The Great Grid Upgrade

North Humber to High Marnham

Preliminary Environmental Information Report

Volume 1: Chapter 4 Description of the Project

February 2025

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Contents

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4. Description of the Project

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4. Description of the Project

4.1 Introduction

4.1.1 This chapter provides a description of the North Humber to High Marnham Project (the 'Project') and represents the current understanding of the Project design parameters. The current design parameters have incorporated feedback received during both the 2023 non-statutory consultation and the 2024 localised non-statutory consultation together with ongoing environmental and design work.

4.1.2 The Project is a proposal by National Grid Electricity Transmission plc (hereafter referred to as National Grid) to build a new high voltage electricity transmission line and associated works including reinforcing the electricity transmission network between the new Birkhill Wood Substation north of Hull close to Creyke Beck in the East Riding of Yorkshire and the new High Marnham Substation at High Marnham in Nottinghamshire.

4.1.3 The Project includes the following principal components:

- Approximately 90 km of new overhead line between the new Birkhill Wood and High Marnham 400 kV Substations.
- Replacement and re-alignment of a section of the existing 400 kV 4ZQ overhead line route between Brantingham and east of Broomfleet.
- Replacement and re-alignment of a section of the existing 400 kV ZDA overhead line route between Ealand and west of Keadby.
- A new 400 kV Birkhill Wood substation, with a new permanent access. This is proposed to be a Gas Insulated Switchgear (GIS) substation.
- Replacement and re-alignment of a section of the existing 400 kV 4ZR route to allow for connection into the new Birkhill Wood substation.
- A new 400 kV High Marnham substation, with a new permanent access. This is proposed to be an Air Insulated Switchgear (AIS) substation.
- Replacement and re-alignment of the existing 4ZV and XE 275 kV overhead line routes and existing 400 kV ZDA and ZDF overhead line routes, to allow for connection into the new High Marnham substation.

4.1.4 The Project will include other required works, for example, temporary diversions for works on existing overhead line routes, temporary access roads, highway works, temporary works compounds, work sites and ancillary works. The Project will also include utility diversions and drainage works. There would also be land required for mitigation, compensation and enhancement of the environment including biodiversity net gain.

4.1.5 Following submission of the EIA Scoping Report (Ref 4.9) the approach to the inclusion of the proposed Birkhill Wood Substation and proposed High Marnham Substation (to which the overhead line is proposed to connect) has altered. Whilst implementation of these two substations remains subject to achieving consent through separate applications made under the Town and Country Planning Act 1990 (TCPA) (Ref 4.10) procedures (and other required consent application procedures), in order to achieve a

comprehensive consenting position for the Project these substations and their associated overhead line reconfigurations have been included as part of the Project. The preliminary assessment of the likely environmental effects of these substations is provided in **Chapter 20 Substations and Associated Works**.

4.1.6 As set out in **Chapter 1 Introduction** this Preliminary Environmental Information Report (PEIR) has been informed by the EIA Scoping Opinion (Ref Ref 4.2) published by the Secretary of State in September 2023. The comments received on the description of the Project in the EIA Scoping Opinion (Ref 4.2) have been taken into account in the production of this Chapter. An explanation of how the comments have been addressed, or will be addressed in the Environmental Statement (ES), are set out in Table 4.1 below.

4.1.7 This chapter has been split into the following subsections, which describe:

- The location of the Project.
- The good design principles that have been embedded into the design of the Project;
- The infrastructure proposed;
- The construction methods that are proposed for installing the Project infrastructure;
- Operation, maintenance and decommissioning requirements; and
- A description of the Project as proposed in each Route Section.

4.1.8 This chapter should be read in conjunction with:

- **Chapter 1 Introduction**;
- **Chapter 3 Project Need and Alternatives**; and
- **Chapter 5 PEIR Approach and Methodology**.

4.1.9 This chapter is supported by the following figures in Volume 2:

- **Figure 4.1 Proposed Project Design**;
- **Figure 4.2 Construction Traffic Routes**;
- **Figure 4.3 Temporary Construction Works**;
- **Figure 4.4 Third Party Works**;
- **Figure 4.5 Proposed Birkhill Wood Substation and Associated Works**; and
- **Figure 4.6 Proposed High Marnham Substation and Associated Works**.

4.1.10 This chapter should be read in conjunction with the following design drawings:

- **NHHM-NG-ENG-DWG-0002 Illustrative Suspension Lattice Pylon**;
- **NHHM-NG-ENG-DWG-0003 Illustrative Tension Lattice Pylon**;
- **NHHM-NG-ENG-DWG-0004 Illustrative Lattice Pylons**;
- **NHHM-NG-ENG-DWG-0005 Illustrative Min-Max Lattice Pylons**;
- **NHHM-NG-ENG-DWG-0006 Illustrative Lattice Pylon Footprints**;
- **NHHM-NG-ENG-DWG-0007 Illustrative Lattice Pylon Foundations**;
- **NHHM-NG-ENG-DWG-0008 Indicative Overhead Line Limits of Deviation**;

- **NHHM-NG-ENG-DWG-0009 Illustrative Lattice Pylon Working Areas**;
- **NHHM-NG-ENG-DWG-0010 Illustrative Lattice Pylon Pulling Positions**;
- **NHHM-NG-ENG-DWG-0011 Illustrative Bellmouth and Visibility Splay**;
- **NHHM-NG-ENG-DWG-0012 Illustrative Stone Access Road**;
- **NHHM-NG-ENG-DWG-0013 Illustrative Interlocking Panel Access**;
- **NHHM-NG-ENG-DWG-0014 Illustrative Culvert Details for Watercourse Crossings**;
- **NHHM-NG-ENG-DWG-0015 Illustrative Bridge Details for Watercourse Crossings**;
- **NHHM-NG-ENG-DWG-0016 Illustrative Construction Compound (Satellite)**; and
- **NHHM-NG-ENG-DWG-0017 Illustrative Construction Compound (Main)**

4.1.11 This chapter is supported by the following appendices in Volume 3:

- **Appendix 4.1 Draft Outline Code of Construction Practice**;
- **Appendix 4.2 Indicative Pylon Schedule**; and
- **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Table 4.1 – Comments raised in the Scoping Opinion relating to the description of the Project

ID	Inspectorate's comments	Response
2.1.1	**Proposed substation connections**: The Scoping Report identifies that the overhead line would connect into two new proposed substations, one located near to the existing Creyke Beck Substation and the other close to the existing High Marnham Substation, each of which would be consented separately. The specific locations of theses proposed substations have not yet been determined. The ES should therefore confirm the likely schedule for development of these substations projects and demonstrate where they have been taken into consideration within the assessment.	As set out in section 4.1.4 the approach to the inclusion of the proposed Birkhill Wood Substation and proposed High Marnham Substation (to which the overhead line is proposed to connect) has altered. The substations and their associated overhead line reconfigurations have been included as part of the Project. The preliminary assessment of the likely environmental effects of these substations is provided **Chapter 20 Substations and Associated Works**.
2.1.2	**Description of the Proposed Development:** The Scoping Report presents a high-level description of the Proposed Development within a scoping boundary and notes that the design is at an early stage of development. Locations of pylons, site compounds and connections to substations have not yet	The Scoping Boundary has now been refined to form the draft Order Limits, taking into account the EIA Scoping Opinion (Ref 4.2), feedback received from both rounds of Non-Statutory Consultation, stakeholder engagement, environmental

ID	Inspectorate's comments	Response
	been determined but are proposed to be within the scoping boundary presented. At the point an application is made, the description of the Proposed Development should be sufficiently detailed to include the design, size, capacity, technology, and locations of the different elements of the Proposed Development. This should include the footprint and heights of the structures (relevant to existing ground levels), as well as land-use requirements for all elements and phases of the development. The description should be supported (as necessary) by figures, cross sections, and drawings which should be clearly and appropriately referenced.	surveys and further design and assessment. The proposed locations of the Pylons are shown on **Figure 4.1 Proposed Project Design** and indicative heights and footprints for each are presented in **Appendix 4.2 Indicative Pylon Schedule**. The proposed locations of site compounds and temporary works required to construct the Project are shown in **Figure 4.3 Proposed Temporary Works**. Indicative design drawings for both the permanent structures and elements of the temporary works have been provided, these are set out in section 4.1.9.
2.1.3	**Limits of Deviation/flexibility:** The Scoping Report notes that the ES will include Limits of Deviation to allow flexibility in the development of the design. Alternative pylon designs, line swap overs, and methods for installation of the overhead line and cabling are not yet confirmed and the Inspectorate considers that these options have potential for very different environmental effects. The Applicant should make every attempt to reduce the range of options and explain clearly in the ES which elements of the Proposed Development have yet to be finalised and provide the reasons. At the time of application, any Proposed Development parameters should not be so wide ranging as to represent effectively different developments. The parameters should use the maximum envelope within which the built development may be undertaken to ensure a worst-case assessment. The ES should also identify the parameters that have been assumed as the worst-case scenario for each aspect scoped into the assessment and ensure that interactions between aspects are taken into account relevant to those scenarios. The development parameters should be clearly defined in the draft	The Scoping Boundary has now been refined to form the draft Order Limits taking into account the EIA Scoping Opinion (Ref 4.2), feedback received from both rounds of Non-Statutory Consultation, stakeholder engagement, environmental surveys and further design and assessment. This chapter describes the proposed Project and details where flexibility is required. The Limits of Deviation (LoD) are described in section 4.4 illustrated on **Figure 4.1 Proposed Project Design**. The topic chapters have taken flexibility into account and the preliminary assessments have undertaken a worst-case assessment. The final development parameters will be clearly defined in the ES and draft Development Consent Order (dDCO) as part of the application submission, once consultation feedback has been considered

ID	Inspectorate's comments	Response
	Development Consent Order (dDCO) and in the accompanying ES. The Applicant, in preparing an ES, should consider whether it is possible to robustly assess a range of impacts resulting from a large number of undecided parameters. The description of the Proposed Development in the ES must not be so wide that it is insufficiently certain to comply with the requirements of Regulation 14 of the EIA Regulations.	and the proposed design has been refined and finalised.
2.1.4	**Transient and temporary construction activities:** The ES should describe the phasing or duration of each stage of construction and any potential for construction works to be carried out in more than one location simultaneously. Any stages where there would be overlapping construction activities in more than one location should also therefore be assessed. Where temporary construction activities such as creation of bunds for topsoil storage, temporary drainage or fencing are required, these should be considered within the assessment, where there is potential for significant effects to occur.	Section 4.5 of this chapter describes the phasing and indicative duration of construction. The individual topic chapters have assessed the impact of temporary construction activities (where these are scoped into their assessments).
2.1.5	**Use of culverts:** The Inspectorate draws the Applicant's attention to the Environment Agency's consultation response (Appendix 2 of [the] Opinion) regarding its position in relation to watercourse culverting.	No culvert crossings of main rivers are proposed. Where a temporary haul road is proposed to cross a main river, a clear span bridge has been proposed. This is set out in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.
2.1.6	**Tunnels and trenchless methods of construction:** Where potential cable routes are proposed to be laid in tunnels or through other methods of trenchless excavation (such as Horizontal Directional Drilling) as mitigation for significant effects, the Applicant should ensure that these measures are appropriately secured in the draft dDCO and ES. Where such methods are employed, the potential consequential environmental effects of these techniques (risks from release of drilling fluids, additional land-take	As a result of ongoing assessment and appraisal, no sections of undergrounding on the proposed overhead line are proposed. There is the requirement to divert existing utilities including low voltage wood pole and telecommunication overhead lines. This includes undergrounding of these assets. This is described in section 4.5 of this chapter and assessed where relevant within the topic chapters.

ID	Inspectorate's comments	Response
	requirements) should also be considered within the assessment.	
2.1.7	**Working widths for cable laying:** Table 4.2 identifies that up to six cable trenches 1.5m wide would be required for cable laying. It is not clear however why the associated cable corridor is therefore 120m wide. The ES should provide appropriate drawings and cross sections to demonstrate the likely working methods for cable laying and thus the need for the temporary and permanent land-take required	These parameters were identified in the Scoping Report specifically in relation to possible requirements for the undergrounding of the overhead line. However, as a result of ongoing assessment and appraisal, no sections of undergrounding on the proposed overhead line are proposed. Details of how third party services would be undergrounded, including the different parameters required for such works, is set out in section 4.5 of this chapter.
2.1.8	**Landscaping / planting:** Where landscape measures or landscape planting is identified, these should be illustrated in appropriate plans within the ES. The ES should provide details of the proposed landscape planting strategy as well as any monitoring proposed, and any assumptions made regarding vegetation growth rates.	Proposed areas for landscape planting are shown on **Figure 4.1 Proposed Project Design**. The ES will provide landscape mitigation plans, details of the proposed landscape planting strategy, proposed monitoring and the assumptions made regarding vegetation growth rates.
2.1.9	**Night-time construction works:** Within the 'Doncaster Landscape Character Assessment and Capacity Study' subsection of Table 6.5, it states that no overnight work is anticipated. Yet Table 15.3 states that night-time construction work may be required at static sites where certain activities cannot be stopped once started. The ES should contain a description of any works that are likely to be required during nighttime construction activities and be consistent throughout in its reporting of night-time construction works.	The proposed construction working hours are set out in section 4.5. Nighttime working is not proposed as standard but there are some specific operations proposed that may take place outside of the proposed core working hours these are set out in section 4.5. The preliminary assessments have considered the proposed core working hours and those operations that may take place outside of them as appropriate.
2.1.10	**Lighting – Night-time working:** There are inconsistencies within the Scoping Report regarding night-time working (see ID 2.1.9 above) Tables 7.5 and 7.5 both	Nighttime working is not proposed as standard as part of the core construction working hours. There are some specific

ID	Inspectorate's comments	Response
	scope in effects of night-time lighting, based on the potential for significant effects. Conversely, Paragraph 7.8.5 states that no significant effects are anticipated from night-time lighting during construction and operation. The Inspectorate requests that the Applicant clarify its position regarding this matter and that the ES is consistent.	operations proposed that may take place outside of the proposed core working hours these are set out in section 4.5. The preliminary assessments have considered the proposed core working hours and those operations that may take place outside of them as appropriate.
2.1.11	**Phases:** The Scoping Report refers to the construction, operation, maintenance, and decommissioning phases. A description of the proposed maintenance activities is set out in Section 4.5 of the Scoping Report. The Scoping Report is inconsistent in the way it addresses maintenance, referring to both the 'maintenance phase' and 'operation/maintenance'. In some instances, this results in a lack of clarity in what activities or aspects of the Proposed Development the Applicant is seeking to scope in or out of the assessment. The Inspectorate is of the view that maintenance activities form part of the operational phase, and any associated effects should be assessed as operational effects and considered alongside other operational effects where relevant, unless a clear justification for why this is not appropriate is provided.	The operation of the Project includes the physical infrastructure and the transmission of electricity through that infrastructure. Maintenance activities are activities undertaken periodically during the operation of the Project, some of which require additional temporary infrastructure such as matting for access tracks and could result in impacts over and above the operation of the Project, such as temporary habitat loss. For those reasons the description of operation, provided at section 4.6 and maintenance at section 4.7 have been kept separate. Both operation and maintenance have been assessed as part of the preliminary assessment. Keeping operation and maintenance separate has ensured the potential temporary effects associated with maintenance activities are clearly set out. For clarity the description of maintenance has been split down into routine maintenance and repair and refurbishment, and where these are scoped into the topic chapters this has been made clear.
2.1.12	**Duration of effects:** Where the Applicant proposes to scope a matter from the EIA based on activities/impacts lasting for 'a short period of time' or 'short duration' or 'short term' only, the Inspectorate will require a defined timeframe for each assessment is required to ascertain that	**Chapter 5 PEIR Approach and Methodology** describes the general methodology that has been applied within this preliminary assessment and will be applied within the ES. This includes the consideration of

ID	Inspectorate's comments	Response
	no LSE will arise. The ES should ensure it is consistent in using such terminology.	duration. The topic chapters set out how they have applied the general methodology taking into account any topic specific guidance. Where duration is a factor, this is explained within each topic chapter as the potential for duration to contribute to a likely significant effect varies for different topics.
2.1.13	**Siting of pylons:** The Applicant should endeavour to fix the siting of each component to reduce uncertainty prior to submission of any application; where this is not possible, the Applicant should justify why pylon locations are not fixed and identify the level of flexibility that is being sought to ensure that the ES assesses a worst-case scenario adopting the parameters-based approach. The Inspectorate notes that a worst case scenario may vary between topic assessments.	The location of the proposed pylons and the horizontal LoD are shown on **Figure 4.1 Proposed Project Design.** A proportionate degree of flexibility has been incorporated into the design so that unforeseen issues encountered after a development has been consented can be addressed. A description of the LoDs applied is provided in section 4.4. A basis of assessment will be provided in the ES, which will set out the worst-case scenario for each topic and how it has been assessed.
2.1.14	**Ease of reference to figures:** The Inspectorate noted the interchanging use of the terms 'figure' and 'image' used in the Scoping Report to describe Figures 17.1 and 17.2. For ease of reference and clarity, the ES should use consistent terminology when referring to figures, particularly to avoid confusion between images within the text and images supplied as separate figures. Where images are embedded in the text, these should be clearly legible.	Where an image has been included within this text this has been labelled as an Image. The Figures provided in Volume 2 are separate to the text and have been labelled as Figures.
2.1.15	**Supporting information:** The Inspectorate noted that some figures were provided only through accessing documents in the Scoping Report list of references rather than supplied within the report itself. The text also mentions a Figure 11.5 and an Appendix 1.A, but these are not referred to again and are not supplied. The Applicant should ensure	All Figures are provided in Volume 2 and Appendices in Volume 3. Each chapter includes a list of those figures and appendices in the introductory section which should be read in conjunction with the chapter.

ID	Inspectorate's comments	Response
	that information is easy to find within the ES, and for example, where information is supplied in supporting documentation, it is clearly referenced. Where possible, supporting information should be supplied as a clearly labelled Appendix to the ES. Appropriate use of contents lists to clearly identify what is contained within volumes of material should also be employed to aid navigation.	

4.2 Location of the Project

4.2.1 The Project is located in the east of England across the Humber and East Midlands regions. The Project is located in an area that is predominantly rural, with large parts of the land under arable use. The city of Kingston-upon Hull, towns of Beverley, Crowle, Scunthorpe, Epworth, Haxey, Gainsborough and Retford are located within 5 km of the draft Order Limits. There are multiple villages and individual properties within or near to the Project.

4.2.2 The Project is located within four local authorities as illustrated on **Figure 1.1 Project Location and Route Sections** in Volume 1. These are:

- East Riding of Yorkshire Council;
- North Lincolnshire Council;
- Bassetlaw District Council in Nottinghamshire; and
- Newark and Sherwood District Council in Nottinghamshire.

Route Sections

4.2.3 For ease of reference the Route Sections adopted during both Non-Statutory Consultations have been applied along the route of the Project. These Route Sections are illustrated on **Figure 1.1 Project Location and Route Sections** and comprise:

- Route Section 1: Creyke Beck to Skidby
- Route Section 2: Skidby to A63 Dual Carriageway
- Route Section 3: A63 Dual Carriageway to River Ouse Crossing
- Route Section 4: River Ouse Crossing
- Route Section 5: River Ouse Crossing to Luddington
- Route Section 6: Luddington to M180 Motorway
- Route Section 7: M180 Motorway to Graizelound
- Route Section 8: Graizelound to Chesterfield Canal
- Route Section 9: Chesterfield Canal to A620 east of North Wheatley
- Route Section 10: A620 east of North Wheatley to Fledborough
- Route Section 11: Fledborough to High Marnham

4.3 Good Design Principles

4.3.1 The Project will be designed, constructed, operated and maintained in accordance with applicable health and safety legislation and regulations. The Project will comply with relevant design safety standards including the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) which set out the criteria and methodology for planning and operating the National Electricity Transmission System. National Grid policies and processes, which contain details on design standards required to be met when designing, constructing, operating and maintaining assets such as those proposed on the Project, will be adhered to.

4.3.2 National Grid's approach to options appraisal allows good design to be considered as part of the design process. This includes locating features of a project away from sensitive receptors, where practicable, and considering measures that can be embedded into the design whilst having regard to the final features.

4.3.3 Table 4.2 outlines the embedded measures that have been incorporated into the Project to date.

Table 4.2 – Embedded design measures

Embedded measure	Benefits
Sensitive Routeing and Siting to develop the draft overhead line alignment, siting of substations and draft Order Limits.	Avoids and reduces, as far as practicable, impacts on identified receptors, in line with the National Policy Statements EN-1 (Ref 4.4) and EN-5 (Ref 4.5) as well as the Holford Rules (Ref 4.6) and the Horlock Rules (Ref 4.8). Further information on options appraisal and the alternative options considered is set out in **Chapter 3 Project Need and Alternatives.**
Selection of a standard lattice pylon as the most appropriate pylon type	To keep a consistent appearance with the existing 400 kV overhead line infrastructure within the existing landscape.
Close parallel sections	Where possible the Project has been designed to be parallel or close parallel with the existing overhead lines. In general terms, a close parallel route may have the potential to reduce the overall extent of environmental impacts arising from the Project by intensifying the degree of impact on receptors already affected by existing overhead lines, rather that spreading impacts to areas not currently affected and forming a coherent appearance in line with Holford Rule 6 (Ref 4.6). Route Sections where close parallel has been possible taking into account constraints present along the existing overhead lines as well as technical complexity include: Route Sections 1-5 to reduce effects on the Yorkshire Wolds Important Landscape Area and potential collision risk on interest features of the

Embedded measure	Benefits
	Humber Estuary Special Protection Area (SPA) and Ramsar. Route Section 7 to reduce effects on the Isle of Axholme area of Special Historic Landscape Interest.
River Ouse crossing	The crossing of the River Ouse has been designed to be upstream of its confluence with the River Trent to minimise the width of the crossing on the Humber Estuary Special Area Conservation (SAC)/SPA/wetland site(s) also designated to be of international importance (Ramsar)/Site of Special Scientific Interest (SSSI). The proposed overhead line has also been routed to be broadly parallel with the existing 400 kV overhead line (taking into account the other environmental, socio-economic and technical considerations) to minimise the potential for effects on the interest features of the Humber Estuary designated sites. The locations of the proposed crossing pylons have been sited outside of the designated sites.
Pylon fittings	Pylon fittings, such as insulators, dampers, spacers and clamps, are designed and procured in accordance with a series of National Grid Technical Specifications and must be type registered (rigorously tested) to ensure the fitting conforms to the specification. These processes reduce the potential for audible noise and tones to occur from all types of fittings, including insulators. Where noise does occur, it is likely to be localised and of short duration. If this is due to a fault, action can be taken to rectify it. Where noise from fittings does occur which results in a complaint, appropriate action can be taken to seek to remedy the cause of the noise, usually through cleaning or replacing the relevant fitting.
The Project will be designed in accordance with National Grid design standards and will be compliant with the guidelines and policies relating to Electromagnetic Fields (EMF) stated in NPS EN-5 (Ref 4.5), including the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines (Ref 4.7)	Compliance with these guidelines and policies mean that the Project has already designed out potential effects from EMF to a level to meet health and safety standards.

Embedded measure	Benefits
The design includes strategically located and optimised temporary haul roads along the Project alignment to support construction of the Project.	Reduce the effects of construction traffic movements on the local public highway network during construction.
Utilising existing watercourse crossing points as far as practicable	Where possible the design of the temporary haul roads has sought to utilise existing bridges and culverts.
Large or sensitive watercourses, for example those designated as main river, and those with Water Framework Directive (WFD) status, will be crossed by the temporary haul road using temporary clear span bridges.	Reduce the effects on watercourses, their banks, and water quality as a result of removing works from within the watercourse.
Rationalisation of existing electricity infrastructure.	The undergrounding of existing third party services which cross the draft Order Limits will provide some benefit in terms of rationalisation of infrastructure.
Siting of the proposed infrastructure within the draft Order Limits to minimise potential impacts on protected habitats and species	Individual pylons and temporary haul roads have been designed to avoid direct and indirect impacts on protected habitats and species where possible. Micro-siting of pylons has taken into account swing of the overhead lines to avoid or minimise loss of woodland and trees as far as practicable.
Application of stand-off distances[1]	Appropriate stand-off distances have been applied to designated sites and priority habitats (including ancient woodland and potential ancient woodland) and watercourses to avoid direct effects where practicable.
Biodiversity Net Gain (BNG)	Areas of permanent habitat loss would be calculated and considered during the BNG assessment. The Project will deliver 10% or greater BNG.

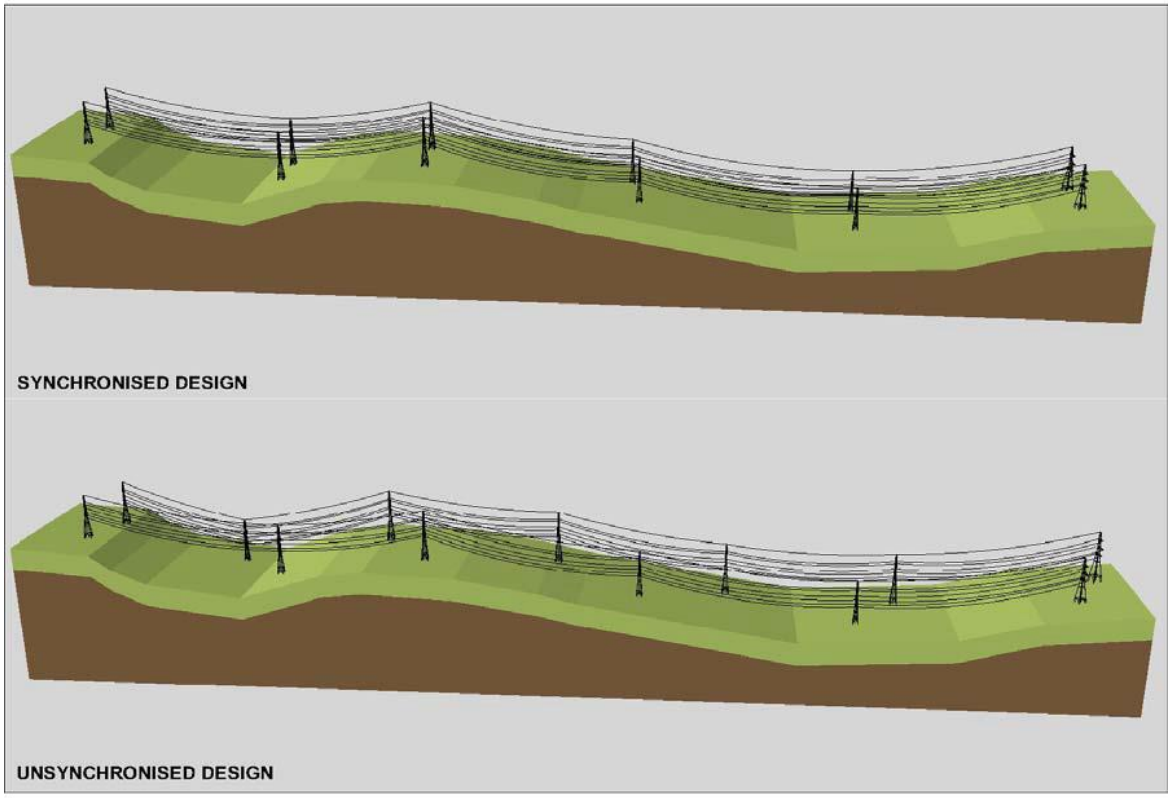
4.3.4 As development of the Project advances, further measures will be identified and included within the Project design.

[1] 'Stand-off distances' refers to a buffer between the proposed infrastructure and associated construction works and a receptor such as a watercourse

Synchronicity

4.3.5 Where sections of the existing and new overhead lines would run in close proximity or parallel to each other, the siting of the new pylons relative to the existing pylons becomes particularly important in visual terms. If the pylons and sag of the conductor in each span were substantially out of step, then the visual 'flow' of the two lines would be discordant, potentially resulting in greater visual effects than a synchronised design. This effect is illustrated in the sketch in Image 4.1 below.

Image 4.1 – Synchronicity



4.3.6 This visual effect can be reduced or avoided if new pylons are located adjacent to the existing pylons and are of a similar height, synchronising the rise and fall of the adjacent lines across the landscape.

4.3.7 There are no policies or guidance documents that specifically refer to the synchronising or pairing of pylons when routeing parallel overhead lines. However, when considering routeing of transmission lines, National Grid employs the Holford Rules (Ref 4.6) as the basis for the approach to routeing.

4.3.8 The following note on Rule 6 of the Holford Rules states:

'In all locations minimise confusing appearance. Arrange wherever practicable that parallel or closely related routes are planned with tower types, spans and conductors forming a coherent appearance; where routes need to diverge, allow where practicable sufficient separation to limit the effects on properties and features between the lines.'

4.3.9 National Grid considers that achieving a coherent appearance includes the pairing or synchronising of pylon locations where practicable.

4.3.10 The following conclusions are made on the definition of synchronisation when referring to two parallel 400 kV overhead lines using approximately 50 m high pylons.

- Synchronised – Pylons are considered to be synchronised when they are located directly perpendicular to each other, or are almost perpendicular, within a maximum deviation of 20 m from the centre of the two pylons.
- Broadly Synchronised – Pylons are considered to be broadly synchronised when they sit almost perpendicular to each other, within a maximum horizontal deviation (up and down the alignment) of between 20 m and 50 m from the centre of the pylons up or down the line. Being broadly synchronised still achieves a level of coherency between the two lines, as in some views the pylons would still present the impression of being paired, but less so in views perpendicular from the line.
- Anything beyond 50 m from the centre of the pylons up or down the line is not considered to be synchronised or broadly synchronised.

Approach to Materials and Waste

4.3.11 The Project would require the use of new materials during construction such as galvanised steel for the pylons, reinforced concrete for the foundations, insulator sets (typically glass, porcelain or polymeric) and aluminium conductors. Further information regarding materials will be provided within the project description within the ES.

4.3.12 The material sources are unlikely to be identified until the detailed design stage of the Project, which would happen post-consent. The nature of the Project means that it is difficult to use secondary (reused/ recycled) sources during construction of the Project, as this can affect the operation and the design life of the Project. However, National Grid has existing processes in place to source materials from sustainable sources and to use recycled materials, where these do not compromise the required design standards and operational life of the Project.

4.3.13 Temporary materials such as aggregate for access routes and site compounds, works cabins and security fencing would be required during construction. Where practicable, temporary materials would be sourced from other construction projects within the region and reused at other construction projects after completion of the Project.

4.3.14 Waste materials would be produced by the Project. The contractor would be required to produce a Site Waste Management Plan (SWMP) prior to construction (commitment GG22 in **Appendix 4.1 Draft Outline Code of Construction Practice**). This would set out the measures to reduce the generation of waste in the first place and appropriate measures to reuse and recycle materials where practicable. It would also identify appropriate waste facilities to dispose of materials.

4.3.15 Soil may need to be removed from site in certain circumstances, such as where the soil was found to be contaminated, in which case, the soils would be managed in an appropriate manner, as set out in the good practice measures within the **Appendix 4.1 Draft Outline Code of Construction Practice** and the future SWMP.

Approach to Energy Consumption

4.3.16 The Project aims to support the UK's transition to Net Zero emissions by 2050. As outlined in **Chapter 3 Project Need and Alternatives**, National Grid has a statutory duty to develop and maintain an efficient, coordinated, and economical electricity transmission system. Therefore, the Project would contribute to supporting the UK's Net Zero transition.

4.3.17 The Project would consume energy during manufacture and construction. The Project will consider a range of measures to reduce energy consumption during construction, such as the use of energy efficient plant and tools. The Project will aim to use a local grid connection for temporary site power, where viable. Where not viable an alternative sustainable option should be used, such as appropriately sized alternatively fuelled or hybrid generators, where practicable.

4.3.18 A Construction Traffic Management Plan (CTMP) will set out measures to reduce journeys, such as car sharing and using public transport where practicable. It will also set out commitments regarding using electric vehicles or vehicles conforming with emission standards ratings (see commitment TT01 and TT02 in **Appendix 4.1 Draft Outline Code of Construction Practice**). Energy consumption during maintenance and operation would be limited to the energy required to operate the Project. National Grid also has existing processes in place to monitor its energy consumption across the network. If consented, the operational energy requirements would be managed as part of the wider network operation.

4.3.19 The measures outlined above would reduce the energy consumption of the Project during both construction and operation, in line with the good design principles.

4.4 Proposed Infrastructure

Draft Order Limits

4.4.1 The draft Order Limits are defined as the maximum extent of land within which the Project, as described in this chapter, may be carried out. They include both permanent and temporary land required to construct, operate and maintain the Project. The draft Order Limits are illustrated on **Figure 4.1 Proposed Project Design**.

Proposed Overhead Line

4.4.2 This section provides a general description of the proposed overhead line. A more detailed description of the Project as proposed in each Route Section is provided in section 4.9.

4.4.3 The overhead line would comprise of conductors supported by pylons. A typical pylon operating at 400 kV is approximately 50 m in height. A typical span distance between pylons is approximately 350 m. In broad terms there are typically three pylons for every kilometre of overhead line.

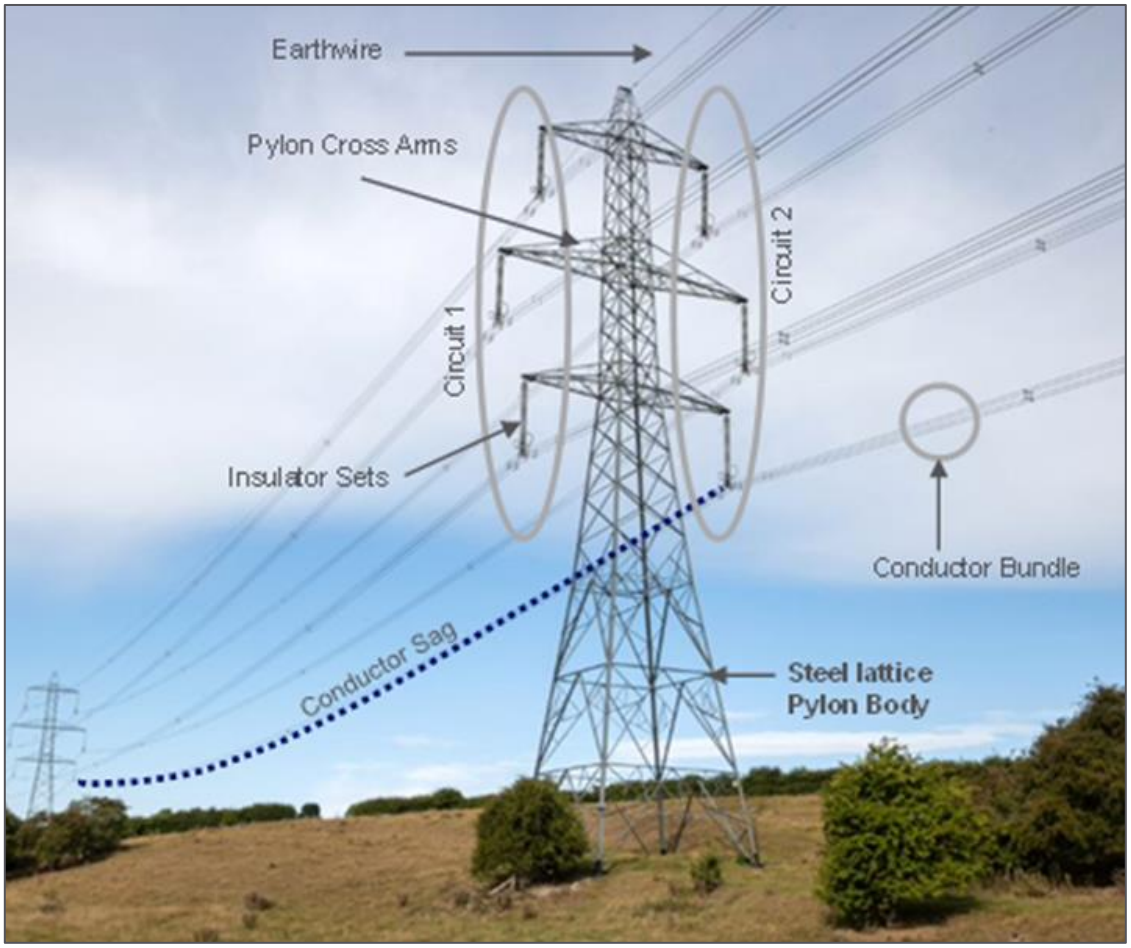
4.4.4 Pylons are in general either: suspension pylons (from which the conductor is simply suspended); or tension (angled) pylons (more robust structures that hold conductors in tension where the alignment of an overhead line changes direction or to maintain tension in long straight sections of the route). An example of a suspension pylon is illustrated on **Design Drawing NHHM-NG-ENG-DWG-0002 Illustrative Suspension Lattice Pylon** and an example of a tension pylon is illustrated on **Design Drawing**

NHHM-NG-ENG-DWG-0003 Illustrative Tension Lattice Pylon. In some locations, such as on the overhead line entries to the proposed substations, terminal pylons are required. **Appendix 4.2 Indicative Pylon Schedule** sets out which pylons are proposed to be suspension and those which are proposed to be tension pylons.

4.4.5 The conductors are connected to the pylon by an insulator assembly consisting of a set of insulators (components made from a material with a high resistance to the flow of electric current such as glass or porcelain) and steel fittings and conductor clamps. Additional fittings, such as spacers and vibration dampers, would be fitted to the conductors. Spacers prevent the conductors from touching each other and vibration dampers prevent oscillations from the conductors from reaching the insulator fittings and minimise effects of fatigue loading. Arcing horns will also be required, which are required to protect insulators from damage due to dangerous electrical conditions, such as overvoltages due to electrical faults or lightning strikes.

4.4.6 The main components of an overhead line are shown in Image 4.2, which shows a typical steel lattice suspension pylon.

Image 4.2 – Components of a typical transmission connection



4.4.7 Where the route of the overhead line changes direction, tension pylons are required to accommodate the additional sideways strains with the insulators tensioning the conductors horizontally to keep conductors aligned, this is illustrated on Image 4.3.

Image 4.3 – Suspension pylon (left) and tension pylon (right)

Proposed pylons

4.4.8 The proposed pylons for the Project would comprise of steel lattice with three arms on either side of a central body. **Design Drawing NHHM-NG-ENG-DWG-0004 Illustrative Lattice Pylons**, provides an illustration of the type of pylon proposed for the Project alongside illustrations of the existing pylon types. **Design Drawing NHHM-NG-ENG-DWG-0006 Illustrative Lattice Pylon Footprints** provides an illustration of the footprints of the proposed pylons.

4.4.9 Typical heights for steel lattice pylons are around 50 m; however, the proposed height of each pylon would depend on the specifics of each location such as topography, land use and crossings. For example, the existing pylons either side of the River Ouse near Ousefleet are approximately 110 m in height, due to the requirement to maintain clearances. Indicative typical pylon heights for the Project are provided in **Appendix 4.2 Indicative Pylon Schedule** and are illustrated on **Design Drawing NHHM-NG-ENG-DWG-0005 Min-Max Lattice Pylons**.

4.4.10 Alternative pylon designs may also be considered, where mitigation (e.g., for landscape and visual effects) is required. The alternative design which may be considered is a low height steel lattice pylon.

Proposed conductors and insulators

4.4.11 The conductor bundle for the proposed 400 kV overhead line and sections on the existing 400 kV 4ZQ overhead line which require reconductoring is Triple Araucaria[2]. The conductor bundle for the proposed replacement and re-alignment of a section of the existing 400 kV ZDA overhead line route between Ealand and west of Keadby is Twin Rubus[3].

4.4.12 Whilst the indicative design has been based on the conductor types stated above, flexibility on conductor choice is required in order to maintain flexibility for the provision of new conductors that may be available prior to the construction of the Project, and which may have capability and sustainability benefits over the indicative design. In addition, flexibility on conductor type is required at the River Ouse crossing to ensure the appropriate loadings are achieved on the crossing and anchor pylons. This will be determined through detailed design.

4.4.13 Insulators can be made of different types of material, but the most common industry standard is either glass, porcelain, or polymeric.

4.4.14 Suspension pylons would typically have a single insulator string hanging vertically downwards from each crossarm end to carry the conductor bundle. A tension pylon would typically have three strings (i.e., three insulator strings for a conductor bundle consisting of three conductors) and these are orientated horizontally outwards from the crossarm ends and take the tension of the conductors.

Line swap overs

4.4.15 Line swap overs comprise reconfiguration of an existing overhead line to allow the overhead line routes to remain parallel without the need for a line ‘duck-under’. Line swap overs allow for the continuation of a route from a section of new pylons to a section of existing pylons, whilst the parallel route is a continuation of a route from a section of existing pylons to a section of new pylons.

4.4.16 Line swap overs are achieved by removing a section of existing line and forming two unconnected ends, which are then each connected to a new line approaching from either side. A line swap over is illustrated schematically on Image 4.4.

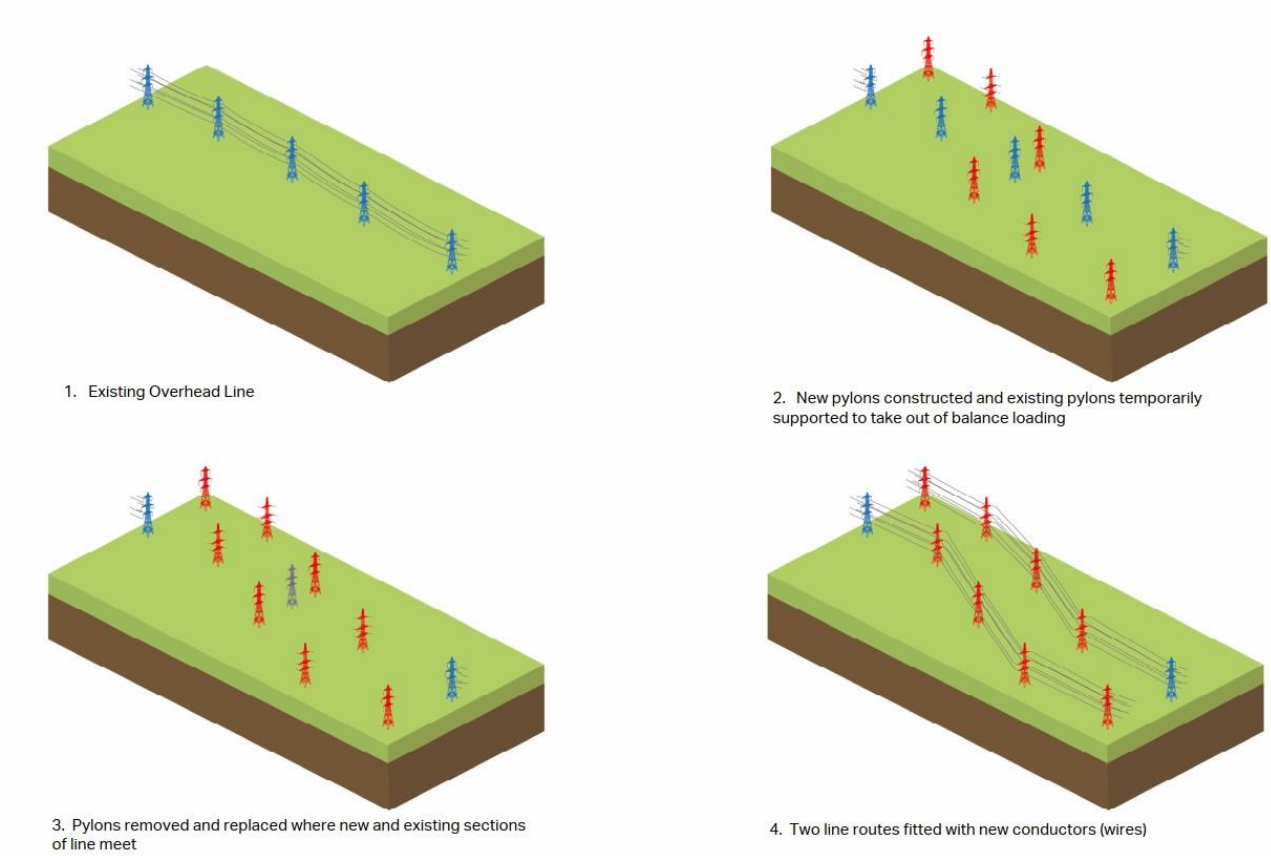
4.4.17 Temporary diversions of localised sections of the existing route may also be required to ensure continuity of supply on the affected routes.

4.4.18 The Project includes two line swap overs in Route Sections 2 and 3. These are described in more detail in section 4.9.

[2] Three conductors in each bundle

[3] Two conductors in each bundle

Image 4.4 – Schematic of a line swap over



Limits of Deviation

4.4.19 As recognised by the Planning Inspectorate's Advice Note Nine (Ref 4.1 a necessary and proportionate degree of flexibility needs to be incorporated into the design of a development so that unforeseen issues encountered after a development has been consented can be addressed – for example previously unidentified poor ground conditions, or the identification of significant unrecorded archaeological remains which may require a pylon to be re-sited. Therefore, to allow for this necessary and proportionate degree of flexibility, limits of deviation (LoD) have been developed for the Project components which will ultimately be detailed in the DCO. The LoDs will provide a maximum distance or measurement of variation within which every component of the Project would be located.

4.4.20 In respect of a 400 kV overhead line, LoDs will be applied horizontally and vertically.

Horizontal

4.4.21 The horizontal LoD is in general 100 m (50 m either side of the centre line). In certain locations this has been reduced to less than 100 m to avoid a particular receptor and, in some locations, the LoD is wider to allow for additional flexibility at this stage. Where the LoD is 100 m the extent of movement of any pylon is limited by the span length and conductor swing. At a maximum span length, the centre of the pylon could move approximately 20 m either side of the centreline subject to topography and local conditions. The proposed horizontal LoD are shown on **Figure 4.1 Proposed Project**

Design and an example of how the LoD could be utilised is shown on **Design Drawing NHHM-NG-ENG-DWG-0008 Overhead Line Limits of Deviation**.

4.4.22 There is no limit placed on the movement of a pylon along the centreline (longitudinal LoD). The horizontal movement along the preferred alignment is constrained by the number of pylons and the distance a single pylon could move, whilst still maintaining the ground clearance and not exceeding the vertical LoD described below.

Vertical

4.4.23 The upwards vertical LoD for a typical standard lattice pylon is approximately 6 m which would allow for two extension panels (typically 3 m per extension panel but varies between pylon types).

4.4.24 There are certain locations where bespoke pylons are required such as at the River Ouse crossing, crossings of Distribution Network Operators (DNO) assets or where there are topographical constraints. In these specific locations the vertical LoD would be greater than 6 m.

4.4.25 There is no limit placed on the maximum depth of below ground works. Whilst a standard below ground LoD is not proposed, the Project would never go deeper than necessary for technical or environmental reasons as this would add engineering operational complexity and cost.

Proposed Substation Works

4.4.26 As set out above whilst the proposed Birkhill Wood and new High Marnham substations are subject to separate applications under the TCPA (Ref 4.10) procedures (and other required consent application procedures). In order to achieve a comprehensive consenting position for the Project these substations have been included as part of the Project.

Proposed Birkhill Wood Substation

4.4.27 The elements of the Project relating to the proposed Birkhill Wood Substation would include a new 400 kV Gas Insulated Substation (GIS) and associated works, comprising:

- 400 kV GIS equipment building / switch house with attached annex to house protection & control, ancillary equipment and welfare facilities.
- Customer Protection and Control rooms.
- Gas insulated and air insulated switchgear.
- Gantries to interface between overhead lines and substation.
- Backup generator.
- Water tank (for emergency fire fighting purposes).
- Ground deployed solar array to support the substation building services power supply.
- Foul water cesspit.
- Lighting columns and CCTV equipment.

- Electrified fence around the perimeter.
- Car parking.
- 11 kV/415 V Utility Distribution Equipment Enclosure.
- Ground treatment comprises loose stone and gravel substrata with hardstanding, buildings and transmission assets.
- A new vehicular access off the A1079 and approximately 1.2 km of new permanent access road to serve the new and existing substation, including new culvert crossings over ditches.
- Temporary haul road, construction compounds and laydown areas.
- Drainage, landscaping and BNG areas.
- An existing wind turbine, located to the southwest of the proposed substation is proposed to be removed to facilitate the substation development.

4.4.28 The proposed substation works also requires the replacement and re-alignment of a section of the existing 400 kV 4ZR route to allow for connection into the new Birkhill Wood substation.

4.4.29 The proposed Birkhill Wood Substation and associated overhead line works is illustrated on **Figure 4.5 proposed Birkhill Wood Substation and Associated Works.**

4.4.30 Whilst the proposed Birkhill Wood substation is subject to a separate TCPA application, the associated overhead line works would fall under Section 37 of the Electricity Act 1989 (Ref 4.11) for which separate consent is to be sought from the Secretary of State.

Proposed High Marnham Substation

4.4.31 The elements of the Project relating to the proposed High Marnham Substation would include a new 400 kV Air Insulated Substation (AIS) and associated infrastructure, comprising:

- Approximately 22 bays.
- Approximately 10 overhead line gantries.
- Standard substation plant, inclusive of two new super grid transformers; 1 x 400/275kV, and 1 x 400/33kV transformers.
- A new substation control building, and relay rooms.
- Security fencing.
- Lighting columns.
- CCTV surveillance.
- A new vehicular permanent access route off an existing private road to serve the new substation.
- Backup generator.
- Car parking.
- Temporary access route during construction.
- Temporary construction compounds, welfare and laydown areas.

- Landscaping, drainage features and BNG areas.

4.4.32 The new High Marnham Substation is proposed to be served by a new access road from Fledborough Road, which is configured similarly to the current existing access.

4.4.33 The proposed High Marnham Substation and associated overhead line works are illustrated on **Figure 4.6 Proposed High Marnham Substation and Associated Works**.

4.4.34 Whilst the proposed High Marnham Substation is subject to a separate TCPA application, the associated overhead line works would fall under Section 37 of the Electricity Act 1989 (Ref 4.11) for which separate consent is to be sought from the Secretary of State.

4.4.35 The existing 275 kV substation located at High Marnham could be demolished. The demolition of the existing substation if undertaken will be undertaken through permitted development rights and does not form part of the Project or the TCPA application for a new 400 kV substation.

Mitigation Planting

4.4.36 Areas of indicative mitigation planting have been identified; these are shown on **Figure 4.1 Proposed Project Design**. These areas include land to reinstate taller vegetation removed to construct the Project which cannot be reinstated under the proposed overhead line and areas to mitigate potential landscape, visual and ecological (including ornithological) effects. These areas will continue to be developed and detailed in the ES, this will include the planting proposals for each area. The planting proposals will be specific to each area and will include a range of habitat types from grasses to more wooded areas.

4.5 Construction

4.5.1 This section describes how the infrastructure described above would typically be constructed and installed. An Outline Code of Construction Practice (CoCP) has been produced and is included in **Appendix 4.1 Draft Outline Code of Construction Practice**. The topic chapters (Chapters 6-21) have taken account of the control and management measures which are set out in the Outline CoCP when undertaking the preliminary assessment.

Construction Programme

4.5.2 Subject to gaining development consent, construction works would be expected to start in 2028 and be available for commercial load (operational) by the end of 2031, with reinstatement works potentially continuing into 2033. Certain advanced works (such as archaeological trial trenching or protected species mitigation) may take place in advance of the construction period.

4.5.3 The construction schedule will be developed as the Project progresses and will take account of seasonal constraints such as protected species breeding or hibernation seasons, and reducing impacts associated with working within flood zones.

4.5.4 Due to the linear nature of the Project, construction activities are expected to be transient, moving along the length of the working area over time. Therefore, the works in

any given area would be shorter duration than the overall construction programme. Further details on the phasing of the project will be set out within the ES.

4.5.5 An indictive construction programme for the Project is presented in Table 4.3.

Table 4.3 – Indicative construction programme

Activity	2028				2029				2030				2031				2032				2033			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Site Mobilisation	■	■	■	■																				
Access & Enabling works		■	■	■	■	■	■	■	■															
Foundations			■	■	■	■	■	■	■	■	■													
Pylon construction				■	■	■	■	■	■	■	■	■	■											
Stringing					■	■	■	■	■	■	■	■	■	■	■									
Commissioning															■	■								
Project operational																■								
Reinstatement													■	■	■	■	■	■	■	■	■	■		

Construction Workforce

4.5.6 It is anticipated the peak construction workforce for the Project would be approximately 570.

Construction Working Hours

4.5.7 The proposed core construction working hours are:

- Monday to Friday 07:00 – 19:00
- Saturday, Sunday and Public Holidays 08:00 – 17:00

4.5.8 The core construction working hours would exclude start up and close down activities which would take up to one hour before or after the core construction working hours.

4.5.9 The following typical operations proposed may take place outside of the proposed core working hours:

- The jointing of underground cables for third party services, with the exception of cable cutting which would only take place during the core working hours.
- The installation and removal of conductors, pilot wires and associated protection across highways, railway lines or watercourses.
- The completion of operations commenced during the core working hours which cannot safely be stopped.
- Activities necessary in the instance of an emergency where there is a risk to persons or property.

- Any highway works requested by the relevant highway authority as necessary to be undertaken outside of core working hours (where possible).
- Oil processing of transformers or reactors in substation sites.
- The testing or commissioning of any electrical plant installed as part of the authorised development.
- The completion of works delayed or held up by severe weather conditions which disrupted or interrupted normal construction activities.
- Security monitoring and surveys.
- Trenchless crossing operations for third party services.
- Deliveries of abnormal indivisible loads (AILs), for example the cable drums which may be outside the core working hours.
- Large concrete pours that cannot be reasonably completed within the core working hours.

Construction Compounds

4.5.10 Construction activities would begin with the preparation and installation of construction compounds. A typical layout of a construction compound is illustrated on **Design Drawing NHHM-ENG-DWG-0017 Illustrative Construction Compound (Main)** and typically includes the following:

- security gate house;
- plant and construction vehicle parking;
- site office parking area;
- site offices and welfare facilities;
- fencing;
- lighting;
- laydown area;
- storage area;
- wheel wash;
- collection, storage and disposal of surface water, in addition to water from within the compound including grey and foul water;
- soil bund;
- spoil storage area;
- power supplies (where feasible to do so alternatively fuelled generators will be used and/or a local grid connection); and
- fuel storage.

4.5.11 Smaller satellite compounds will be required at specific working areas along the route to ensure provision of welfare, storage, and mess room facilities for site operatives. A

typical layout of a satellite compound is shown on **Design Drawing NHHM-ENG-DWG-0016 Illustrative Illustrative Construction Compound (Satellite)**.

4.5.12 The location of the proposed construction compounds are shown on **Figure 4.3 Temporary Construction Works**.

Overhead Line Construction

4.5.13 The construction of the 400 kV overhead line would generally follow the sequence outlined below as work progresses along the length of the overhead line:

- Surveys including archaeological investigation;
- ground investigation;
- installation of bellmouths and creation of visibility splays;
- installation of stock proof fencing and gates or equivalent;
- topsoil stripping, temporary drainage installation where required;
- installation of access tracks (including culverts and bridges) and demarcated pylon working areas;
- installation of pylon foundations (pad and column, mini pile, tube pile or bespoke);
- working area and layout of steelwork in preparation for erection;
- assembly (painting if required) and erection of steelwork;
- installation of protection prior to stringing of conductors, including scaffolding;
- installation of insulator assemblies on suspension pylons;
- establishment of machine sites for conductor stringing;
- conductor and earthwire stringing;
- temporary earthing;
- installation of insulator assemblies on tension and terminal pylons;
- installation of pylon signage including safety notice plate and anti-climbing devices;
- removal of construction equipment and reinstatement of ground and restoration of soils;
- removal of access tracks and bellmouths; and
- removal of construction compounds and ground reinstatement.

4.5.14 Activities such as surveys, archaeological investigation, ground investigation, construction of bellmouths and access tracks could commence without the full construction compounds in place. Nominal office and welfare facilities would suffice for an initial period until the full construction compounds were available.

Vegetation clearance assumptions

4.5.15 Vegetation clearance may be undertaken prior to or during any of the activities identified above, this would be in accordance with any ecological requirements identified through the EIA and secured through a DCO requirement.

4.5.16 Vegetation clearance is required to ensure the Project can be safely constructed and operated. Vegetation clearance generally falls into four categories: removed, affected managed, potentially affected, and not affected. These areas will be shown on plans submitted as part of the application for the DCO and assessed within the relevant chapters of the ES.

4.5.17 For the purpose of the preliminary assessment the following assumptions have been applied.

Overhead line

- Any vegetation within 20 m either side of the overhead line centreline would require removal.
- Any vegetation between 20 m and 28 m of the overhead line centreline would be affected managed[4].
- Any vegetation between 28 m and 50 m of the overhead line centreline would be potentially affected.
- Any vegetation beyond 50 m would not be affected.

Construction access and working areas

4.5.18 Vegetation would be removed in the following areas:

- Construction compounds
- Access tracks, including culverts
- Bellmouths and visibility splays
- Pylon working areas
- Crossing protection working areas
- Bridge working areas
- Highway widening
- Third party works

4.5.19 Vegetation would be affected managed in the following areas:

- Overhanging of accesses and bellmouths
- Trackway access and panel working areas
- Operational, maintenance and third-party accesses
- Stringing areas and between crossing protection (for netting)
- Proposed temporary drainage areas
- Temporary fibre optic diversions

[4] Management of vegetation for electrical clearances such as crown reduction, coppicing or pruning

4.5.20 Unless otherwise stated it is assumed that vegetation within the draft Order Limits (but outside one of the areas listed above) could be potentially affected when taking account of the flexibility afforded.

Installation of bellmouths and the creation of visibility splays

4.5.21 Where new accesses or widening of existing accesses from the public highway are required, bellmouths would be installed. The location of the proposed bellmouths are shown on **Figure 4.3 Proposed Temporary Works**. The installation of bellmouths may require realignment or protection of existing underground services and the creation of visibility splays to create a line of sight for the safe use of the bellmouth. Within the visibility splay, vegetation would need to be cut to a specified height, relocation of street furniture or visual obstacles removed depending on local conditions, the speed rating of the road and whether traffic management was in place. A typical bellmouth is illustrated on **Design Drawing NHHM-NG-ENG-DWG-0011 Illustrative Bellmouth and Visibility Splay**.

Highway widening

4.5.22 In certain locations works to the public highway maybe required to install passing places, potential surfaces upgrades or carriageway widening required. Areas of potential highway widening are shown on **Figure 4.3 Temporary Construction Works**.

Construction traffic routes

4.5.23 Construction traffic routes are the public roads upon which construction vehicles would travel to site, having left the Strategic Road Network. The proposed construction traffic routes and the types of vehicles proposed to use each route during the construction of the Project are shown on **Figure 4.2 Construction Traffic Routes**.

4.5.24 The construction traffic routes have been split down into Primary Access Routes (PARs). **Chapter 14 Traffic and Transport** provides predicted volumes of traffic on each PAR during the construction of the Project.

Topsoil stripping

4.5.25 The topsoil may be required to be stripped from the bellmouths, access tracks, site compounds and pylon working areas. The topsoil would be stored carefully to one side; typically, topsoil would be stored in bunds. Temporary drainage would be installed as required, with environmental protection measures (such as silt fences) installed where necessary.

Drainage

4.5.26 Temporary drainage would be required during construction to manage rainfall runoff and water encountered during excavation, installation of working areas and compounds, where appropriate. The drainage design will include a variety of potential measures to address silt runoff. Construction sustainable drainage systems (SuDS) would be used if necessary and where appropriate.

Installation of access tracks (including culverts and bridges) and pylon working areas

4.5.27 A single way access track/haul road would typically be 4 m wide, and typically up to 8 m wide at passing places, which, coupled with the area for soil storage and drainage between the track and the fence line, would give a typical swathe of 12 m. They would be stone laid on geotextile membrane. A typical layout of a stone access road is shown on **Design Drawing NG-ENG-DWG-0012 Illustrative Stone Access Road.** Other accesses may also be used comprising of interlocking panels, depending on ground conditions and the duration and type of use. A typical layout of an interlocking panel access road is shown on **Design Drawing NG-ENG-DWG-0013 Illustrative Interlocking Panel Access.** Soil stabilisation techniques could be considered subject to local conditions.

4.5.28 The stone access tracks would be constructed using secondary or primary aggregates. The total amount of aggregate material that would be needed for the construction of the stone access tracks (including bellmouths) and pylon working areas will be determined through the development of the Project and reported in the ES. On completion of construction, the access tracks would be removed, and aggregates taken to an appropriate facility which could include recycling, or onward use, for example as secondary aggregate in the construction industry.

4.5.29 Culvert installations would be required for temporary access tracks to cross ditches and watercourses. The size and depth of a culvert is dependent upon the dimensions of the crossing, sensitivity, and importance of the watercourse. To maintain the flow of a watercourse during installation of the culvert a pump would be used on site. An illustrative design for a culvert is shown on **Design Drawing NG-ENG-DWG-0014 Illustrative Culvert Details for Watercourse Crossings** and the locations of the proposed temporary culverts are detailed in **Appendix 4.3 Bridge and Culvert Schedule**.

4.5.30 Should culverts not be suitable for a particular crossing, due to either the sensitivity of the watercourse or engineering requirements, a temporary bridge would be installed.

4.5.31 Temporary bridges may need to accommodate a mobile crane (in general approximately 250 t capacity, subject to detailed design although larger capacity cranes may be required at certain locations, such as for the taller River Ouse crossing pylons) and the temporary bridge support requirements would be assessed on a site-by-site basis. Most bridge crossings would be of a short span and flat deck construction; however, Bailey style bridges may also be used. All bridges would be clear span, and the foundations would be placed clear of the main channel of the watercourse, where feasible.

4.5.32 Once the foundations are in place the temporary bridge would be fitted. Although the installation method is dependent on the type of bridge being installed, a typical bridge would be delivered in sections. Each bridge component would be assembled on site and lifted into position by crane. With the bridge in position, decking panels would be lifted and fixed into position. An illustrative design for a temporary bridge is shown on **Design Drawing NG-ENG-DWG-0015 Illustrative Bridge Details for Watercourse Crossings** and the location of the proposed temporary bridge crossings are detailed in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

4.5.33 Pylon working areas would typically be 60 m by 60 m for a suspension pylon and 70 m by 70 m for a tension pylon. They would either be stone laid on a geotextile, or formed of interlocking panels, depending on ground conditions and the duration and type of

use. Soil stabilisation techniques could be considered subject to local conditions. An indicative pylon working area is shown on **Design Drawing NG-ENG-DWG-0009 Illustrative Lattice Pylon Working Areas** and the locations of the pylon working areas are shown on **Figure 6.1 Proposed Project Design**.

Installation of pylon foundations (pad and column, mini pile or tube pile)

4.5.34 The foundations for the pylons would either be pad and column, mini pile or tube pile (or bespoke if required). The selection of foundation type would depend upon the ground conditions encountered. Illustrative pylon foundations are shown on **Design Drawing NG-ENG-DWG-0007 Illustrative Lattice Pylon Foundations**.

Assembly and erection of steelwork

4.5.35 The steelwork components would be brought to each pylon working area. The steelwork components would be bolted together on the ground. The pylon would be assembled in sections beginning from ground upwards, using a telehandler for the lower sections and a mobile crane for the upper sections.

4.5.36 To lift the topmost sections of the pylons, a crane with a general capacity of up to 250 t maybe required (although a larger capacity crane maybe required in certain locations, for example the River Ouse crossing pylons) for the reach and weight of the sections to be positioned into place. A smaller capacity crane could be used to lift pylon sections up to the limit of reach of the crane based on the load to be lifted. Though in this instance the larger capacity crane would still be required to complete the pylon.

Crossing protection prior to stringing of conductors

4.5.37 Temporary scaffolding and nets would be installed during construction where required as a safety measure to protect assets such as roads, railways, and distribution network overhead lines (where not already moved underground) and could include hedgerows which would be crossed by the proposed 400 kV overhead line. This is required to protect these features during conductor stringing from the accidental dropping of conductors and any of the associated equipment. Temporary closures of some affected asset, such as roads, may be required during these works to install the protective netting, or indeed may be used instead of installing scaffolding.

4.5.38 The scaffolding would be transported to site using a lorry or tractor and trailer and assembled either side of the feature being protected. Alternative methods may be utilised dependant on local site conditions/restrictions, such as aerial catenary support systems, where feasible.

Installation of insulators

4.5.39 The insulators would be fastened to the cross arms of the pylons, with running wheels hung from the end of the insulators to carry the pilot wires in preparation for installing the conductors.

Establishment of machine sites for conductor stringing

4.5.40 The conductors are usually installed from tension pylon to tension pylon, often termed a ‘section’, with machine sites required at either end of the section.

4.5.41 The machine sites for conductor stringing would normally be located within the pylon conductor pulling positions, sited on earthed interlocking panels laid directly onto the ground surface reducing disturbance to the underlying soils.

4.5.42 A conductor pulling position would be established at each end of the section with a winching machine ('winch') and empty steel reels to accept pilot wires. At the other end of the section the full conductor drums would be arranged in close proximity to the tensioning machine ('tensioner'). An indicative conductor pulling position is illustrated on **Design Drawing NG-ENG-DWG-0010 Illustrative Lattice Pylon Pulling Positions** and the proposed locations are shown on **Figure 4.1 Temporary Construction Works**.

Conductor stringing

4.5.43 The conductors would be delivered to pulling positions on large cable drums and, depending on the conductor type, each completed drum could weigh up to 8T, although larger and heavier drums are possible depending on the supplier and the length of conductor. The drums containing the conductors would typically be delivered to the construction compound, or satellite compound, first, and would be distributed from there.

4.5.44 Light pilot wires would be laid at ground level (and over temporary scaffolding protecting assets such as roads and railway lines) along the length of the section between the pulling positions. Some vegetation management will be required. The pilot wires would be lifted and fed through running wheels on the cross arms of all the pylons in the section, and then fed around the winch at the pulling position. The light pilot wires are used to pull through heavier, stronger pilot wires which are in turn used to pull conductors through from their drums. The tensioning machine would keep the wires off the ground and prevent the conductors running freely when the winch pulls the pilot wire. When the conductor is fully 'run out', it would be fastened at its finished tension and height above ground by a linesman working from platforms on the pylons which are suspended beneath the conductors. Additional fittings, such as spacers, vibration dampers and arcing horns would be fitted.

4.5.45 To counterbalance the out of balance loading at the tension pylons at the end of a conductor stringing section, it is normal to install temporary backstays or concrete blocks for safety of installation. The temporary backstays or concrete blocks would be removed as the conductor stringing process starts on the next section. Temporary backstays might also be required at other locations such as connecting new conductor to existing conductor, temporary diversions, and temporary spans.

4.5.46 A drone/helicopter may be utilised in the construction of the overhead line, and/or transportation of equipment to the Project site.

Dismantling of existing pylons

4.5.47 As described in section 4.4 there is a requirement to dismantle a number of existing pylons in order to facilitate the line swap overs, the ZDA crossing and the overhead line reconfiguration works associated with the proposed substations.

4.5.48 Fittings such as dampers and spacers would be removed from the conductors. The conductors would be cut into manageable lengths or would be winched onto drums in a reverse process to that described for construction the conductor, fittings and insulator assemblies would be removed from the pylons and lowered to the ground.

4.5.49 Each pylon would most likely be dismantled by crane, with sections unbolted and lowered to the ground for further dismantling and removal from site. Depending on the access and space available, it may be possible to cut the pylon legs and then pull the pylon to the ground using a tractor. The pylon could be cut into sections on the ground. Unless there was a compelling need for removal of all the foundations, these would be removed to approximately 1 m deep, sufficient for safe agricultural use of the land and subsoil and topsoil reinstated. All waste removed from site and recycled in line with waste disposal regulations at the time.

Removal of construction equipment, reinstatement of ground and restoration of soils

4.5.50 Once the 400 kV overhead line is constructed, the access tracks and working areas at the pylon site would be removed and the ground reinstated to their previous condition. Other surfaces would be reinstated, and accesses would be restored to the condition they were in at the commencement of the works, unless agreed otherwise.

Third Party Services

4.5.51 In order to construct the 400 kV connection safely and efficiently, sections of existing overhead or underground third party services (for example DNO low voltage power lines, or telecommunication lines) would be modified (undergrounded, protected or relocated). These sections are included within the draft Order Limits and form part of the Project.

4.5.52 The works would most likely be undertaken by the asset owners prior to construction of the relevant section of the Project; however, the DCO would grant National Grid the power to undertake this work subject to agreement with the asset owner. The proposed works are illustrated on **Figure 4.4 Third Party Works** and the following sections set out the principles which would be applied to the works, and which have been assessed by the technical chapters.

4.5.53 The specific methods for the modifications to these existing third party services will need to be confirmed and agreed with the asset owner prior to any works being carried out. Typically this will include temporary access using all-terrain or low pressure bearing vehicles to drive over existing field surfaces likely using existing access gates. Most of the work would be done in advance of the National Grid access tracks being in place, however where one was already in place and if it were appropriate to do so, these would be used. Typically, these modifications to third party assets would include placing the asset underground which could include the use of open cut trenching through agricultural fields for example or trenchless techniques such as Horizontal Directional Drill (HDD) to facilitate the crossing of roads or other existing infrastructure. Generally, any redundant wood poles would be removed completely, however where this is problematic the wooden pole may be cut below ground level. In all cases once the modification to the third party asset is operational any redundant infrastructure (including poles, conductor, insulator, fittings) would be removed from site and the disturbed foundation area reinstated.

4.6 Operation

4.6.1 The operation of the Project includes the physical infrastructure described in section 4.4 above.

4.6.2 During operation the Project would transmit electricity between the proposed new Birkhill Wood substation and the proposed new High Marham substation and onto the remainder of the national transmission system.

4.6.3 The Project would be operated remotely in the same way as National Grid operates the rest of the network.

4.7 Maintenance

Routine maintenance

4.7.1 The overhead line would be subject to annual inspection from the ground by foot patrol, small van, or by air using drone/helicopter to check for visible faults or signs of wear. The inspections would also indicate if plant/tree growth or third-party developments were at risk of affecting safety clearances. Inspections would provide input as to when refurbishment was required.

4.7.2 The overhead line could support telecommunication equipment such as small mobile telephone antennae and would contain optical fibres within the earthwire. If this were to be the case, independent companies would require access for maintenance purposes using pickup trucks and vans. Access for the optical fibres will usually be at the joint box positions located just above the anticlimbing devices on certain pylons. The position and frequency of joint boxes is subject to design by the successful contractor.

4.7.3 Access for vegetation management, telecommunications and fibre optic maintenance would be along routes operation and maintenance access routes as illustrated on **Figure 4.1 Proposed Project Design.** Temporary interlocking track mat panels may be required along these routes during maintenance activities.

Repair and Refurbishment

4.7.4 The overhead line would be made up of a variety of materials including concrete and steel for the foundations, steelwork for the pylon and aluminium for the conductors. All these materials have an expected lifespan which would vary depending on how the overhead line was used and where it is located. Typically, pylon steelwork and foundations have a life expectancy of approximately 80 years, the conductors have a life expectancy of approximately 40 to 60 years and the insulators and fittings have a life expectancy of approximately 25 to 40 years. The lifespan of the overhead line may be longer than the anticipated 80 years, depending on its condition, the environment to which it is exposed, refurbishments and transmission network requirements.

4.7.5 Minor repairs or modifications may be required from time to time for local earthwire damage, addition of jumper weights, local conductor damage, broken insulator units, damaged or broken spacers, broken or damaged vibration dampers, and damaged or broken anti climbing devices. Minor repairs would be programmed locally by a maintenance team using pickup trucks and vans to access site along routes agreed with landowners. Access may require interlocking track mat panels.

4.7.6 Refurbishment work would be undertaken typically on one side of the pylon at a time, so that the other side could be kept ‘live’ or in use.

4.7.7 Refurbishment work could involve:

- replacement of pylons;

- replacement of conductors and earth wires;
- replacement of insulators and steelwork that holds the conductors and insulators in place,
- insulator fittings, conductor fittings, pylons signage;
- painting or replacement of the pylon steelwork;
- replacement of telecommunication equipment (by separate companies); and
- foundation repairs/upgrades.

4.7.8 Refurbishment would usually be carried out in two stages because the overhead line has two circuits, one on each side of the pylon. This means that work can be undertaken on one side only, so that the other side can be kept 'live'. Once all the work has been completed on the first side, the circuit would be re-energised, and the opposite side switched off, so that the work could be carried out on the other side.

4.7.9 The refurbishment works would require temporary access tracks, a small compound and potentially scaffolding to protect roads and other features during the work.

4.7.10 Vans are used to carry workers in and out of site and trucks are used to bring new materials and equipment to site and remove old equipment. Temporary works including installation of access routes and installation of scaffolding to protect roads, railways and footpaths would be required as necessary for the overhead line refurbishment (similar to the initial construction requirements).

4.8 Decommissioning

4.8.1 The design life of the Project is at least 80 years but with regular maintenance is likely to extend further. At the time that decommissioning would take place, the regulatory framework, good industry practices and the future baseline could have altered. At the point where the Project requires decommissioning, National Grid would consider and implement an appropriate decommissioning strategy taking account of good industry practice, its obligations to landowners under the relevant agreements and all relevant statutory requirements. As such, decommissioning has been scoped out of the assessment.

4.9 Description of the Project in each Route Section

Route Section 1: Creyke Beck to Skidby

Proposed Substation Works at Birkhill Wood

4.9.1 The proposed Birkhill Wood Substation is located approximately 360 m to the east of Birkhill Wood and 400 m to the west of the A1079. A 1.2 km temporary and permanent access road is proposed from the A1079 which would require two new permanent culverts for the crossing of two field drains. Three construction compounds / laydown areas are proposed.

Associated overhead line works

4.9.2 As part of the substation works there is a requirement to turn in the existing 4ZR 400 kV overhead line into the proposed new Birkhill Wood Substation. This requires the construction of two new pylons (4ZR003B and 4ZR003A) and a section of the existing 4ZR 400 kV overhead line to be reconductored between existing pylon 4ZR002 and existing pylon 4ZR008. To facilitate these works an approximate 1.4 km section of temporary overhead line would be required between existing pylon 4ZR002 and existing pylon 4ZR006 including four temporary structures Following completion of the works the temporary overhead line would be dismantled.

4.9.3 The proposed Birkhill Wood Substation and associated works are shown on **Figure 4.5 Proposed Birkhill Wood Substation and Associated Works**.

Proposed Overhead Line

4.9.4 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 1 to 2) and the pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. The proposed overhead line is routed west for approximately 1.6 km from the proposed Birkhill Wood Substation to the crossing of A164 Beverley Road passing to the south of Jillywood. From the crossing of A164 Beverley Road the proposed overhead line is then routed to the southwest for a further 1.5 km to the north of Platwoods Bar Plantation and the settlement of Skidby and south of Dunflat Road.

4.9.5 Within the Route Section the proposed overhead line is broadly parallel with the existing 4ZQ 400 kV overhead line.

Mitigation planting

4.9.6 An area of mitigation planting is proposed to the east of the A164 adjacent to Jillywood Lane. This proposed area of planting is shown on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.7 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.8 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.9 In this Route Section three bellmouths are proposed, one bellmouth (BM-001) is located south off the A1079 which would provide construction access to the proposed Birkhill Wood Substation, a second east off the A164 (BM-002) and a third south off Dunflat Road (BM-003).

4.9.10 A section of highway widening is proposed at bellmouth BM-001 to facilitate both the temporary and permanent substation access off the A1079.

4.9.11 A temporary haul road is proposed between bellmouths BM-001 and BM-002 and between bellmouth BM-003 and BM-005 at Little Weighton Road in Route Section 2.

4.9.12 To facilitate the temporary haul roads four culvert watercourse crossings are proposed in this Route Section, crossing C-100 and C-101 as shown **on Figure 4.3.1** in **Appendix 4.3 Bridge and Culvert Schedule** would be permanent culverts as these would be required to provide permanent access into the Proposed Birkhill Wood Substation.

Construction compounds

4.9.13 A satellite construction compound is proposed to the east of Birkhill Wood. The proposed location of this construction compound is illustrated on **Figure 4.3 Temporary Construction Works**.

Conductor stringing

4.9.14 There are four pulling positions proposed within this Route Section at the terminal pylon 4AF3 and at the location of the three other tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of the A164. The proposed location of the pulling positions and crossing protection are illustrated on **Figure 4.3 Temporary Construction Works.**

Third party works

4.9.15 The proposed overhead line crosses two existing 11 kV and one existing 33 kV overhead line in this Route Section. Sections of these existing low volage overhead lines are proposed to be undergrounded where the proposed overhead line would cross. The location of these are shown on **Figure 4.4 Third Party Works**.

Route Section 2: Skidby to A63 Dual Carriageway

Proposed Overhead Line

4.9.16 The proposed overhead line in Route Section 2 of the Project is shown on **Figure 4.1 Proposed Project Design** (Sheets 2 to 4) and the pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. The proposed overhead line is routed southwest from Route Section 1 for approximately 1.1 km, crossing Little Weighton Road to proposed pylon 4AF16. From proposed pylon 4AF16 the proposed overhead line is routed south for approximately 850 m to proposed pylon 4AF19. From pylon 4AF19 the proposed overhead line is routed southwest to the south of the settlement of Little Weighton and in close parallel with the existing 4ZQ 400 kV overhead line for approximately 6.1 km, crossing Riplingham Road to the south of the junction with Rowley Road, Lambwell Hill and Dale Road. From here the proposed overhead line routes to the north of Brantingham Dale SSSI to proposed pylon 4AF37. In this Route Section and continuing to Route Section 3 there is a line swap. Line swaps are described in general in section in section 4.4 above. In this Route Section from proposed pylon 4AF37 the proposed conductors swap onto existing pylons on the existing 4ZQ 400 kV overhead line for the remainder of this Route Section. To facilitate this, five new pylons will be constructed to the south of the existing 4ZQ 400 kV overhead line and a new section of conductor will be installed diverting/transferring the existing 4ZQ 400 kV overhead line route onto the five new pylons within this Route Section.

Mitigation planting

4.9.17 A number of areas of mitigation planting are proposed within this section, these are illustrated on **Figure 4.1 Proposed Project Design**. A linear belt of planting is proposed between Socken Wood and Riplingham Road to mitigate for potential loss of trees and vegetation within Socken Wood. Areas of mitigation planting are proposed either side of Ellerker Wold Lane in order to the mitigate for the potential loss of trees and vegetation within Brantingham Dale.

Maintenance access

4.9.18 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.19 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.20 In this Route Section ten bellmouths are proposed. Bellmouth BM-004 south off Dunflat Road, BM-005 and BM-006 off either side of Little Weighton Road, BM-007 and BM-008 south off Rowley Road, BM-009 and BM-010 off either side of Lambwell Hill, BM-011 and BM-012 off either side of Dale Road and BM-013 off Ellerker Road. These are illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.21 Sections of highway widening are proposed on Rowley Road and Lambwell Hill to facilitate passing places and visibility at the junctions with Riplingham Road. These areas are illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.22 A continuous temporary haul road is proposed from the start of this Route Section continuing from Route Section 1 through to proposed bellmouth BM-007 at Rowley Road and then from proposed bellmouth BM-010 on Lambwell Hill through to BM-013 at Ellerker Road. The temporary haul roads are illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.23 To facilitate the temporary haul roads, two proposed culvert crossings are proposed. One crossing C-005 would utilise an existing culvert which may require upgrading. The location of these crossings is shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.24 There are no proposed construction compounds in this Route Section.

Temporary pylons and overhead line

4.9.25 In order to facilitate the line swap over, approximately 750 m of temporary overhead line is required to the north of Brantingham Dale, between existing pylons 4ZQ80 and 4ZQ78 (which would become 4AF37). This would include the construction of two temporary pylons. This will maintain continuity of supply ensuring both circuits are not switched off. This section of line swap over is illustrated on **Figure 4.1 Proposed Project Design** (Sheet 4).

Conductor stringing

4.9.26 There are nine pulling positions proposed in this Route Section at the location of the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of Little Weighton Road. At the junction with Riplingham Road and Rowley Road, Lambwell Hill Dale Road and Ellerker Road. The proposed location of the pulling positions and crossing protection are illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.27 The proposed overhead line crosses four existing 11 kV overhead lines in this Route Section. Sections of these existing low volage overhead lines are proposed to be undergrounded for a short section where the proposed works cross these existing utilities. The location of the third party works is shown on **Figure 4.4 Third Party Works**.

Route Section 3: A63 Dual Carriageway to River Ouse Crossing

Proposed Overhead Line

4.9.28 The proposed overhead line in Route Section 3 is shown on **Figure 4.1 Proposed Project Design** (Sheets 5 to 11) and the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of this section at the crossing of the A63 the proposed overhead line is routed to the south of the settlement of Ellerker and north of the settlement of Broomfleet in close parallel with the existing overhead line. It is routed in a south westerly direction crossing Brough Road, Sands Lane, Ings Lane, the Selby to Hull railway line, Carr Lane, Landing Lane, Market Weighton Canal, Tongue Lane and Staddlethorpe Broad Lane to the end of this Route Section at Blacktoft Lane.

4.9.29 Continuing from the line swap in Route Section 2 the proposed conductor would be strung on existing pylons on the 4ZQ 400 kV overhead line to existing pylon 4ZQ68 (which would become 4AF47). To facilitate this, in this Route Section between the A63 and existing pylon 4ZQ63, 11 new pylons would be constructed to the south and a new section of conductor installed diverting/transferring the existing 4ZQ 400 kV overhead line route onto the eleven new pylons within this Route Section.

Mitigation planting

4.9.30 Two areas of mitigation planting are proposed in this Route Section, to the north of Whin Moor Lane and to the north of proposed pylon 4AF73; these are illustrated on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.31 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.32 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.33 In this Route Section 22 bellmouths are proposed. Bellmouths BM-016 and BM-017 east off Brough Road, BM-018 west of Brough Road, BM-019 and BM-020 southeast and northwest of Sands Lane, BM021 and BM-022 east and west off Ings Lane. There are six bellmouths (BM-023 to BM-028) proposed north off Ings Lane. Bellmouths BM-029 and BM-030 are proposed east and west off Carr Lane, BM-031 and BM-032 north and south off Landing Lane, BM-033 and BM-102 east off Tongue Lane and BM-035 west off Tongue Lane. Bellmouths BM-036 and BM-037 are proposed east and west off Staddlethorpe Broad Lane and BM-038 north off Blacktoft Lane. The location of these proposed bellmouths is shown on **Figure 4.3 Temporary Construction Works**.

4.9.34 Sections of highway widening are proposed on Ings Lane and Norfolk Bank Lane from proposed bellmouth BM-028 to the junction with Ellerker Road and a section of Ellerker Road from the junction with Norfolk Bank Lane to the junction with Willow Flats. A section of highway widening is proposed along Carr Lane from proposed bellmouths BM-029 and BM-030 to the junction with Common Road, a section of Common Road from the junction with Carr Lane to the junction with Wallington Lane and along Wallington Lane from the junction with Common Road to the junction with the B1230, Main Road. A section of highway widening is proposed along Tongue Lane from BM-102 to the junction with the B1230, Main Road and along Staddlethorpe Broad Lane from proposed bellmouths BM-036 and BM-037 to just south of the junction with Bellasize Lane. These areas of proposed highway widening are illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.35 A continuous section of temporary haul road is proposed from the start of this Route Section at proposed Pylon 4ZQ74 through to proposed bellmouth BM-021 at Ings Lane. Individual haul roads are proposed off Ings Lane to each of the proposed pylons 4AF50 to 4AF57. A section of continuous haul road is then proposed from proposed pylon 4AF58 through to the end of this Route Section at Blacktoft Lane, including a temporary bridge over the Market Weighton Canal. The proposed location of the temporary haul roads is illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.36 To facilitate the temporary haul roads 46 culvert watercourse crossings are proposed, 27 of which are existing culverts which may require upgrading. There are two proposed temporary bridge crossings in this Route Section, one over Mill Beck and a second over the Market Weighton Canal both off which are classified as Main Rivers. The proposed location of these crossings is shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.37 Within this Route Section two construction compounds are proposed. A main construction compound is proposed off Brough Road to the west of the A63 and a satellite construction compound is proposed off Tongue Lane. The proposed location of these construction compounds is illustrated on **Figure 4.3 Temporary Construction Works**.

Overhead line dismantling

4.9.38 Once the line swap in this Route Section is complete a 1.2 km section of the existing 4ZQ overhead line between proposed pylon 4AF48 and existing pylon 4ZQ63 would be removed, including the removal of four pylons. This section of dismantling is shown on **Figure 4.3 Temporary Construction Works**.

Conductor stringing

4.9.39 There are fourteen pulling positions in this Route Section at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of the A63, Brough Road, Sands Lane, Ings Lane, the Selby to Hull railway line crossing, Carr Lane, Landing Lane, the Market Weighton Canal, Tongue Lane, Staddlethorpe Broad Lane, Bellasize Drain and Blacktoft Lane. The proposed location of the pulling positions and crossing protection are illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.40 The proposed works cross nine existing 11 kV overhead lines and one 33 kV overhead line in this Route Section. Sections of these existing low volage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other third party works are shown on **Figure 4.4 Third Party Works**.

Route Section 4: River Ouse Crossing

Proposed Overhead Line

4.9.41 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 11 to 13) and the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of this Route Section at Blacktoft Lane the proposed overhead line is routed in a general southerly direction crossing the River Ouse and Townend Causeway between the settlements of Ousefleet and Whitgift to the southern extent of this Route Section at the southern extent of Narrow Lane. The proposed overhead line remains broadly parallel with the existing overhead line in this Route Section, however, the new overhead line deviates from being in close parallel in order to avoid oversailing properties within the settlement of Ousefleet and Hall Garth moated site Scheduled Monument.

4.9.42 In this Route Section proposed pylons 4AF77 and 4AF78 would be bespoke pylons; in order to facilitate the crossing of the River Ouse and they would be similar in height to the existing pylons. Indicative pylon heights are provided in **Appendix 4.2 Indicative Pylon Schedule**.

Mitigation planting

4.9.43 No areas of mitigation planting have been proposed in this Route Section.

Maintenance access

4.9.44 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.45 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.46 In this Route Section three bellmouths are proposed. Bellmouth BM-039 south off Blacktoft Lane and BM-040 and BM-041 north and south off Townend Causeway. These are illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.47 A section of highway widening is proposed on Church Lane from the junction with Townend Causeway and the junction with Kings Causeway in Route Section 5. These areas are illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.48 A temporary haul road is proposed from the start of this Route Section at Blacktoft Lane to proposed pylon 4AF77 and a continuous section of temporary haul road is proposed from proposed pylon 4AF78 through to the end of this Route Section at the southern end of Narrow Lane. The proposed location of the temporary haul roads is illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.49 To facilitate the temporary haul roads four watercourse culvert crossing are proposed, all of which would require a new temporary culvert. The proposed location of these crossings is shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.50 There is one proposed satellite construction compound in this Route Section. This is located to the west of Narrow Lane and is illustrated on **Figure 4.3 Temporary Construction Works**.

Conductor stringing

4.9.51 There are two pulling positions in this Route Section at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of Blacktoft Lane and Townend Causeway. The proposed location of the pulling positions and crossing protection is **Figure 4.3 Temporary Construction Works**.

4.9.52 At the River Ouse Crossing, the new overhead line would be installed above the River Ouse and the designated Humber Estuary nature conservation sites. In order to install the conductors, lightweight ropes will need to be laid out and lifted into position on the new pylons either side of the river. These ropes will therefore need to be carried across the river. There are a number of ways that this could be achieved. One method would entail the use of boats to draw the ropes across the river. In order to safely transfer the ends of the rope onto the boat, safe access would be needed to the water's edge on a number of days likely over a period of a few weeks. The form of temporary works needed to achieve safe access has yet to be determined but indicative working areas are shown on **Figure 4.3 Temporary Construction Works**. The location of these temporary access works necessarily encroaches into the designated site (whilst the proposed position and works to construct the pylons themselves lie beyond the designated sites). If alternative installation methods prove achievable (e.g., carrying ropes across the river using drones or helicopter) then the riverside working areas might be removed from the final DCO application.

Third party works

4.9.53 The proposed works cross one existing 11 kV overhead line in this Route Section. A section of this existing low volage overhead line is proposed to be undergrounded for a short section where the proposed works would cross this existing utility. The location of this and other third party works is shown on **Figure 4.4 Third Party Works**.

Route Section 5: River Ouse Crossing to Luddington

Proposed Overhead Line

4.9.54 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 13 to 15) and the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of this Route Section at Narrow Lane the proposed overhead line is routed broadly southeast to the west of the settlement of Garthorpe and east of the settlement of Luddington crossing Adlingfleet Drain, Pasture Lane and Carr Lane to the end of this Route Section at Meredyke Road.

4.9.55 The proposed overhead line is routed in close parallel with the existing overhead line for the full extent of this Route Section.

Mitigation planting

4.9.56 One area of mitigation planting is proposed in this Route Section along the course of the Old River Don to the north of Carr Lane. This area is illustrated on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.57 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.58 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.59 In this Route Section nine bellmouths are proposed. Bellmouths BM-042 and BM-043 east off Kings Causeway, BM-044 and BM-045 north and south off Pasture Lane and five bellmouths (BM-046 to BM-050) off Carr Lane. The location of these proposed bellmouths is shown on **Figure 4.3 Temporary Construction Works**.

4.9.60 A section of highway widening is proposed on Church Lane from Kings Causeway to the junction with Townend Causeway in Route Section 4. An area of highway widening is proposed on Kings Causeway at the location of bellmouths BM-042 and BM-043 and a section of Carr Lane from proposed bellmouth BM-046 to the junction with Meredyke Road. These areas of proposed highway widening are shown on **Figure 4.3 Temporary Construction Works**.

4.9.61 A continuous temporary haul road is proposed from the start of this Route Section linking back to proposed bellmouth BM-041 in Route Section 4 through to Carr Lane at proposed Bellmouth BM-046. Approximately 2.5 km of temporary haul road is proposed from bellmouth BM-042 and BM-043 on Kings Causeway along an existing track to the southern extent of Narrow Lane on the boundary between Route Section 4 and Route Section 5. Individual temporary haul roads are proposed to proposed pylons 4AF95 to 4AF93 off Carr Lane. The proposed location of these temporary haul roads is illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.62 To facilitate the temporary haul roads, 20 culvert watercourse crossings are proposed, 11 of these would utilise existing culverts which may require upgrading. There is one

proposed bridge crossing over Adlingfleet Drain, this would utilise an existing bridge which may require upgrading. The proposed location of these crossings are shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.63 There are no proposed construction compounds in this Route Section.

Conductor stringing

4.9.64 There are four pulling positions in this Route Section at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of Pasture Lane, at two locations along Carr Lane and either side of Meredyke Road. The proposed location of the pulling positions and crossing protection areas are illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.65 The proposed works cross two existing 11 kV overhead lines in this Route Section. Sections of these existing low volage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other third party works are shown on **Figure 4.4 Third Party Works**.

Route Section 6: Luddington to M180 Motorway

Proposed Overhead Line

4.9.66 The proposed overhead line in this Route Section 6 is shown on **Figure 4.1 Proposed Project Design** (Sheets 15 to 19) and the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of this section at Meredyke Road the proposed overhead line is routed southwest to the south of the settlements of Luddington and Eastoft for approximately 5.3 km crossing Pasture Lane and Carr Lane to proposed pylon 4AF114. From proposed pylon 4AF114 the proposed overhead line is routed broadly south to the east of Crowle for a further 6.4 km crossing Outgate, the existing ZDA 400 kV overhead line, the Sheffield and South Yorkshire Navigation and the A18 to the end of the section at the M180.

4.9.67 In this Route Section the proposed overhead line moves away from being in parallel or close parallel with the existing 4ZQ overhead line at proposed pylon 4AF100.

4.9.68 Within this Route Section the proposed overhead line crosses the existing ZDA 400 kV overhead line between Keadby and Crowle. To facilitate this crossing, the existing ZDA overhead line would be split into two sections of lowered overhead line between proposed pylons ZDA119A and ZDA120C. This is to give the required clearance between the proposed and existing line. Six new pylons are proposed and approximately 520 m of existing ZDA overhead line including two pylons would be removed. This type of crossing is referred to as a ‘diamond duck under’.

Mitigation planting

4.9.69 A small area of mitigation planting is proposed in this Route Section close to proposed pylon 4AF116 this area is shown on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.70 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.71 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.72 In this Route Section 18 bellmouths are proposed. To the north of the proposed ZDA 400 kV overhead line crossing, proposed bellmouth BM-051 is located south off Meredyke Road, BM-052 east off Ox Pasture Lane, there are four proposed bellmouths (BM-053 to BM-056) located off Carr Lane and BM-057 and BM-058 east and west off Washinghall Lane. Between the proposed ZDA 400 kV overhead line crossing and the A18 there are five proposed bellmouths, bellmouths BM-059 to BM-063 off Outgate and BM-064 north off Bonnyhale Road. To the south of the A18 there are three proposed bellmouths east off A161 (BM-067, BM-068 and BM-015) and BM-131 south off the A18. The location of the proposed bellmouths are shown on **Figure 4.3 Temporary Construction Works**.

4.9.73 A section of highway widening is proposed along Carr Lane from the junction with Shady Lane to proposed bellmouth BM-056 and a section of Ox Pasture Lane is proposed to be widened between the junction with Carr Lane and proposed bellmouth BM-052. A section of Outgate / Bonnyhale Moor Road is proposed to be widened between proposed bellmouth BM-062 and proposed bellmouth BM-063. This proposed highway widening is shown on **Figure 4.3 Temporary Construction Works**.

4.9.74 A continuous temporary haul road is proposed from bellmouth BM-051 on Meredyke Road at the start of this Route Section through to proposed bellmouth BM-052 on Ox Pasture Lane. Individual temporary haul roads are proposed to proposed pylons 4AF106 to 4AF108 off Carr Lane. A continuous temporary haul road is proposed from bellmouth BM-056 off Carr Lane through to proposed bellmouth BM-059 on Outgate / Bonnyhale Moor Road and then from proposed bellmouth BM-060 on Outgate through to proposed bellmouth BM-064 on Bonnyhale Road. Proposed pylons 4AF124 and 4AF125 between the Sheffield and South Yorkshire Navigation and the A18 would either be accessed from the north through proposed bellmouth BM-036 off Bonnyhale Moor Road or from the south through proposed bellmouth BM-066 off the A18. A continuous section of haul road is proposed to the south of the A18 through to the end of the Rote Section at the M180. The location of the proposed temporary haul roads are shown on **Figure 4.3 Temporary Construction Works**.

4.9.75 To facilitate the temporary haul roads, 59 culvert watercourse crossings are proposed in this Route Section, 32 of these would utilise existing culverts which may require upgrading. There are 11 proposed bridge crossings. New temporary bridge crossings are proposed across Pauper's Drain (B-11) and Bewcarrs Drain (B-10). The proposed temporary haul road would utilise an existing bridge crossing over North Soak Drain (B-05) the Sheffield and South Yorkshire Navigation (B-03) and South Soak Drian (B-04). The three proposed accesses off the A18 would utilise existing bridges across Hatfield Waste Drain (B-02 and B-01), South Engine Drian (B-18) and Folly Drain (B-17). A new temporary bridge (B-14) is proposed across South Engine Drian and Folly Drain and an existing bridge across Folly Dain (B-07) may require upgrading. The location of these

proposed watercourse crossings are shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.76 There is one proposed main construction compound in this Route Section this is located to the south of Outgate / Bonnyhale Moor Road the location of which is shown on **Figure 4.3 Temporary Construction Works**.

Temporary pylons and overhead line / overhead line dismantling

4.9.77 In order to facilitate the construction of the 'diamond duck under' crossing at the existing ZDA 400 kV overhead line, approximately 1.4 km of temporary overhead line would be required including two temporary pylons between existing pylons ZDA117 and ZDA121. Once the temporary overhead line has been constructed a 0.5 km section of the existing ZDA 400 kV overhead line would be dismantled including the removal of two pylons. This temporary section of overhead line would also be dismantled flowing completion of the crossing. These section of temporary overhead line and dismantling are shown on **Figure 4.3 Temporary Construction Works**.

Fibre diversion

4.9.78 To facilitate the works proposed on the existing ZDA 400 kV overhead line an existing fibre optic cable on this overhead line would require a diversion whilst the modification works are being carried out. This proposed diversion would be from existing pylon ZDA124 through to existing pylon ZDA115. The proposed diversion is shown on **Figure 4.4 Third Party Works** and would involve ducted post and rail with three horizontal directional drills across the Keadby Windfarm access road and watercourse, South Cross Moors Road and Outgate.

Conductor stringing

4.9.79 There are 12 proposed pulling positions in this Route Section at the location of the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side Meredyke Road, Ox Pasture Lane, Carr Lane, Washinghall Lane and at two locations either side of Outgate. Crossing protection is also proposed to the north of North Soak Drain and south of South Soak Drain to the north of Hatfield Waste Drain and south of the River Torne encompassing the A18, to the north of South Engine Drain and south of Folly Drain and either side of the M180. The proposed location of the pulling positions and crossing protection areas is illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.80 The proposed works cross four existing 11 kV overhead lines in this Route Section. Sections of these existing low volage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other third party works are shown on **Figure 4.4 Third Party Works**.

Route Section 7: M180 Motorway to Graizelound

Proposed Overhead Line

4.9.1 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 19 to 23) and the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of the Route Section at the M180 the proposed overhead line is generally routed south, to the west of the settlements of Beltoft and Owston Ferry and east of the settlements of Belton, Epworth, East Lound and Graiselound. The proposed overhead line crosses Belton Road, Gurry Lane, Epworth Road, Newlands Lane, Melwood Hill, Burnham Road, East Lound Road, Ferry Road and Gunthorpe Road to the end of the section at Stockwith Road.

4.9.2 In this Route Section the proposed overhead line is routed in parallel or close parallel with the existing 400 kV overhead lines for approximately 5 km between proposed pylons 4AF142 and 4AF156.

Mitigation planting

4.9.3 There are a number of proposed areas of mitigation planting within this Royte Section. They are proposed adject to Mill Hill Wood and the M180, to the north of Burnham Road close to proposed pylon 4AF151, to the east of East Lound close to proposed pylon 4AF156, to the south of Ferry Road and either side of Warping Drain. These proposed areas are shown on **Figure 4.1 Proposed Project Design.**

Maintenance access

4.9.4 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.5 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.6 In this Route Section 19 bellmouths are proposed. Bellmouths BM-069 and BM-070 north and south off Belton Road. There are four bellmouths proposed (BM-071 to BM-074) off Beltoft Road / Epworth Road. Bellmouth BM-075 is proposed north off Newland Lane and BM-076 and BM0-77 south of Newland Lane. Bellmouths BM-078, BM-079 and BM-132 are proposed off Melwood Hill, BM-080 and BM-081 north and south off Burnham Road, BM-082 and BM-083 north and south of East Lound Road, BM-084 and BM-085 north and south off Ferry Road and BM-087 east off Stockwith Road. The proposed locations of these bellmouths are shown on **Figure 4.3 Temporary Construction Works**.

4.9.7 A section of highway widening is proposed along Belton Road from proposed bellmouths BM-069 ad BM-070 to the junction with Jeffery Lane and King Edward Street. A section of highway widening is proposed along Beltoft Road between bellmouth BM-071 and Hollingswoth Lane. A section of highway widening is proposed along Newland Lane between bellmouth BM-075 and BM-077 and on Melwood Hill between proposed bellmouths BM-078 and BM-079. A section of highway widening is proposed along East Lound Road between proposed bellmouths BM-082 and BM-083

and East Lound and on Ferry Road from proposed bellmouth BM-084 and Graizelound. These areas of proposed highway widening are shown on **Figure 4.3 Temporary Construction Works**.

4.9.8 A section of continuous temporary haul road is proposed between proposed pylon 4AF134 in the north of this Route Section to proposed bellmouth BM-071 at Beltoft Road / Epworth Road. Individual temporary haul roads are proposed to proposed pylons 4AF139 and 4AF140 with a continuous temporary haul road proposed between bellmouth BM-074 on Beltoft/Epworth Road and BM075 on Newland Lane and from bellmouth BM-077 on Newland Lane to bellmouth BM-078 on Melwood Hill. From proposed bellmouth BM-079 on Melwood Hill there is a continuous temporary haul road proposed through to bellmouth BM-084 at Ferry Road and from proposed bellmouth BM-085 on Ferry Road through to bellmouth BM-086 off Stockwith Road. Proposed pylon 4AF163 in the far south of this Route Section would be served by an individual temporary haul road from proposed bellmouth BM-084 off Stockwith Road. The proposed location of these temporary haul roads are shown on **Figure 4.3 Temporary Construction Works**.

4.9.9 To facilitate the temporary haul roads, 34 culvert watercourse crossings are proposed in this Route Section, 13 of these would utilise existing culverts which may require upgrading. There are no bridge crossings proposed in this Route Section. The location of these watercourse crossings shown on **Figure 4.3.1 in Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.10 There are no construction compounds proposed in this Route Section.

Conductor stringing

4.9.11 There are eight proposed pulling positions in this Route Section located at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of Belton Road, Beltoft Road/ Epworth Road, Newland Lane, Melwood Hill, Burnham Road, East Lound Road, Ferry Road, Warping Drain / Gunthorpe Road and Stockwith Road. The proposed location of the pulling positions and crossing protection areas are illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.12 The proposed works cross five existing 11 kV overhead lines, one 33 kV overhead line in this Route Section. Sections of these existing low volage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other third party works are shown on **Figure 4.4 Third Party Works**.

Route Section 8: Graizelound to Chesterfield Canal

Proposed Overhead Line

4.9.13 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 23 to 26) and the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of the section at Stockwith Road the proposed overhead line is routed generally west for approximately 3 km crossing a

railway line and Tindle Bank Road to proposed pylon 4AF172. From proposed pylon 4AF172 the proposed overhead line is then routed generally south for approximately 4.6 km to the west of the settlement of Misterton to the Chesterfield Canal, crossing the River Idle, Cornley Road and Cattle Road.

4.9.14 The proposed overhead line is not routed in parallel or close parallel with the existing lines in this Route Section.

Mitigation planting

4.9.15 There are four areas of proposed mitigation planting in this Route Section, adjacent to the railway line to the west of Station Road, two areas along field boundaries between the River Idle and Cornley Road, and an area to the east of proposed pylon 4AF185. These proposed areas of planting are shown on **Figure 4.1 Proposed Project Design.**

Maintenance access

4.9.16 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.17 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.18 In this Route Section nine bellmouths are proposed. Bellmouth BM-088 west off Stockwith Road, BM-089 east off Station Road, BM-090 west off Haxey Gate Road. Bellmouth BM-091 is proposed north off Tindle bank Road and BM-092 south off Tindle bank Road. Bellmouths BM-093 and BM-094 are proposed north and south off Cornley Road and BM-095 and BM-096 north and south of Cattle Road. The proposed location of these bellmouths is illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.19 A section of highway widening is proposed along Tindle Bank Road from proposed bellmouth BM-092 to the junction with Haxey Gate Road and on Cornley Road from proposed bellmouths BM-093 and BM-094 to the junction with Carr Lane and Cattle Road. These areas of proposed highway widening are shown on **Figure 4.3 Proposed Temporary Works**.

4.9.20 A section of continuous temporary haul road is proposed between bellmouth BM088 on Stockwith Road and proposed bellmouth BM-089 on Station Road. Proposed pylons 4AF168 and 4AF164 would be accessed via proposed bellmouth BM-090 off Haxey Gate Road and BM-091 off Tindale Bank Road. Proposed pylons 4AF170 through to 4AF172 between Tindale bank Road and the River Idle would be constructed using a continuous section of temporary haul road from proposed bellmouth BM-092 off Tindale bank Road. A continuous section of temporary haul road is proposed from proposed pylon 4AF173 through to the Chesterfield Canal at the southern end of this Route Section. The proposed location of the temporary haul roads are shown on **Figure 4.3 Temporary Construction Works**.

4.9.21 To facilitate the temporary haul roads 23 culvert watercourse crossings are proposed in this Route Section, ten of these would utilise existing culverts which may require upgrading. There is one new temporary bridge crossing proposed on the boundary of this Route Section and Route Section 9 over the Chesterfield Canal. The location of

these crossings are shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.22 There is one satellite construction compound proposed in this Route Section, this is located to the south of Warping Drain between Station Road and Stockwith Road the location of which is shown on **Figure 4.3 Temporary Construction Works**.

Conduction stringing

4.9.23 There are eight proposed pulling positions in this Route Section located at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of Stockwith Road, the railway line, Haxey Gate Road, Tindale bank Road, the River Idle, Cornley Road, Cattle Road and the Chesterfield Canal. The proposed location of the pulling positions and crossing protection areas is illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.24 The proposed works cross two existing 11 kV overhead lines and one 33 kV overhead line in this Route Section. Sections of these existing low voltage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other proposed third party works is shown on **Figure 4.4 Third Party Works**.

Route Section 9: Chesterfield Canal to A620 east of North Wheatley

Proposed Overhead Line

4.9.25 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 26 to 28) the proposed pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of the Route Section at the Chesterfield Canal the proposed overhead line is routed in a general southeasterly direction for approximately 6 km to the east of the settlements of Walkeringham and Beckingham and east of the settlement of Gringley on the Hill to the end of the Route Section at the A620. The proposed overhead line crosses the B1403, Walkeringham Road, A63 and Wood Lane.

4.9.26 The proposed overhead line is not routed in parallel or close parallel with the existing 400 kV overhead lines in this Route Section.

Mitigation planting

4.9.27 There are three areas of proposed mitigation planting in this Route Section, these are proposed along two field drains to the south of Walkeringham Road and a larger area to the east of Wood Lane. These proposed planting areas are shown on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.28 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.29 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.30 In this Route Section five bellmouths are proposed. Bellmouth BM-097 is proposed west off the B1403, BM-098 south of Walkeringham Road, BM-099 and BM-101 north and routh off the A631 and BM-104 northwest off the A620 Gainsborough Road. The proposed location of these bellmouths is shown on **Figure 4.3 Temporary Construction Works**.

4.9.31 There are no sections of highway widening proposed in this Route Section.

4.9.32 A section of continuous haul road is proposed continuing from Route Section 8 over the Chesterfield Canal to proposed bellmouth BM-097 on the B1403 and from proposed bellmouth BM-098 off Walkeringham Road through to proposed bellmouth BM-104 on the A620 Gainsborough Road at the southern extent of this Route Section. The proposed location of the temporary haul roads is shown on **Figure 4.3 Temporary Construction Works**.

4.9.33 To facilitate the temporary haul roads 14 culvert watercourse crossings are proposed in this Route Section, all 14 of these would require new temporary culverts. The proposed location of these watercourse crossings is shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.34 There is one main construction compound proposed in this Route Section, this is proposed to the north of the A631 and its proposed location is shown on **Figure 4.3 Temporary Construction Works**.

Conductor stringing

4.9.35 There are four proposed pulling positions in this Route Section located at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of the Chesterfield Canal, the B1403, Walkeringham Road, the A631, Wood Lane and the A620 Gainsborough Road. The proposed location of the pulling positions and crossing protection areas are illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.36 The proposed works cross four existing 11 kV overhead lines in this Route Section. Sections of these existing low voltage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other proposed third party works is shown on **Figure 4.4 Third Party Works**.

Route Section 10: A620 east of North Wheatley to Fledborough

Proposed Overhead Line

4.9.37 The proposed overhead line in this Route Section is shown on **Figure 4.1 Proposed Project Design** (Sheets 28 to 34) and the pylons detailed in **Appendix 4.2 Indicative Pylon Schedule**. From the start of the section at A620 Gainsborough Road the overhead line is routed southeast to the east of North and South Wheatley for approximately 2.3 km to proposed pylon 4AF209 to the north of Sturton-le-steeple. The proposed overhead line crosses the railway line to proposed pylon 4AF210 from where it is routed in a southwesterly direction for approximately 3.6 km to the east of the railway and west of Sturton le Steeple crossing over Station Road, Springs Lane, a disused railway line and Dunstone Road to proposed pylon 4AF221 adjacent to Caddow Wood. From proposed pylon 4AF221 the proposed overhead line is routed southeast for approximately 1.3 km crossing Betford Gate and Retford Road West to proposed pylon 4AF225. From proposed pylon 4AF225 the proposed overhead line is routed generally south for approximately 8.1 km to the west of South Leverton, Treswell, Woodbeck and East Drayton and east of Darlton crossing Hallowgate Road, Cowsland Road, Forewood Lane, Ashley Lane, Retford Road, Main Street, Retford Road (East Drayton), Dalton Road, and the A57 to proposed pylon 4AF256 at the southern end of this Route Section.

4.9.38 The proposed overhead line is not routed in parallel or close parallel with the existing lines in this Route Section.

Mitigation planting

4.9.39 There are 14 areas of proposed mitigation planting in this Route Section. Two areas of planting are proposed between Gainsborough Road and the railway line along a field drain and field boundary. A larger area of plating is proposed along Gainsborough Road and to the north of proposed pylon 4AF210. Areas of planting are proposed either side of Station Road and along two field drains to the west of Sturton le Steeple. Larger areas of planting is proposed to the west of Caddow Wood and to the south of Hallowgate Road. Areas of planting are proposed to the north and south of Forewood Lane and along two field margins to the west of Woodbeck. A small area of planting is proposed along a field drain between proposed pylons 4AF239 and 4AF240. These proposed planting areas are shown on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.40 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.41 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.42 In this Route Section 25 bellmouths are proposed. Bellmouth BM-105 south of Gainsborough Road, BM-103 and BM-106 west of Gainsborough Road, BM-107 and BM-108 north and south off Station Road, BM-109 and BM-110 north and south off Springs Lane, BM-111 and BM-112 north and south off Retford Gate, BM-113 and BM-

114 off Retford Road West, BM-115 and BM-116 north and south off Forewood Lane, BM-117 and BM-118 north and south off Ashley Lane, BM-119 and BM-120 north and south off Retford Road, BM-121 and BM-122 north and south off Main Street, BM-123 and BM-124 off Retford Road (East Drayton), BM-125 and BM-126 east and west off Darlton Road and BM-127 and BM-128 north and south off A57. These are illustrated on **Figure 4.2 Temporary Construction Works**.

4.9.43 There are no sections of highway widening proposed in this Route Section.

4.9.44 A section of continuous temporary haul road is proposed continuing from Route Section 9 and proposed bellmouth BM-105 off Gainsborough Road through to proposed bellmouth BM-103 off Gainsborough Road. A continuous haul road is also proposed from bellmouth BM-106 off Gainsborough Road through to proposed pylon 4AF219 to the north of the disused railway. A continuous temporary haul road is proposed from proposed pylon 4AF221 and Betford Gate through to the southern extent of this Route Section at proposed pylon 4AF256. The proposed location of the temporary haul roads is illustrated on **Figure 4.2 Temporary Construction Works**.

4.9.45 To facilitate the temporary haul roads, 21 culvert watercourse crossings are proposed in this Route Section, four of these are existing culverts which may require upgrading. There are three proposed bridge crossings in this Route Section over Wheatley Beck, East Drayton and Fledborough Beck. The location of these watercourse crossings are shown on **Figure 4.3.1** in **Appendix 4.3 Indicative Bridge and Culvert Schedule**.

Construction compounds

4.9.46 A satellite construction compound is proposed to the north of Retford Road west and a second on the boundary of Route Section 10 and Route Section 11 to the east of proposed pylon 4AF256.

Conductor stringing

4.9.47 There are 13 proposed pulling positions in this Route Section at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing protection for conductor stringing is proposed either side of A620 Gainbrough Road, the railway line, Station Road, Springs Lane, the disused railway, Retford Road West, Forewood Lane, Ashely Lane, Retford Road, Main Street, Retford Road (East Drayton), Darlton Road and the A57. The proposed location of the pulling positions and crossing protection areas are illustrated on **Figure 4.3 Temporary Construction Works**.

Third party works

4.9.48 The proposed works cross eight existing 11 kV and one 33 kV overhead line in this Route Section. Sections of these existing low voltage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these are other proposed third party works are shown on **Figure 4.4 Third Party Works**.

Route Section 11: Fledborough to High Marnham

Proposed Overhead Line

4.9.49 The proposed overhead line in the Route Section 11 is shown on **Figure 4.1 Proposed Project Design** (Sheets 34 to 36) and the pylons detailed in **Appendix 4.2 Indicative**

Pylon Schedule. From the boundary with Route Section 10 the proposed overhead line is routed southeast for approximately 0.5 km crossing the disused railway to west of the Marnham Railway Yard Local Wildlife Site and Fledborough to Harby Dismantled Railway Local Wildlife Site to proposed pylon 4AF258. From proposed pylon 4AF258 the proposed overhead line is routed east for approximately 0.5 km to the proposed High Marnham Substation.

4.9.50 The proposed overhead line is not routed in parallel or close parallel with the existing 400 kV overhead lines in this Route Section.

Mitigation Planting

4.9.51 There is one area of proposed mitigation planting in this Route Section to the north of the disused railway. This proposed planting area is shown on **Figure 4.1 Proposed Project Design**.

Maintenance access

4.9.52 The proposed maintenance access routes in this Route Section are illustrated on **Figure 4.1 Proposed Project Design**.

Temporary construction works

Construction access

4.9.53 The proposed construction traffic routes are illustrated on **Figure 4.2 Construction Traffic Routes**.

4.9.54 In this Route Section three bellmouths are proposed. Bellmouth BM-129 which is proposed west off Main Street to the north of the disused railway and bellmouths BM-130 and BM-100 east and west off Main Street to the south of the disused railway. The proposed location of these bellmouths is shown on **Figure 4.3 Temporary Construction Works**.

4.9.55 No sections of highway widening are proposed in this Route Section.

4.9.56 A section of temporary haul road is proposed from bellmouth BM-129 to the temporary construction compound and proposed pylon 4AF257. A short section of temporary haul road is proposed west from bellmouth BM-130 to proposed pylon 4AF258 and east from bellmouth BM-100 through to the proposed pylon 4AF260 and the proposed gantries. The proposed location of the temporary haul roads is illustrated on **Figure 4.3 Temporary Construction Works**.

4.9.57 There are no proposed watercourse crossings in this Route Section.

Construction compounds

4.9.58 A satellite construction compound is proposed to the north of Retford Road west and a second on the boundary of Route Section 10 and Route Section 11 to the east of proposed pylon 4AF256.

Conductor stringing

4.9.59 There are two proposed pulling positions in this Route Section at the proposed tension pylons as detailed in **Appendix 4.2 Indicative Pylon Schedule**. Temporary crossing

protection for conductor stringing is proposed either side of the disused railway line. The proposed location of the pulling positions and crossing protection areas are illustrated on **Figure 4.3 Proposed Temporary Works**.

Third party works

4.9.60 The proposed works cross two existing 11 kV overhead lines in this Route Section. Sections of these existing low voltage overhead lines are proposed to be undergrounded for a short section where the proposed works would cross these existing utilities. The location of these and other proposed third party works are shown on **Figure 4.4 Third Party Works**.

Proposed Substation Works at High Marnham

4.9.61 The proposed High Marnham Substation is located to the west of the former High Marnham Power Station, approximately 0.1 km to the east of Main Street and approximately 1.4 km to the north of Hollowgate Lane. A new permanent access is proposed from the current access road off Main Street, this would also serve as one of the proposed temporary construction accesses. Three construction compounds / laydown areas are proposed.

Associated overhead line works

4.9.62 As part of the substation works there is a requirement to turn in the existing overhead lines that currently connect into the existing 275 kV substation into the proposed new 400 KV substation. This requires:

- The construction of three new pylons (ZDF004A, ZDF004B, ZDF004C) and a section of the existing ZDF overhead line route reconductored between existing pylons ZDF011 and ZDF005. Dismantling of an approximate 0.8 km section including three pylons on the existing ZDF overhead line. To facilitate these works an approximate 0.6 km section of temporary overhead line would be required between existing pylons ZDF005 and ZDF003 including one temporary pylon. Following completion of the works the temporary overhead line would be dismantled.
- The construction of one new pylon (ZDA251C) and approximately 1.1 km of reconductoring on the existing ZDA overhead line route. Dismantling of approximately 3.4 km including 15 pylons on the existing ZDA overhead line. To facilitate these works an approximate 1.2 km section of temporary overhead line would be required including two temporary pylons. Following completion of the works the temporary overhead lines would be dismantled.
- The construction of one new pylon (XE004A) and approximately 1.4 km of reconductoring on the existing XE overhead line. Dismantling of approximately 0.75 km including three pylons on the existing XE overhead line.
- The construction of three new pylons (4ZV003A, 4ZV003B and 4ZV003C) and approximately 3.4 km of uprating the existing circuits on the 4ZV overhead line. Dismantling of approximately 1 km including five pylons on the existing 4ZV overhead line. To facilitate these works an approximate 0.7 km section of temporary overhead line including one temporary pylon would be required. Following completion of the works the temporary overhead line would be dismantled.

4.9.63 The proposed High Marnham Substation and associated works are shown on **Figure 4.6 Proposed High Marnham Substation and Associated Works**.

4.10 References

Ref 4.1 Planning Inspectorate (2018). Advice Note 9: Using the Rochdale Envelope [Online] Available at: https://www.gov.uk/government/publications/nationally-significant-infrastructure-projects-advice-note-nine-rochdale-envelope [Accessed November 2024].

Ref 4.2 Planning Inspectorate (2023). Scoping Opinion: Proposed North Humber to High Marnham Case Reference: EN020034. [Online] Available at: https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN020034/documents [Accessed December 2024].

Ref 4. 3 National Grid (2021). Our 2021–2026 Environmental Action Plan [Online]. Available at: https://www.nationalgrid.com/uk/electricity-transmission/document/136551/download [Accessed November2024].

Ref 4.4 Department for Energy Security and Net Zero (2023). Overarching National Policy Statement for Energy (EN-1). [Online]. Available at: https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf [Accessed November24]

Ref 4.5 Department for Energy Security and Net Zero (2023). National Policy Statement for Electricity Networks Infrastructure (EN-5). [Online]. Available at: https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5 [Accessed November24].

Ref 4.6 National Grid, The Holford Rules, [Online] Available at; Microsoft Word - The Holford Rules.doc (nationalgrid.com), [Accessed November 2024]

Ref 4.7 International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines [Online] Available at; https://www.icnirp.org/en/applications/power-lines/index.html, [Accessed November2024]

Ref 4.8 National Grid, The Horlock Rules, [Online] Available at: https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf, [Accessed November 2024]

Ref 4.9 National Grid (2023). North Humber to High Marnham Environmental Impact Assessment Scoping Report. [Online]. Available at: https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN020034/documents [Accessed December 2024].

Ref 4.10 H.M. Government (1990). Town and Country Planning Act 1990 [Online] Available at: https://www.legislation.gov.uk/ukpga/1990/8/data.pdf (Accessed December 2024)

Ref 4.11 H.M.Government (1989). Electricity Act 1989. [Online]. Available at https://www.legislation.gov.uk/ukpga/1989/29/contents (Accessed December 2024)

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