BT-NG-020621-545-0051

Bramford to Twinstead Reinforcement

Volume 6: Environmental Information

Document 6.2.4: Environmental Statement: Main Report Chapter 4 – Project Description

Final Issue A
April 2023

Planning Inspectorate Reference: EN020002

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

nationalgrid

Page intentionally blank

Contents

4. Project Description

4.1 Introduction

4.1.1 This chapter provides a description of the project in terms of what infrastructure is proposed, where it would be located, what size it would be, permanent access requirements, its likely appearance and how it would be constructed, operated, maintained and decommissioned subject to an order granting development consent.

4.1.2 This chapter describes the application design that has been used for the basis of the Environmental Impact Assessment (EIA) presented within the Environmental Statement (ES). It includes reasonable worst-case assumptions about the design and construction methods that may be used to construct the project. These assumptions are then carried through into the topic chapters (ES Chapters 6 to 15) as the basis of the assessment.

4.1.3 The design has developed as a result of the ongoing engineering design, landowner discussions and environmental assessment. It has also been informed by consultation responses received during formal consultation and though project meetings with relevant bodies. This chapter builds on ES Chapter 3: Alternatives Considered (**application document 6.2.3**), which sets out how the project has evolved from a concept, through strategic options, route corridors and indicative alignments to the project presented within the application for development consent. It should also be read alongside ES Appendix 4.1: Good Design (**application document 6.3.4.1**), which presents the different choices made during the design process that have led to the application design.

4.1.4 The project would include the following principal components:

- The installation of approximately 18km of new overhead transmission electric line (consisting of approximately 50 new pylons and conductors);
- The installation of approximately 11km of new underground transmission electric cable system (with associated joint bays and above ground link pillars);
- The construction of four cable sealing end (CSE) compounds which would be required in order to facilitate the transition between the overhead line and underground cable technology. The CSE would be within a fenced compound, and contain electrical equipment, support structures, control building and a permanent access track;
- The removal of approximately 27km of existing overhead line and associated pylons (comprising 25km of existing 132kV overhead line between Burstall Bridge and Twinstead Tee, and 2km of the existing 400kV overhead line to the south of Twinstead Tee); and
- The construction and operation of a new grid supply point (GSP) substation to facilitate the removal of the existing 132kV overhead line. The GSP substation would include associated works, including replacement pylons, a single circuit sealing end compound and underground cables to tie the GSP substation into the existing 400kV and 132kV networks.

4.1.5 Other ancillary activities would be required to facilitate construction and operation of the project, including (but not limited to):

- Modifications to, and realignment of sections of existing overhead lines, including pylons;
- Temporary land to facilitate construction activities including temporary amendments to the public highway, public rights of way (PRoW), working areas for construction equipment and machinery, site offices, welfare, storage and access;
- Temporary infrastructure to facilitate construction activities such as amendments to the highway, pylons and overhead line diversions, scaffolding to safeguard existing crossings and watercourse crossings;
- Diversion of third-party assets and land drainage from the construction and operational footprint; and
- Land required for mitigation, compensation and enhancement of the environment as a result of the environmental assessment process, and National Grid's commitments to Biodiversity Net Gain (BNG).

4.1.6 It is assumed that this reinforcement would operate at least 400kV in a similar way to the majority of the rest of the transmission network. For the purposes of this report, the new overhead line is referenced as 'proposed 400kV overhead line' to differentiate it from the existing 400kV overhead line and the UK Power Networks (UKPN) owned 132kV overhead line.

Structure of the Chapter and Supporting Documents

4.1.7 This chapter describes the construction activities and works associated with the 'main project', which includes the 132kV overhead line removal, proposed 400kV overhead line, underground cables and CSE compounds as described in Sections 4.4 to 4.7. Construction activities and works associated with the GSP substation are described in Section 4.8.

4.1.8 The chapter is split into the following sections:

- Section 4.1 Introduction: This sets out the structure of the chapter and links to other relevant documents;
- Section 4.2 Overview of the Project: This gives an overview of the project's key features, describes the embedded and good practice measures built into the project and describes the Order Limits and Limits of Deviation (LoD);
- Section 4.3 Description of Each Project Section: This describes each section of the project (i.e. Section AB: Bramford Substation/Hintlesham to Section H: GSP Substation) and describes the geographical location of key project features;
- Section 4.4 General Construction: This describes the project assumptions that have been used for undertaking the assessment, including construction schedule, working hours, estimated construction workforce and describes the temporary works such as the temporary compound areas;
- Sections 4.5 to 4.7 describe how each component of the 'main project' would be constructed including the 132kV overhead line removal (Section 4.5), proposed 400kV overhead line (Section 4.6) and underground cables (Section 4.7);

- Section 4.8 GSP Substation: This describes the works associated with the GSP substation and how this connects into the network. It also includes minor works to the existing overhead lines, for example installing arcing horns to the existing pylons;
- Section 4.9 Operation and Maintenance: This describes the permanent features of the project that would be in place during operation and describes the activities that are anticipated during the operation stage including site inspections and routine maintenance; and
- Section 4.10 Decommissioning: This describes what would happen once the project reaches the end of its design life and/or was no longer required.

4.1.9 This chapter should be read alongside ES Figure 4.1: The Project (**application document 6.4**) and is supported by the following appendices:

- Appendix 4.1: Good Design (**application document 6.3.4.1**);
- Appendix 4.2: Construction Schedule (**application document 6.3.4.2**); and
- Appendix 4.3: Greenhouse Gas Assessment (**application document 6.3.4.3**).

4.1.10 In addition, the following plans should be referred to when reading this chapter:

- Work Plans which also include the table of parameters (**application document 2.5**);
- Traffic Regulation Order Plans (**application document 2.6)**;
- Access, Rights of Way and Public Rights of Navigation Plans (**application document 2.7**);
- Trees and Hedgerows to be Removed or Managed Plans (**application document 2.9**);
- General Arrangement Plans (**application document 2.10**); and
- Various design and layout plans provided for illustrative purposes (**application documents 2.11.1 to 2.11.15**).

4.2 Overview of the Project

General Overview

4.2.1 The project is located in the east of England and crosses a county administrative boundary defined by the River Stour, with Suffolk County to the east of the river and Essex County to the west. The project lies within three local planning authority areas: the eastern part of the project lies in Mid Suffolk District (Suffolk); the central parts of the project lie in Babergh District (Suffolk); and the western part of the project lies in Braintree District (Essex).

4.2.2 There is an existing 400kV overhead line operated by National Grid between Bramford and Twinstead Tee, where the circuits split and one continues to Pelham and the other continues to Braintree and Rayleigh. There is also an existing 132kV overhead line that is operated by the Distribution Network Operator, which is UKPN in the east of England. UKPN distributes electricity at lower voltages to industrial, commercial and domestic users.

4.2.3 The project involves the reinforcement of the electricity transmission network between Bramford Substation in Suffolk and Twinstead Tee in Essex. This would be achieved by the construction and operation of a new electricity transmission line over a distance of approximately 29km.

4.2.4 The reinforcement would comprise approximately 18km of overhead line (consisting of approximately 50 new pylons, and conductors). Two types of pylon are proposed on the project. These are:

- Suspension (line) pylons which support the overhead line in a straight line; and
- Tension (angle) pylons which support the overhead line where the line changes direction.

4.2.5 Four CSE compounds would be required to facilitate the transition between the overhead and underground cable technology, one at the end of each underground cable section, i.e. Dedham Vale East, Dedham Vale West, Stour Valley East and Stour Valley West. The CSE would be within a fenced compound, and contain electrical equipment, support structures, control building and a permanent access track.

4.2.6 Approximately 27km of existing overhead line and associated pylons would be removed as part of the proposals (25km of existing 132kV overhead line between Burstall Bridge and Twinstead Tee, and 2km of the existing 400kV overhead line to the south of Twinstead Tee). To facilitate the overhead line removal, a new GSP substation is required at Butler's Wood, east of Wickham St Paul, in Essex. The GSP substation would include associated works, including replacement pylons, a single circuit sealing end compound and underground cables to tie the substation into the existing 400kV and 132kV networks.

4.2.7 As noted in ES Chapter 1: Introduction (**application document 6.2.1**), National Grid obtained planning consent for the GSP substation under the Town and Country Planning Act (TCPA) in October 2022 (planning application reference 22/01147/FUL). However, for the purposes of a complete assessment of the effects of the project, the GSP substation is described within this chapter and the likely significant effects are assessed within ES Chapters 6 to 15. Most topic chapters assess the 'main project' first and then the remaining ES topic chapters assess the project and 'GSP substation'. The assessment presented under the 'main project' heading comprises the components covered by Sections 4.4 to 4.7 of this chapter, whereas the assessment presented under the 'GSP Substation' heading assesses the components described in Section 4.8.

Order Limits and Limits of Deviation

4.2.8 As noted in ES Chapter 1: Introduction (**application document 6.2.1**), the project is a Nationally Significant Infrastructure Project (NSIP) and Order Limits have been defined to encompass the land required temporarily to build the project and permanently to operate the project. The Order Limits include LoD, which represent the maximum locational flexibility for permanent infrastructure, such as the overhead line, pylons, CSE compounds and underground cables. This allows for adjustment to the final positioning of project features to avoid localised constraints or unknown or unforeseeable issues that may arise. The horizontal LoD are shown on the Work Plans and the vertical LoD are presented in the table of parameters, which can be found at the end of the Work Plans (**application document 2.5**).

4.2.9 The assessment presented within the ES is based on the Proposed Alignment, which is the design that is shown on the General Arrangement Plans (**application document 2.10**) and also ES Figure 4.1: The Project (**application document 6.4**). However, it should be noted that the permanent aspects of the project, including pylon locations, are not fixed and could be located anywhere within the LoD, as defined on the Work Plans (**application document 2.5**). The location and orientation of the CSE compounds, GSP substation and underground cables may also change within the LoD.

4.2.10 The LoD in some cases are three-dimensional, with vertical (up and down), lateral (perpendicular to the Proposed Alignment) and longitudinal (along the Proposed Alignment). There are no LoD associated with the removal of the 132kV or the existing 400kV overhead line, as no flexibility is required regarding the removal of these lines. The Order Limits and the LoD are described in Table 4.1 and are shown on the Work Plans (**application document 2.5**).

4.2.11 The LoD include an unlimited extent below ground in relation to the pylons, underground cables and other components with below ground features, including their foundations. As the assumed depth is important to the assessment of effects for some topics, for example geology and hydrogeology, the ES is based on a reasonable worst case maximum depth based on the current designs and potential construction techniques. If the required depth were to exceed the assessed depth within the ES, National Grid would undertake a review of the potential effects to see if there likely to be any materially new or materially different environmental effects to those identified in the ES likely to result from the change in depth, as set out in Article 5 of the draft Development Consent Order (DCO) (**application document 3.1**).

4.2.12 Table 4.1 outlines the assumptions used when undertaking the assessment, where these differ from the flexibility that would be granted through the DCO. Anything else not listed could be anywhere within the Order Limits.

Table 4.1 – Order Limits, Limits of Deviation and ES Assumptions

Component	Assumption within the DCO (as shown on the Work Plans (application document 2.5)	ES Assumption
Overhead Line Removal		
Order Limits	As depicted on Work Plans, approximately 40m wide.	Same as DCO.
Vertical, lateral and longitudinal LoD	There are no LoD associated with the overhead line removal.	Same as DCO.
Proposed 400kV Overhead Line and Realignment or Modifications to Existing Overhead Lines		
Order Limits	As depicted on the Work Plans approximately 110m wide. This is based on an up to 80m by 80m working area around tension (angle) pylons and flexibility to allow for unforeseen site conditions during detailed design and / or construction.	Same as DCO.
Vertical LoD (upwards)	Not exceeding 4m above the maximum height shown on the table of parameters in the Work Plans.	Same as DCO.

Component	Assumption within the DCO (as shown on the Work Plans (application document 2.5)	ES Assumption
Vertical LoD (downwards)	Any extent downwards as is considered necessary or convenient.	Up to 15m downwards.
Lateral LoD (perpendicular to Proposed Alignment)	As depicted on the Work Plans, typically up to 30m either side of the centre line.	Same as DCO.
Longitudinal LoD (along the Proposed Alignment)	Unlimited within the Order Limits.	Same as DCO, unless a commitment has been made to avoid a specific location.
CSE Compound		
Order Limits	Order limits are approximately 180m by 150m around the CSE compound area. Additional Order Limits encompass the embedded planting and permanent access.	Same as DCO.
Vertical LoD (upwards)	Not exceeding 10% above the maximum height shown on the table of parameters in the Work Plans.	Same as DCO.
Vertical LoD (downwards)	Any extent downwards as is considered necessary or convenient.	Up to 15m downwards.
Longitudinal / lateral LoD	The location and orientation of the CSE compound could lie anywhere within the CSE compound non-linear LoD.	Same as DCO.
Proposed 400kV or above Underground Cables		
Order Limits	As depicted on the Work Plans approximately 100m wide in open fields with no constraints. This is typically based on a 60m cable width with a 10m working area on either side and 10m for flexibility on either side to allow for unforeseen site conditions during detailed design and / or construction. Order Limits are wider at trenchless crossing locations and other areas of constraint to accommodate the additional temporary works.	Same as DCO.
Opencut cables (standard) vertical LoD (upwards)	Minimum of 0.9m between the top of the protective tiles and the top of the finished ground level.	Same as DCO.
Opencut cables (standard) vertical LoD (downwards)	Any extent downwards as is considered necessary or convenient.	Up to 2m downwards.
Opencut cables (road, watercourse or service crossings) vertical LoD (upwards)	Minimum of 0.9m between the top of the protective tiles and the top of the finished ground level.	Same as DCO.

Component	Assumption within the DCO (as shown on the Work Plans (application document 2.5)	ES Assumption
Opencut cables (road, watercourse or service crossings) vertical LoD (downwards)	Any extent downwards as is considered necessary or convenient.	Up to 6m downwards.
Trenchless crossings vertical LoD (upwards)	Minimum of 0.9m from finished ground level to the top of the protective tile or duct.	Same as DCO.
Trenchless crossings vertical LoD (downwards)	Any extent downwards as is considered necessary or convenient.	Up to 10m downwards.
Lateral (perpendicular to Proposed Alignment) including above ground apparatus	As depicted on Work Plans, the underground cable LoD is typically 100m and the cable width is typically 60m within this.	Same as DCO.
Longitudinal (along the Proposed Alignment) including above ground apparatus	Unlimited within the underground cable LoD.	Same as DCO.
GSP Substation		
Order Limits	Order limits are approximately 100m by 400m for the main GSP substation site. Additional Order Limits encompass the associated works.	Same as DCO.
Vertical LoD (upwards)	Not exceeding 10% above the maximum height shown on the table of parameters in the Work Plans.	Same as DCO
Vertical LoD (downwards)	Any extent downwards as is considered necessary or convenient.	Assumed to be up to 5m depth to include piled foundations.
Longitudinal / lateral LoD	The location of the GSP substation could lie anywhere within the GSP substation non-linear LoD.	Same as DCO.

Flexibility in the ES

4.2.13 As noted in the previous sub-section, the Order Limits include the LoD, which represent the maximum locational flexibility for permanent infrastructure, such as the overhead line, pylons, underground cables, CSE compounds and the GSP substation. This chapter describes the assumptions used for the ES, which is assessed in Sections 6 to 10 of each topic chapter.

4.2.14 The ES topic chapters also consider sensitivity testing of flexibility in design and construction or methodology that could be applied, to see if there would be new or different significant effects. This is assessed within Section 11 of each topic chapter and include:

- Assessment of Alternative Construction Schedule: Each ES topic chapter assumes the baseline construction schedule described in ES Appendix 4.2: Construction

Schedule (**application document 6.3.4.2**) for the purposes of the assessment in Sections 6 to 10 of each topic chapter. Sensitivity testing considering the alternative scenario, which has a later start date due to the GSP substation delivered pursuant to the DCO, is considered as part of the sensitivity testing in section 11 of each topic chapter. (see Section 4.4 for more details);

- Flexibility in Design: Each ES topic chapter considers aspects of the design that could be different. These include:
  - Flexibility in trenchless crossings, for example change to the drilling direction of trenchless crossings or assumed method (see Table 4.7 for the baseline assumptions);
  - Flexibility in construction method, for example changes to methodology for foundations e.g. if piling is not required, as assumed in the baseline assessment; and
  - Flexibility within the Order Limits, for example changes to the location or height of permanent features, such as pylons, within the LoD.

Embedded and Good Practice Measures

4.2.15 The project has been designed in accordance with applicable health and safety legislation. The project also complies with design safety standards including the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS), which sets out the criteria and methodology for planning and operating the National Electricity Transmission System. This informs a suite of National Grid policies and processes, which contain details on design standards required to be met when designing, constructing and operating assets such as proposed on the project.

4.2.16 Environmental appraisal has been an integral part of the project design process since conception, which has meant that the project has been able to avoid environmentally sensitive features as far as reasonably practicable. ES Chapter 3: Alternatives Considered (**application document 6.2.3**) provides a summary of the options appraisal.

Embedded Measures

4.2.17 National Grid has also embedded measures into the design of the project. These are measures that are intrinsic to and built into the design of the project, some of which are inherent to the DCO (**application document 3.1**) and/or shown on the Work Plans (**application document 2.5**). It also includes measures that have been identified through the environmental assessment as part of the iterative design and have been committed to as part of the application of the mitigation hierarchy, to avoid or reduce likely significant environmental effects to support a proportionate assessment. These have been given an 'EM' prefix and reference number to make it easy to cross reference them.

4.2.18 Table 4.2 outlines the key embedded measures that are relevant to the project description set out within this chapter. The full set of embedded measures are set out in the Register of Environmental Actions and Commitments (REAC) which forms Appendix B of the Construction Environmental Management Plan (CEMP) and is secured by Requirement 4 in the draft DCO (**application document 3.1**).

Table 4.2 – Key Embedded Measures

Ref	Embedded Measure	Benefits
Whole Project		
EM-P01	The project has committed to deliver net gain by at least 10% or greater in environmental value (including biodiversity) on this project.	This means that the project would deliver a net improvement in environmental value (including biodiversity). This would be reported separately outside of the ES to avoid overlap or double counting of any required EIA mitigation. Further details can be found in the Environmental Gain Report (**application document 7.4**).
EM-P02	Approximately 25km of the existing 132kV overhead line will be removed between Burstall Bridge and Twinstead Tee.	The project includes removing a section of the existing 132kV overhead line, which would reduce the magnitude of change of the proposed 400kV overhead line on landscape and views. It would also bring benefits to sections of the project where underground cables are proposed by removing an overhead line from the landscape.
EM-P03	The project would include triple Araucaria conductors or alternative technology that performs to the same or better standard in relation to noise on standard lattice pylons.	Due to its geometrical configuration the triple Araucaria design is the least electrically stressed conductor system that National Grid uses. It is currently the best design for reducing the effects of line crackle (corona discharge) from the proposed overhead lines during operation.
EM-P04	The project will be designed in accordance with National Grid design standards and will be compliant with the guidelines and policies relating to electric and magnetic fields (EMF) stated in National Policy Statement (NPS) EN-5 (Department of Energy and Climate Change, 2011b), including the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines (1998).	Compliance with these guidelines and policies means that the project would already have designed out potential effects from EMF to a level to meet health and safety standards. Further details can be found in the EMF Report (**application document 5.2)**
EM-P05	The project will be designed to comply with design safety standards including NETS SQSS and the suite of National Grid policies and processes which contains details on design standards required to be met when designing, constructing and operating its project.	Existing National Grid processes are designed to identify potential risks during construction and operation and to design these out and each stage of project development.
EM-P06	Full line tension gantries are proposed at all four of the proposed CSE compounds.	This removes the need for four terminal pylons across the project and associated impacts, particularly in relation to landscape and visual.

Ref	Embedded Measure	Benefits
EM-P07	The GSP substation and the CSE compounds including their Limits of Deviation have been located outside of areas at medium and high risk of river flooding (Flood Zones 2 and 3).	This avoids loss of floodplain and also reduces the risk that these components of the project are at risk of flooding.
Section AB Bramford Substation/Hintlesham		
EM-AB01	The Proposed Alignment to the north of Hintlesham Hall is based on the pylon locations from the optimised alignment discussed with English Heritage (now Historic England) in 2013. National Grid will continue to work with Historic England as the designs develop to identify the most suitable location for the pylons in relation to the setting of Hintlesham Hall, taking into account the limits of deviation and technical considerations such as distance between conductor spans.	Discussions have taken place with Historic England since the recommencement of the project in 2020, regarding the location of pylons in relation to the setting of Hintlesham Hall.
EM-AB02	The new 400kV overhead line will reuse the existing pylons (RB12 and RB13) at Hintlesham Woods Site of Special Scientific Interest (SSSI).	This avoids impacts on Hintlesham Woods SSSI by reducing the works that take place in and around the SSSI.
Section C Brett Valley		
EM-C01	Scaffolding and netting will be used during construction of the overhead line (conducting installation works) over Hadleigh Railway Walk.	This would maintain safe and continued access for users of Hadleigh Railway Walk during construction.
Section D Polstead		
EM-D01	The design allows for an area of landscape planting around the CSE compound at Dedham Vale East. The embedded planting will be maintained for the life of the CSE compound.	National Grid has included land within the Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This would reduce effects on views and on the setting of the Dedham Vale Area of Outstanding Natural Beauty (AONB).
Section E Dedham Vale AONB		
EM-E01	The project includes a section of underground cable through Section E: Dedham Vale AONB.	The Dedham Vale AONB is a nationally important and designated landscape. With the proposed underground cable and the removal of the existing 132kV overhead line, the project would result in one fewer overhead line within the landscape in the AONB compared to the existing baseline.
EM-E05	A trenchless crossing is proposed at the River Box. The drive pits will be located outside of Flood Zone 3 where practicable or will be managed in accordance with the flood risk action plan (W08 in the CoCP). On receipt of a severe flood warning,	A trenchless crossing would avoid disturbance to the river habitats and geomorphological features.

Ref	Embedded Measure	Benefits
	the Contractor would deploy suitable flood protection measures to safeguard work site personal and equipment.	
Section F Leavenheath/Assington		
EM-F01	The design allows for an area of landscape planting around the CSE compound at Dedham Vale West. The embedded planting will be maintained for the life of the CSE compound.	National Grid has included land within the Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This would reduce effects on views and on the setting of the Dedham Vale AONB.
Section G Stour Valley		
EM-G01	Approximately 2km of the existing 400kV overhead line will be removed to the south of Twinstead Tee.	In addition to the 132kV overhead line removal outlined in EM-P02, the project includes the removal of a section of the existing 400kV overhead line through parts of Section G: Stour Valley. This would improve the landscape and views within the Stour Valley by reducing wirescape.
EM-G02	The project includes a section of underground cable through parts of the Section G: Stour Valley.	The Stour Valley, although not designated, is a valued landscape and has similar features to Dedham Vale AONB. With the proposed underground cable, the removal of the existing 132kV overhead line and the removal of 2km of 400kV overhead line, the project would result in fewer overhead lines within the most sensitive areas of the Stour Valley compared to the existing situation (i.e. baseline).
EM-G03	The design allows for an area of landscape planting around the CSE compound at Stour Valley East. The embedded planting will be maintained for the life of the CSE compound.	National Grid has included land within the Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This would reduce effects on views and the landscape character of the Stour Valley.
EM-G04	A trenchless crossing is proposed at the River Stour and beneath the Sudbury Branch Railway Line. The drive pits will be located outside of Flood Zone 3 where practicable or would be managed in accordance with the flood risk action plan (W08 in the CoCP). On receipt of a severe flood warning, the Contractor would deploy suitable flood protection measures to safeguard work site personal and equipment.	A trenchless crossing would avoid disturbance to the river habitats and geomorphological features and would also reduce disruption to water-based recreation users such as canoeists. This would also reduce flood risk to construction workers, equipment and materials and reduce the risk of pollution during flood conditions

Ref	Embedded Measure	Benefits
EM-G05	The Order Limits have been widened at the crossing of the River Stour to accommodate soil storage outside of Flood Zone 3 where practicable or to allow placement of soil leaving gaps to avoid blocking floodplain flow paths.	The gaps in the temporary soil storage stockpiles would prevent floodwater from being impeded and reduce the risk of flooding during construction.
EM-G06	The design allows for an area of landscape planting around the CSE compound at Stour Valley West. The embedded planting will be maintained for the life of the CSE compound.	National Grid has included land within the Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This would reduce effects on views and the landscape character of the Stour Valley.
Section H GSP Substation		
EM-H01	The GSP substation will include a noise enclosure around the transformers and this is built into the designs.	The noise enclosure would provide a barrier around the transformers and reduce the noise levels at the boundary of the site.
EM-H02	Landscape planting has been proposed to the east and west of the GSP substation. This will be maintained for the life of the GSP substation.	The landscape planting would help to soften views towards the GSP substation and reconnect the two separate blocks of ancient woodland.

Good Practice Measures

4.2.19 National Grid has also identified a number of good practice measures, which generally comprise measures imposed through legislative requirements or represent standard sector good practices. These include measures to reduce nuisance from construction activities. The good practice measures are set out in the Code of Construction Practice (CoCP) (**application document 7.5.1**).

Management Plans

4.2.20 Four management plans have been produced which set out the commitments and management measures that would be implemented during construction. These are secured through Requirement 4 of the draft DCO (**application document 3.1**):

- Construction Environmental Management Plan (CEMP) (**application document 7.5**): This sets out the general commitments and management measures that would be undertaken during construction. It also contains Appendix A: CoCP (**application document 7.5.1**) and Appendix B: REAC (**application document 7.5.2**);
- Construction Traffic Management Plan (CTMP) (**application document 7.6**): This sets out how the project would manage both construction traffic and impacts on the wider traffic network during construction;
- Materials and Waste Management Plan (MWMP) (**application document 7.7**): This sets out how the project would seek to reduce consumption of raw materials and also reduce waste by following the waste hierarchy; and
- Landscape and Ecological Management Plan (LEMP) (**application document 7.8**): This sets out the commitments and management measures with regards to landscape

and ecology. The LEMP also contains the vegetation retention and removal plans (**application document 7.8.1**) and the reinstatement plans (**application document 7.8.2**) in Appendix A and B respectively.

Environmental Mitigation and Biodiversity Net Gain

4.2.21 Table 4.2 describes the embedded measures that are assumed as part of the design prior to the assessment in the ES topic chapters. The ES topic chapters (ES Chapter 6 to 15) then present the impact assessment and identify the need for any additional mitigation required to avoid or reduce likely significant effects. The locations of proposed additional mitigation measures are shown on ES Figure 16.1: Embedded Measures and Mitigation Proposals (**application document 6.4**).

4.2.22 The Environment Act 2021 introduced BNG into planning law, and Schedule 15 Paragraph 3(2) of the Act confirms the requirement to be at least 10%. It is intended that this should apply across all terrestrial projects, or terrestrial components of projects, which are accepted for examination through the NSIP regime from November 2025. Whilst BNG is therefore not required by the Act at the time of DCO application for the project in 2023, the principles are recognised as an integral component of emerging policy and aligns closely with National Grid's own commitment to deliver net gain by at least 10% or greater in environmental value on all construction projects, secured on the project through Requirement 13 of the draft DCO (**application document 3.1**).

4.2.23 National Grid has identified potential opportunities for delivering BNG, and where practicable link to wider environmental gains. These enhancement proposals are outlined within the Environmental Gain Report (**application document 7.4**). In the interests of clarity, the enhancements are not assessed as part of the ES, as the enhancements may be delivered through different funding streams and over a different timetable and so that a clear distinction is drawn between necessary mitigation required to offset likely significant effects.

4.3 Description of Each Project Section

Introduction

4.3.1 For ease of reference and to aid description of the project, the project has been split into seven sections based on the landscape character and feedback during consultation. The sections are illustrated on ES Figure 4.1: The Project (**application document 6.4**) and comprise:

- Section AB Bramford Substation/Hintlesham (Overhead Line);
- Section C Brett Valley (Overhead Line);
- Section D Polstead (Overhead Line and Underground Cable);
- Section E Dedham Vale AONB (Underground Cable);
- Section F Leavenheath/Assington (Overhead Line and Underground Cable);
- Section G Stour Valley (Overhead Line and Underground Cable); and
- Section H GSP Substation.

Section AB Bramford Substation/Hintlesham (Overhead Line)

4.3.2 The proposed network reinforcement would start within the perimeter fencing at the existing National Grid substation at Bramford. The proposed works at Bramford Substation include the installation of switch gear, two new shunt reactors to maintain the electrical operating parameters of the 400kV network and gantry structures to connect the overhead line into the substation.

4.3.3 The proposed 400kV overhead line would tie into the existing substation on the western boundary. This would require realignment of the existing 400kV overhead line and a new overhead line, including a new tension (angle) pylon, near Hill Farm to connect into Bramford Substation. The existing 400kV overhead line to the north-east of Hill Farm would be removed (comprising three pylons and the intervening spans of conductors).

4.3.4 The proposed 400kV overhead line would run south-west from Bramford Substation to a tension (angle) pylon near Church Road. It would then change to a slightly more westerly orientation, to run parallel to the existing 400kV overhead line to the north of Hintlesham Park and Hintlesham Hall.

4.3.5 The proposed 400kV overhead line would use the existing 400kV pylons at Hintlesham Woods SSSI, and the existing 400kV overhead line would be transposed (realigned) onto new pylons located to the north and west of the SSSI (Ramsey Wood). The transposition works (moving of the existing overhead line) would mean that some construction work would need to rely on planned electrical outages. Further details on the assumed timings can be found in Section 4.4.

4.3.6 Once to the south of Hadleigh Bee Farm, the proposed 400kV overhead line would follow the same alignment, which runs to the north of Tom’s Wood and in a generally westerly direction to Hadleigh Railway Walk. Hadleigh Railway Walk forms the boundary between Section AB: Bramford Substation/Hintlesham, and Section C: Brett Valley.

4.3.7 The existing 132kV overhead line running to the south of Hintlesham would be removed in its entirety through this section. The existing 132kV underground cables, from Bramford Substation to Burstall Bridge, would not be removed, and would remain buried and connected to the existing CSE platform pylon, as these serve the low voltage network running south and eastwards from the substation.

Section C Brett Valley (Overhead Line)

4.3.8 The proposed 400kV overhead line runs to the south of, and broadly parallel to the existing 400kV overhead line between Hadleigh Railway Walk to the east and Overbury Hall to the west. The proposed 400kV overhead line approximately follows the alignment of the existing 132kV overhead line, which would be removed in its entirety in this section.

Section D Polstead (Overhead Line and Underground Cables)

4.3.9 The proposed 400kV overhead line would run to the south of and broadly parallel to the existing 400kV overhead line. The proposed 400kV overhead line generally follows the route of the existing 132kV overhead line, which would be removed in its entirety in this Section. The proposed 400kV overhead line would also cross Layham Quarry (not currently operational), which is crossed by both the existing 400kV and the existing 132kV overhead lines.

4.3.10 This section of the proposed 400kV overhead line would terminate at the proposed Dedham Vale East CSE compound, beyond which the alignment continues underground. The CSE compound would be located immediately west of Millwood Road, between two areas of woodland. A permanent access track would connect the CSE compound to Millwood Road. The CSE compound would provide the interface point between the 400kV overhead line and the underground cable.

Section E Dedham Vale AONB (Underground Cable)

4.3.11 Underground cables are proposed throughout this section and the existing 132kV overhead line would be removed entirely. This would result in one fewer line being present within Section E than existing.

4.3.12 The underground cable would run in a south-west direction from Holt Road to Heath Road before diverting in a north-west direction underneath the existing 400kV overhead line and to the north of Dollops Wood. From here the cables divert in a south-westerly direction and would pass back underneath the existing 400kV overhead line to the north of Bushy Park Wood. The underground cables would then cross below the River Box using a trenchless crossing technique, before passing around the southern edge of Alder Carr and through a gap in the apple orchards at Boxford Fruit Farm. The section ends to the north of the B1068 (Stoke Road), where the cables would cross the road into the Dedham Vale West CSE compound in the field to the north-west of Stewards Farm. A permanent access route would be constructed from Stoke Road.

Section F Leavenheath/Assington (Overhead Line)

4.3.13 The proposed 400kV overhead line would extend from the CSE compound in a south-west direction, crossing the A134 where the overhead line changes to a more westerly direction to the east of High Road. From here it continues on this alignment to the south of Assington and on to Upper Road, which forms the western end of the section.

Section G Stour Valley (Overhead Line and Underground Cables)

4.3.14 The proposed 400kV overhead line would continue west from Upper Road to the proposed Stour Valley East CSE compound south of Workhouse Green. The CSE compound would have a permanent access route from the B1508 (St Edmund's Hill) near Dunstead Farm.

4.3.15 From the CSE compound, the underground cables would be laid in a westerly alignment towards the B1508 (St Edmund's Hill) and the River Stour. The River Stour would be crossed using a trenchless crossing technique. It is also assumed that the Sudbury Branch Railway Line would also be crossed using a trenchless crossing technique, subject to further consultation with Network Rail.

4.3.16 After the Sudbury Branch Railway Line, the cable would be routed across Henny Road and continue to the south-west, across St Edmunds Way PRoW to Moat Lane. After crossing Moat Lane, the cables would continue in a south-westerly direction to a proposed trenchless crossing to the south of Ansell's Grove. The underground cable would then change to a southerly direction after crossing the existing 400kV overhead line (which would later be removed) before crossing Henny Back Road to connect to the Stour Valley West CSE compound to the south.

4.3.17 Five pylons and five spans of the existing 400kV overhead line would be removed from the section between Twinstead Tee and the Stour Valley West CSE compound. The existing 132kV overhead line would be removed up to the point at which it crosses beneath the existing 400kV overhead line at Twinstead Tee.

Section H GSP Substation

4.3.18 National Grid is proposing to remove the existing 132kV overhead line between Burstall Bridge and Twinstead Tee, a distance of approximately 25km. This requires alternative arrangements to be put in place to secure the supply of the local electricity distribution network. This would be achieved by establishing a new GSP substation, between Butler's Wood and Waldegrave Wood, to the east of Wickham St Paul.

4.3.19 The proposed GSP substation would include a fenced compound located between Butler's Wood and Waldegrave Wood. The proposed GSP substation would include two super grid transformers with noise enclosures, to convert the voltage from 400kV to 132kV, as well as other switchgear, modular buildings and equipment.

4.3.20 A 400kV single circuit sealing end compound to the west of Waldegrave Wood would be separately fenced outside of the proposed GSP substation to the south of the existing overhead line. This would connect the southern circuit of the existing 400kV overhead line back into the proposed GSP substation via a new 400kV underground cable. Works would be required to the existing 400kV overhead line, including the removal and replacement of a pylon.

4.3.21 The proposed GSP substation would also be connected to the existing 132kV overhead line to the south via a new underground cable. An existing pylon on the 132kV overhead line would be replaced with a new CSE platform pylon to enable this. The construction would be facilitated by temporary overhead line diversions on both the existing 400kV and the existing 132kV overhead lines.

4.3.22 Minor works are also required to the existing 400kV overhead line pylons between Twinstead Tee and Hedingham Road (in Section G and H). The works comprise replacing the arcing horns, which are projecting conductors used to protect insulators or switch hardware on high voltage electric power transmission systems from damage.

4.4 General Construction

Introduction

4.4.1 This section sets out how the project would be constructed and the construction assumptions that have been used when undertaking the EIA. It includes project-wide assumptions in relation to the construction programme, working hours, construction workforce and vehicles. It also includes assumptions associated with the temporary works, for example the location of compounds. It also provides details about the assumed materials that would be consumed on the project and the likely wastes generated.

4.4.2 The terms 'temporary working width' and 'temporary working area' are used within the ES to help define areas where construction could occur within the Order Limits. For example, the Order Limits within the underground cable sections are typically 100m wide. However, within that 100m, there would be an 80m temporary working width (or area when considered along a given length of the section). This is the areas where construction activities would take place. The additional 20m is included within the Order Limit width to provide flexibility for any unforeseen conditions.

Construction Schedule

Baseline Construction Schedule

4.4.3 A construction programme (termed the baseline construction schedule) has been assumed for the assessment presented within the ES. This is provided in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**). It assumes that the GSP substation is constructed in advance of DCO consent via the extant planning permission under the TCPA (planning application reference 22/01147/FUL).

4.4.4 Construction at the GSP substation is anticipated to commence in spring 2023. The majority of the civil construction works at the GSP substation (consisting of earthworks, concrete works and fencing) is anticipated to be completed prior to any outages and would take approximately six to eight months to construct.

4.4.5 The remaining works at the GSP substation would be dependent on allocated network outages associated with the temporary overhead line diversion during construction. The exact timing of these works would be dependent on when outages can be taken and may be up to a year after the 400kV overhead line diversion is installed.

4.4.6 The main project works (including the overhead line removal, new overhead line and underground cable) would be constructed under the DCO, subject to consent, commencing in autumn 2024. In general, this would start with enabling works, such as setting up the main compound and temporary access routes (including the temporary bridges, culverts and bellmouths).

4.4.7 The 132kV overhead line removal would occur once the GSP substation is operational and generally in advance of the construction of the proposed 400kV transmission line, as the latter would use the same alignment in a number of locations. Removal of the overhead line may occur in phases, with the 132kV overhead line being removed in sections and potentially multiple sections being undertaken concurrently.

4.4.8 The construction of the proposed 400kV overhead line and underground cables (including CSE compounds) would generally follow the removal of the 132kV overhead line, although some offline works could happen concurrently.

4.4.9 The removal of the 400kV overhead line in Section G: Stour Valley, would be timed as appropriate within an agreed outage window. It is anticipated that this would be undertaken towards the end of construction, once the proposed 400kV transmission line has been installed and tested.

4.4.10 Temporary features such as site cabins, fencing and scaffolding would generally be removed at the end of construction. Some temporary access routes (including any temporary bridges, culverts and bellmouths) would be in place for the duration of construction (up to four years) to maintain access to the working area and to reduce the number of heavy goods vehicles (HGV) using the local road network. However, temporary access routes would be removed where these are no longer required. Any stripped topsoil would be reinstated, and the temporary working areas would generally be reinstated to their former use as described within the CEMP (**application document 7.5**).

4.4.11 Testing would occur once the project was constructed and prior to operation. Land would be reinstated as soon as reasonably practicable and mitigation planting may continue beyond the construction phase, based on seasonal constraints. The target date for the project to be operational is late 2028.

4.4.12 The baseline construction schedule forms the basis of the impact assessment presented in Sections 6 to 10 of the ES topic chapters, with the exception of ES Chapter 12: Traffic and Transport (**application document 6.2.12**) as noted below.

Alternative Scenario

4.4.13 Although the baseline construction schedule is National Grid's preferred approach for constructing the project, an alternative scenario for the construction schedule is assessed within the ES. This is referred to as the alternative scenario and is described in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**).

4.4.14 Under the alternative scenario, the assumption is that all works (including the GSP substation) would commence in autumn 2024 under the DCO, subject to consent and operation of the reinforcement would commence at the end of 2028.

4.4.15 The assessments presented in ES topic chapters 6 to 15 of the ES generally consider the alternative scenario as part of the sensitivity analysis in Section 11 of each chapter. This assesses the potential for any new or different effects that would result from the alternative scenario. The exception is ES Chapter 12: Traffic and Transport (**application document 6.2.12**), which assesses the alternative scenario as the basis of the impact assessment presented in Sections 6 to 10. This is because the alternative scenario is anticipated to have higher traffic and worker numbers due to overlapping construction activities and therefore represents a reasonable worst case in terms of traffic effects.

Construction Schedule Assumptions at Hintlesham Woods SSSI

4.4.16 The project requires a 'transposition' of the existing overhead line onto the new alignment (and new pylons) to the north and west of Hintlesham Woods SSSI (Ramsey Wood). The transposition would involve works to an existing transmission line and therefore would need to be completed within a pre-agreed programme of set electrical outage windows. These are set by the electricity network operator and typically occur over the summer when electricity demand is at its lowest.

4.4.17 Hintlesham Woods SSSI is designated for its breeding woodland bird assemblage. Therefore, National Grid has made a commitment to limit the works scheduled within bird breeding season to those that need to take place during a planned outage, which would apply to both the baseline construction schedule and the alternative scenario.

4.4.18 EM-AB09 in the REAC (**application document 7.5.2**) states that for the construction works in and around Hintlesham (between pylons 4YL011 and 4YL017A) these would be undertaken outside of bird breeding season except for the following activities which need to take place within agreed outages:

- Install conductors / transposition works;
- Construction of pylon 4YL12A and removal of the existing 4YL12; and
- Assembly and removal of temporary pylon RB12T.

Construction Working Hours

General

4.4.19 The ES assumes the following core working hours for construction that are set out within Requirement 7 of the draft DCO (**application document 3.1**):

- 07:00–19:00 Mondays to Fridays; and
- 08:00–17:00 on Saturdays, Sundays and Bank Holidays.

4.4.20 The following operations may take place outside of the core working hours:

- Trenchless crossing operations including beneath highways, railway lines, woodlands or watercourses;
- The installation and removal of conductors, pilot wires and associated protective netting across highways, railway lines or watercourses;
- The jointing of underground cables (save for the cutting of underground cables);
- The completion of operations commenced during the core working hours which cannot safely be stopped;
- Any highway works requested by the highway authority to be undertaken on a Saturday, Sunday or a Bank Holiday or outside the core working hours;
- 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;
- Activities necessary in the instance of an emergency where there is a risk to persons or property;
- Security monitoring; and
- Surveys.

4.4.21 The core working hours exclude start up and close down activities, which can take place up to one hour either side of the core working hours.

Night Working

4.4.22 There is no intention for night working on the project as standard. There may be occasions where night working is required, as set out in the operations that may take place outside of the core working hours above in paragraph 4.4.20. There is also the potential for the trenchless crossings to be undertaken at night, as once started operations cannot safely stop, as noted in the exceptions to the working hours above.

4.4.23 For the purposes of assessing a reasonable worst case in the ES, it is assumed that works at the trenchless crossings could be undertaken overnight. It is assumed that night working outside of the trenchless crossings would be exceptional and infrequent.

4.4.24 The DCO contains reference to a 12 hour construction day. In winter, this would include working after nightfall in the latter part of the working day. Experience from other construction projects indicates that working after dark under construction lighting is likely to be limited to contained sites, such as the construction compounds and specific sites along the route. This is because it is generally impractical to provide construction lighting along linear sections such as the overhead line and underground cable sections. Therefore, for the purposes of the ES, it is assumed that winter working requiring lighting may be required at contained sites, but not at other locations. There may be other locations where lighting is required for safety reasons e.g. at a specific access point, however these are considered to be exceptional and would be considered on a case by case basis and are therefore not assessed within the ES.

4.4.25 In all instances, construction lighting would be of the lowest luminosity necessary to safely perform each task. It would also be designed, positioned and directed to reduce the intrusion into adjacent properties, protected species and sensitive habitats as described in good practice measure GG20 in the CoCP (**application document 7.5.1**).

Construction Access, Public Rights of Way and Navigation

Abnormal Indivisible Loads

4.4.26 The project would require the use of abnormal indivisible loads (AIL) for delivery of the super grid transformers to the GSP substation (two deliveries), for the delivery of the cable drums (approximately 200 deliveries) and for the shunt reactors and works within Bramford Substation (approximately eight deliveries). The AIL would travel along routes approved by the relevant highway authorities and would also require a police escort while on the public highway.

4.4.27 It is assumed that the AIL deliveries would be made to the following access points to the site which are shown on ES Figure 4.1: The Project (**application document 6.4**):

- D-AP2 (Millwood Road): Serving Dedham Vale East CSE compound;
- F-AP5 (A134): Serving Dedham Vale West CSE compound;
- G-AP4 (B1508): Serving Stour Valley East CSE compound;
- H-AP20 (A131): Serving Stour Valley West CSE compound; and
- H-AP-1 (A131): Serving the GSP substation.

4.4.28 The project is also anticipated to use a 160 tonne and a 250 tonne crane for the installation and removal of the pylons. A piling rig is also anticipated to be used for construction of the foundations of the pylons, CSE compound, GSP substation and temporary bridges. It is assumed that the cranes and the piling rig would be delivered on a low-loader, which is anticipated to fall within the criteria of the Special Types General Orders regulations. These vehicles are not anticipated to require a police escort.

General Construction Traffic

4.4.29 The project would also require the use of HGV, for example for delivery of equipment and materials to site, for example the pylon parts, stone hardcore for the temporary access routes and compound areas, water, concrete and sheet piling. There would also be delivery of the site cabins to the main compound area and delivery of the machinery used to undertake the earthworks for the cable trenches and component foundations.

4.4.30 There would also be light goods vehicles (LGV) used for example to bringing workers to site (e.g. minibuses and welfare vehicles), for supplies of office materials to the main compound and also for undertaking planting as part of the landscape contract.

4.4.31 National Grid has estimated the number of construction vehicles that it anticipates during construction of the project. Under the alternative scenario, which represents a reasonable worst case for traffic and transport, a peak of 373 vehicles are anticipated in August 2025. This is split between 194 HGV and 179 LGV per day across the Order Limits. Further details on the vehicles numbers and the assumptions used to derive these can be found in the Transport Assessment (**application document 5.7**).

4.4.32 The proposed construction routes which would be used between the strategic road network (i.e. the A12, A120 or A14) and the construction access points are shown on ES Figure 12.1: Traffic and Transport Study Area (**application document 6.4**). A review has been undertaken of the construction routes to identify existing restrictions or limitations and to assess the suitability of the road network for accommodating construction vehicles. This has informed the final construction routing.

4.4.33 The temporary access route off the A131 may require modifications to the road to allow construction vehicles to safely turn in and out of the bellmouth. The project would also include the construction of temporary access points (see next sub-section) and potential repositioning of existing street furniture. Other than this, no other physical changes to the local road network have currently been identified. However, National Grid will continue to undertake discussions with the relevant highway authorities to confirm any works that may be required on the local road network.

4.4.34 Traffic management would be required on some roads during construction, for safety reasons, although access would be maintained for residents and essential users as described in good practice measure AS03 in the CoCP (**application document 7.5.1**). Locations where there may need to be traffic management measures (including temporary traffic lights) are shown on the Traffic Regulation Order Plans (**application document 2.6**). It is generally anticipated that any roads that are closed for longer than one day, would have a diversion route in place. The proposed diversion routes are shown on the Access, Rights of Way and Public Rights of Navigation Plans (**application document 2.7**).

Access Points and Temporary Access Routes

4.4.35 An access point is where the construction vehicles would leave the local road network and access the Order Limits. There are currently 126 temporary access points proposed across the Order Limits, which are split into four types:

- AP: an access point serving the main construction works, for example constructing the proposed 400kV overhead line or underground cable;
- DAP: an access point associated with the removal of the 132kV overhead line;
- EAP: an access point associated with environmental mitigation and enhancement areas; and
- YLAP: an access point associated with the minor modifications to, and realignment of sections of the existing 400kV overhead line in Section G and H.

4.4.36 Over half of the temporary access points, particularly the DAP and YLAP access points, make use of existing access points on the local road network. Some of these may need to be widened to create a bellmouth (a widened entrance with visibility splays) to safely accommodate construction vehicles. These works may include widening existing entrances to provide space for vehicle turning. Others involve creating new temporary entrances where a current access point does not exist. An example of what a proposed access point and bellmouth may look like can be found in Design and Layout Plans Temporary Bellmouth for Access (**application document 2.11.12**).

4.4.37 The bellmouths may also require suitable visibility splays which would be dependent on the road (for example speed limit and consideration of bends) and the types of vehicles using the access point. The vegetation within the sight lines would be coppiced or cut back and maintained while the access point is in use. The assumed location of vegetation affected by sight lines is shown on the Trees and Hedgerows to be Removed or Managed Plans (**application document 2.9**).

4.4.38 Lane closure and temporary traffic management may be required during the construction and removal of the access points and bellmouths on B Roads and above. Smaller roads may require full closure with diversion routes provided where practicable. In both cases, works are likely to take approximately two weeks during site set up, and a similar duration at the end to reinstate the bellmouth to the previous condition. Access would be maintained for residents and other essential users as described in good practice measure AS03 in the CoCP (**application document 7.5.1**). Proposed road closures and diversion routes are shown on the Access, Rights of Way and Public Rights of Navigation Plans (**application document 2.7**).

4.4.39 Temporary access routes are used by construction vehicles between the access point and a specific working area within the Order Limits. Temporary access routes may consist of existing access routes where suitable, use of temporary trackway matting to protect the soil or involve construction of a temporary access route made out of imported stone. Sections 4.5 to 4.8 set out the ES assumptions for each component of works. All temporary access routes and bellmouths would be removed at the end of construction and the land reinstated to its former condition.

Photograph 4.1a – Construction of a Bellmouth and 4.1b – Example of Temporary Access Route Made of Imported Stone

Watercourse Crossings

Bridge Crossings

4.4.40 National Grid has committed to using temporary clear span bridges to cross the Rivers Brett, Box and Stour (good practice measure W17 in the CoCP (**application document 7.5.1**)). The ground levels around the temporary bridges would be built up locally to the crossing point. This would likely involve topsoil being stripped and ground levels being built up with stone and compacted over a few days. The bridge foundations/abutments would be set back away from the river's edge to avoid the need to excavate the riverbank. The abutments may have standard concrete poured or piled foundations. It is assumed that a crane would be required to lift the bridge into place.

4.4.41 The temporary bridges would be designed specifically to take into account the span length and the weight and size of plant and equipment that would cross the bridge. For the purposes of assessment, the bridges are assumed to be in place for the duration of construction (assumed to be four years). The bridges would be removed at the end of construction and the bridge foundations removed to 1.5m depth, with the ground then reinstated. The proposed design and construction methodology for the bridges would be agreed with the Environment Agency as part of an application for the relevant Flood Risk Activity Permit. A typical design of a temporary bridge can be found in Design and Layout Plans Temporary Bridge for Access (**application document 2.11.13**).

Culvert Crossings

4.4.42 Other watercourses (and dry ditches) that need to be crossed by construction activities would be crossed using temporary box or circular culverts. A typical design of a culvert can be found in Design and Layout Plans Temporary Culvert for Access (**application document 2.11.14**). The culverts would be sized to reflect the channel width and the estimated flow characteristics of the watercourse under peak flow conditions as per good practice measure W04 in the CoCP (**application document 7.5.1**).

4.4.43 There are currently 20 minor watercourses and ditches that are anticipated to be crossed by the temporary access routes. It is assumed that up to 10m of channel banks at each watercourse could be affected during installation of the culverts and that the culverts could be in place for the majority of construction (assumed to be four years). The original bank profile and bed levels would be reinstated when the culvert is removed at the end of construction as described in the LEMP (**application document 7.8**).

4.4.44 If water is present within the ditches requiring a culvert, a suitable method for collecting sediment would be installed downstream of the work area, where required, to avoid siltation. For assessment purposes, it is assumed that the relevant watercourse section would be dammed using sandbags and water over pumped through a filter to the next section of watercourse downstream to enable a dry working area for culvert installation. It is assumed that this would be for a short duration, for example two weeks during the installation of the temporary crossing.

4.4.45 The culverts would be backfilled with clean stone or sandbags over the top of the box or pipe. A geotextile membrane would then be placed on the clean stone, and a layer of sub-base material placed and compacted on top of the geotextile. Barriers would be used on each side of the temporary access route crossing to prevent vehicles driving off the crossing point into the watercourse and to prevent debris such as mud from falling into the watercourse.

Public Rights of Way

4.4.46 No PRoW would be permanently stopped up or diverted on the project (i.e. required after construction is complete). National Grid has identified a number of PRoW that would be affected temporarily during construction. These are shown on the Access, Rights of Way and Public Rights of Navigation Plans (**application document 2.7**).

4.4.47 National Grid has identified the preferred method for managing, diverting or suspending the public right to use the respective PRoW (temporary closure), which typically comprise:

- Keep PRoW open and manage interface between PRoW users and construction activities (for example by a gated system) where safe and appropriate to do so;
- Temporarily close the PRoW through the construction area and divert users to a nearby alternative existing PRoW, where this is available;
- Where an alternative route onto a nearby PRoW is not available, create a permissive diversion within or adjacent to the working area to enable the section of PRoW which conflicts with the working area to be closed in line with the sequencing of the construction works. Due to the transient nature of construction activities on a linear project, it is possible that there may be multiple short-term closures depending on the works taking place in that specific location; and
- Where a long term closure or diversion is required, identification of specific solutions in consultation with PRoW officers at Essex and Suffolk County Councils.

4.4.48 Alternative (diversion) routes have been identified where practicable and these are shown on the Access, Rights of Way and Public Rights of Navigation Plans (**application document 2.7**). Where alternative routes are provided these would be signposted at strategic points on the PRoW network to allow users to follow the diversion and barriers would be erected to prevent continued use of the formal PRoW for the period of the works.

4.4.49 National Grid would endeavour to avoid or reduce impacts on PRoW including reducing the duration of any closure, as far as practicable. Typically, most closures and diversions are anticipated to be in place for up to four weeks in duration. Further details on assumptions regarding PRoW closures and diversions can be found in the Transport Assessment (**application document 5.7**).

4.4.50 Although not a designated PRoW, Hadleigh Railway Walk is well used by cyclists and pedestrians. National Grid has made a commitment to keep this route open to users by using scaffolding and netting to provide safety for users from overhead works (EM-C01).

Navigation

4.4.51 The only navigable water body within the Order Limits is the River Stour. It is proposed to install underground cables beneath the River Stour using a trenchless construction technique (EM-G04) and to use a clear span bridge for the temporary access route (good practice measure W17). These methods would allow the river to remain navigable during the majority of construction.

4.4.52 For safety reasons, it is anticipated that the River Stour may need to be stopped up (closed for navigation) during the installation and removal of the temporary bridge and during the lowering and removal of the existing 132kV overhead line for the length within the Order Limits. It is anticipated that each of these activities may require closure for up to one week for safety reasons. Notices would be placed up and downstream of the Order Limits at least four weeks in advance (or as otherwise agreed with the navigation authority) to notify river users of the works. During the conductor lowering and bridge works, it is anticipated that a boat would be moored in the river to prevent and warn users accessing the working area. This commitment is within the CTMP (**application document 7.6**), which is secured through Requirement 4 of the draft DCO (**application document 3.1**).

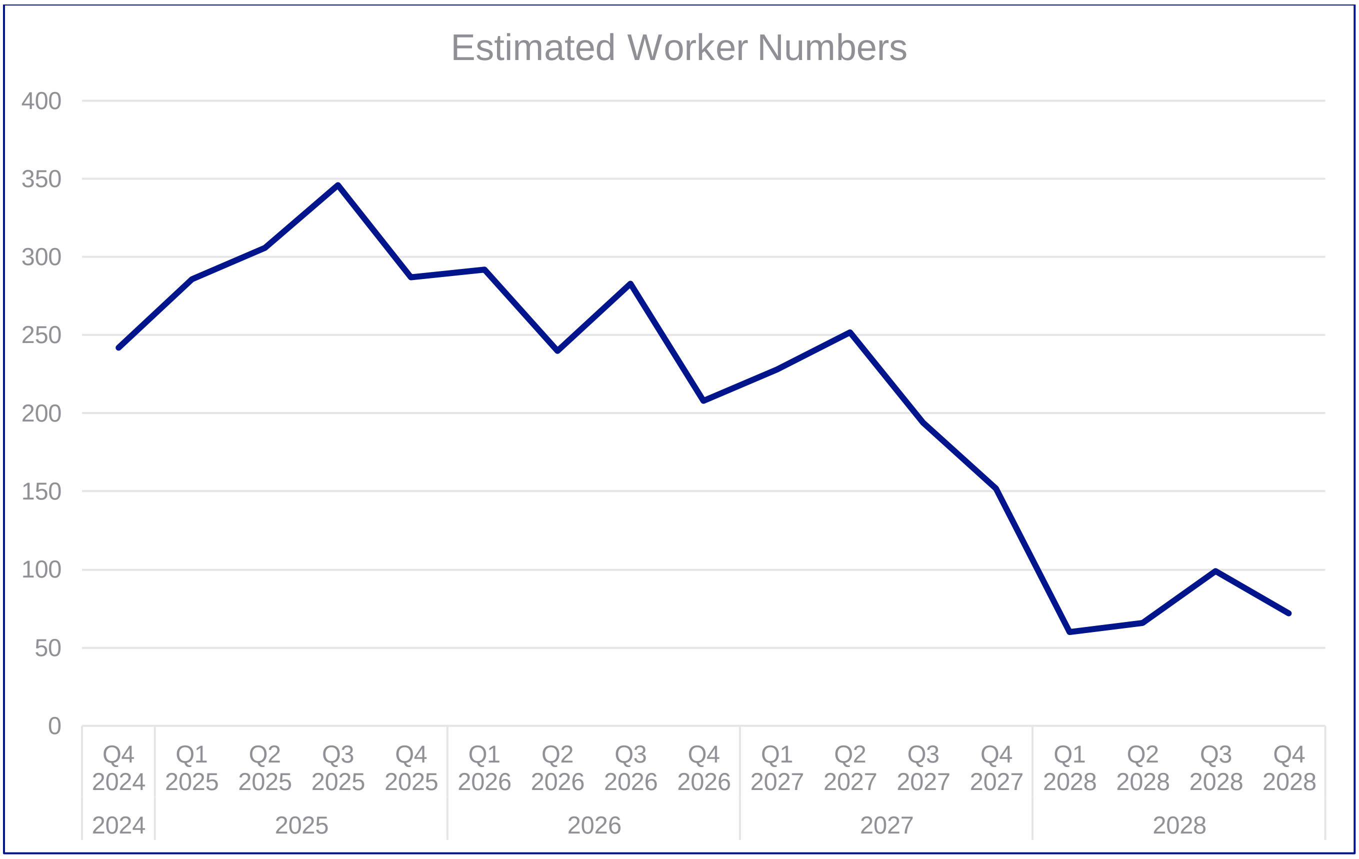
Sudbury Branch Railway Line

4.4.53 There is the potential that the Sudbury Branch Railway Line would need to be closed for up to one day for 132kV overhead line removal. Subject to discussions with National Rail, the closure would be carried out during an off-peak period, either over night or at a weekend to reduce impacts on passengers. National Grid would liaise with Network Rail to agree any additional measures that may be required as part of the works. Further details can be found in the CTMP (**application document 7.6**).

Construction Workforce Numbers

4.4.54 National Grid has estimated the number of construction workers that it would require to construct the project and how these are assumed to be spread across the construction schedule (Illustration 4.1). This is based on the alternative scenario presented in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**), which assumes a reasonable worst case, that the GSP substation is included as part of the DCO and that works would be undertaken in more than one section at the same time. This estimation indicates that there would be up to 350 workers per day at peak (Quarter 3, 2025) across the project and an average of around 180 workers on site across the whole of the construction schedule.

Illustration 4.1 – Estimated Construction Worker Numbers (Based on the Alternative Scenario)



4.4.55 The majority of employment activities would require trained specialists who are qualified to work on National Grid infrastructure, and it is assumed that these would be sourced from an existing pool of approved contractors. However, experience of other National Grid projects suggests that it is likely that a minimum of 10% of the workers would be sourced from the local labour market, including apprentices, security workers and delivery drivers.

4.4.56 Welfare facilities for construction workers would typically be provided in the form of a welfare van at the working areas. It is assumed that the welfare van would collect the workers from their accommodation each day and bring them to the specific work front e.g. a pylon base. The welfare van would be used to return workers back to their accommodation at the end of the day.

Construction Compounds

4.4.57 A main site compound is proposed off the A134 at Leavenheath, which would include the site offices, storage areas, parking (including electric vehicles charging points if appropriate) and welfare facilities. Smaller satellite compounds would be required at the locations listed in Table 4.3. These are anticipated to include storage for soil, machinery and other materials, parking, local welfare facilities and waste management facilities. The construction compounds are shown on ES Figure 4.1: The Project (**application document 6.4**).

4.4.58 It is anticipated that the main site compound off the A134 would have mains connections for electricity and potable water but that wastewater would be taken off site in tankers. It is assumed that the compounds located at the CSE compound locations (compound numbers 2, 4, 6 and 9 listed in Table 4.3) and the GSP substation (compound 10) would have mains power connections, as these sites would require mains connections during the operational phase. It is assumed that other compounds would use temporary generators as the power source.

4.4.59 With the exception of the main compound, it is anticipated that potable water for all compounds would be provided via the welfare vans and wastewater disposed of by tankers. Water required for the works, such as for damping down soil to reduce dust, would also be imported to site in tankers. If these assumptions were to change, any relevant consents would be obtained from the relevant undertaker. The tanker numbers are included in the vehicle number assumptions in the Transport Assessment (**application document 5.7**).

Table 4.3 – Temporary Construction Compounds

Ref	Location	Grid Reference	Approx. Area	Purpose
1	Adjacent to Bramford Substation	TM095457	0.5ha	Serving the construction of overhead line works around Bramford Substation.
2	Adjacent to Millwood Road	TM001396	0.4ha	Serving the construction of Dedham Vale East CSE compound. Assumed mains power connection as this is required for the operational phase of the project.
3	South-west of River Box	TL975382	0.4ha	Serving the construction of the River Box trenchless crossing. Containing equipment and laydown areas for trenchless crossing methods.

Ref	Location	Grid Reference	Approx. Area	Purpose
4	North-east of A134	TL956379	0.4ha	Serving the construction of Dedham Vale West CSE compound. Assumed mains power connection as this is required for the operational phase of the project.
5	Adjacent to the A134	TL948377	4.0ha	Main site compound serving the construction of the whole project. Assumed mains power and mains potable water.
6	Adjacent to the Stour Valley East CSE compound (to the south-east of Workhouse Green)	TL905367	0.4ha	Serving the construction of Stour Valley East CSE compound. Assumed mains power connection as this is required for the operational phase of the project.
7	Adjacent to B1508	TL898368	0.7ha	Serving the construction of the east side of the River Stour trenchless crossing. Containing equipment and laydown areas for trenchless crossing methods.
8	Adjacent to Henny Road	TL887363	0.6ha	Serving the construction of the west side of the Sudbury Branch Railway Line trenchless crossing. Containing equipment and laydown areas for trenchless crossing methods.
9	Adjacent to the Stour Valley West CSE compound (to the west of Alphamstone)	TL869351	0.4ha	Serving the construction of Stour Valley West CSE compound. Assumed mains power connection as this is required for the operational phase of the project.
10	GSP substation	TL844371	3.1ha	Serving the construction of the GSP substation work. Assumed mains power connection as this is required for the operational phase of the project.
11	West of A131	TL842365	0.1ha	Serving the construction of the new underground cable connection from the GSP substation into the 132kV line.
12	Off the temporary access route from the A131	TL862352	1.2ha	Serving the construction of Stour Valley West CSE compound and the temporary access route from the A131.

Third Party Services

4.4.60 New permanent mains electricity connections are proposed at the four CSE compounds and for the GSP substation. It is assumed that these connections would be provided by underground cables. The trenches would be opencut and would be approximately 2m wide. The proposed electricity connections are shown on ES Figure 4.1: The Project (**application document 6.4**) and are included within the Order Limits.

4.4.61 In addition to the new power connections, there would be a need to divert or modify existing third party services to allow safe construction and operation of the project. This may include undergrounding of low voltage power lines (on timber poles) and other local service crossings, such as existing cables in roads. These works may be undertaken by the relevant service provider as part of their permitted powers. These works would be limited in nature and are unlikely to result in any additional significant effects to those identified as part of the construction of the overhead lines and underground cables.

Abstractions and Dewatering

4.4.62 Where excavation of soil is required, for example at the base of the pylons and for the cable trenches, and where water is encountered in the excavation, it would be pumped out using an appropriate pump and a sump made in the subsoil using the excavator. The water would be pumped from the sump and allowed to filter through silt traps. The assessment presented within the ES assumes that there may be the need for temporary 'short-term dewatering', such as removal of rainwater or surface water when undertaking soil excavation. It is anticipated these would be local discharges to ground (after using settlement tanks) and not to watercourses. Removing rainwater from excavations does not require a permit.

4.4.63 Dewatering is assessed within the ES at locations where there is an intersection with the water table (and active lowering of the water table) for 100 days or more and therefore could require a permit. Permits relating to temporary dewatering (abstraction) may be required at the trenchless crossings at the River Stour and River Box. If the abstracted groundwater is discharged immediately to soakaway, the abstraction would be exempt from an abstraction license. If the water is not immediately discharged to a soakaway, it would be exempt when the abstraction is:

- Less than 100m^3 per day and located more than 500m from a designated site or 250m from a spring, well or borehole, or
- Less than 50m^3 per day and located less than 500m from a designated site or 250m from a spring, well or borehole.

4.4.64 In all other cases, a license would be required. Once the discharge duration, volume and water quality have been assessed, a decision would be made, in conjunction with the Environment Agency, as to whether an abstraction licence and / or discharge permit is required.

4.4.65 The discharge would be exempt from a discharge permit if it is a groundwater discharge where the water quality meets the Drinking Water Standards and is of less than 30 days duration (Environment Agency, 2021a). It would also be exempt if it is a surface water discharge of clean water, without suspended solids, and is for a duration of less than three months. At the present time, a permit is only anticipated for the temporary works associated with the River Stour and River Box crossing.

Vegetation Removal and Reinstatement

Vegetation Removal

4.4.66 Vegetation within the Order Limits would need to be removed where directly affected by construction activities or operation of the overhead line. The contractor would retain vegetation where practicable and vegetation with the potential to support breeding birds would not be removed during the breeding bird season or would be checked by an ecologist prior to removal taking place in accordance with good practice measures LV01 and B02 in the CoCP (**application document 7.5.1**).

4.4.67 Vegetation loss assumptions are shown on the Trees and Hedgerows to be Removed or Managed Plans (**application document 2.9**). Vegetation removal would be in accordance with the measures outlined within the LEMP (**application document 7.8**).

Vegetation Reinstatement

4.4.68 Vegetation removed temporarily for construction activities would be reinstated at the end of the construction phase in the first available planting season. Hedgerows and woodland areas that have been coppiced would be allowed to regrow. Hedgerow gaps created for construction of the temporary access route, underground cable lengths and other areas would be replanted along with reinforcement planting along the surrounding hedgerow where appropriate.

4.4.69 The underground cable swathe would be replanted with low rooting hedgerow species so that roots do not interfere with the operation of the cable system. If trees are lost from the hedgerow, these would be replaced as close to the original as practicable but not situated over the top of the cable swathe due to operational planting restrictions. Further details on vegetation reinstatement can be found in the LEMP (**application document 7.8**).

4.4.70 National Grid has included embedded planting around the CSE compounds and the GSP substation (EM-D01, EM-F01, EM-G03, EM-G06 and EM-H02 respectively). At these locations, National Grid would either own the land or have a long-term agreement to maintain the planting for the life of the asset. The embedded areas are shown on ES Figure 4.1: The Project (**application document 6.4**).

4.4.71 National Grid has also committed to undertaking a five-year landscape contract on hedgerows, trees and habitats that are reinstated as part of the project and also on areas where mitigation planting is proposed. The additional mitigation planting areas are shown on Figure 16.1: Embedded Measures and Mitigation Proposals (**application document 6.4**). Further details on the landscape contract and how this would be undertaken are set out within the LEMP (**application document 7.8**).

4.4.72 As noted in Section 4.2, National Grid has made a commitment to deliver net gain by at least 10% or greater in environmental value (including BNG) on this project. Further details can be found in the Environmental Gain Report (**application document 7.4**).

Assumptions on Materials and Waste

Materials During Construction

4.4.73 The project would require the use of new materials during construction. The main materials would include steel for the pylons, concrete for the foundations, insulator sets and aluminium conductors (wire), ducting and the underground cables. Table 4.4 outlines estimates of the main materials and quantities that are anticipated based on the Proposed Alignment and knowledge of similar projects.

4.4.74 Materials would also be required for temporary works during construction. These include hardcore aggregates for the temporary access routes, crane pads and site compounds, temporary fencing and temporary drainage. It is assumed that water required for construction activities is brought to site in tankers and this is assumed in the estimated vehicle numbers provided in the Transport Assessment (**application document 5.7**).

Table 4.4 – Key Materials Anticipated on the Project

Material	Estimated Quantity
Concrete for foundations of new pylons	600m^3
Cement bound sand (for underground cables)	7,000 m^3
Protective tiles	180,000
Steel pylons	Assume 50 no.
Overhead line conductors (aluminium)	20km
Underground cables (aluminium)	60km

4.4.75 The material sources are unlikely to be identified until the detailed design and procurement stage of the project, which would happen post-consent. The nature of the project means that it may be difficult to use secondary sources during construction, as this can affect the operation and the design life. 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. Further details on sustainable material management in relation to the project can be found in the MWMP (**application document 7.7**).

4.4.76 The ES assumes that construction materials are delivered to the site using HGV or other construction vehicles on the road network and this is assumed in the traffic numbers presented within the Transport Assessment (**application document 5.7**). Given the nature of the railway stations on the line, the distance from the specific working areas and the nature of the deliveries, rail transportation is not suitable for delivery of construction materials on the project.

Waste During Construction

4.4.77 Waste materials would be produced during construction. NPS EN-1 states that the waste hierarchy must be applied when managing waste and only disposing of waste where other waste management options are not available. Table 4.5 describes the main wastes anticipated on the project and that these are likely to be recycled based on experience of similar projects. The MWMP (**application document 7.7**) sets out the measures proposed to reduce the generation of waste by applying the waste hierarchy.

Table 4.5 – Key Waste Anticipated on the Project

Waste	Estimated Quantity	Proposed Hierarchy
132kV and 400kV steel pylons	450 tonnes	Assume recycled.
132kV and 400kV conductors	126,000m	Assume recycled.
Removed foundations of 132kV and 400kV pylons	940m^3	Assume recycled.
Low voltage wooden poles	13 tonnes	Assume recycled.
Excavated spoil from road crossings	1,500 tonnes	Assume recycled.
Displaced soil from pylon bases	6,720 tonnes	Assume reused on site where suitable.

4.4.78 It is assumed that soil excavated from the project (e.g. displaced from the cable ducts) would be reused on site where soil is suitable for reuse (for example, not contaminated and giving consideration to land holdings and applicable biosecurity measures). This could be through the backfilling of foundations removed from 400kV and 132kV overhead line removal, the cable trenches and for landscaping. It is assumed that all soil could be reused on site, however if it arises that excess spoil cannot be reused on site, this soil would be taken off site in accordance with measures outlined within the MWMP (**application document 7.7**) and good practice measure AS09 in the CoCP (**application document 7.5.1**).

Assumptions on Energy Consumption

4.4.79 During construction, the project would consume energy both in the form of power for plant and tools and fuel for construction vehicles. ES Appendix 4.3: Greenhouse Gas Assessment (**application document 6.3.4.3**) presents a summary of the estimated carbon that would be released during construction (either embodied within the materials or associated with construction vehicles and machinery). This sets a baseline estimate for the carbon likely to be generated by the project during construction and operation which future targets to reduce energy would be measured against.

4.4.80 National Grid and its contractors would also consider measures to reduce energy consumption during construction, through using energy efficient plant and tools and would also consider using electricity as a form of power, over diesel, where available and practicable. Further details, including targets for reducing energy consumption, can be found in the MWMP (**application document 7.7**).

Emissions and Residues

4.4.81 The Infrastructure Planning (EIA) Regulations 2017 require an ES to present the likely residues and emissions that are expected to be produced by a project during construction. Table 4.6 outlines the types of residues and emissions anticipated during construction, and outlines where these are assessed within the ES. In all cases, if the assumptions used within the ES were to change and a consent was deemed necessary, then the relevant consents would be sought from the discharging body as necessary. The equivalent table for operation can be found in Section 4.9.

Table 4.6 – Likely Residues and Emissions During Construction

Residue / Emission	ES Assumptions	ES Chapter Cross-Reference (If Applicable)
Emissions to water	The ES assumes that there are no discharges to watercourses proposed on the project. There may be a requirement to extract rainwater from excavations (dewatering) and managing run off during construction. It is assumed that this would be discharged to ground and would apply the good practice measures outlined within the CoCP (**application document 7.5.1**). The ES assumes that wastewater would be removed off site in tankers. The CEMP also include measures to	With the good practice measures outlined in the CEMP and the CoCP, there are no emissions to water anticipated that would generate significant effects. Further details can be found in ES Chapter 9: Water Environment (**application document 6.2.9**) and ES Chapter 10: Geology and Hydrogeology (**application document 6.2.10**).

Residue / Emission	ES Assumptions	ES Chapter Cross-Reference (If Applicable)
	reduce the risk of breakout during drilling and the use of bentonite or other agents proposed.	
Emission to air	The ES assumes that there could be construction emissions due to exhaust from construction vehicles, dust generated during earthworks and tracking.	With the good practice measures outlined in the CoCP, there are no emissions to air anticipated that would generate significant effects. Further details can be found in ES Chapter 13: Air Quality (**application document 6.2.13**).
Emissions to soil/subsoil	No emissions to soil/subsoil are anticipated other than the rainwater extracted (dewatering) during construction of excavations, which is described in emissions to water above.	The CEMP sets out good practice measures for reducing the risk of pollution. With these good practice measures in place there are unlikely to be significant effects on soil. Further details can be found in ES Chapter 11: Agriculture and Soils (**application document 6.2.11**).
Noise and vibration	The ES assumes that there could be noise and vibrations from machinery or vehicles using the road network during construction.	Noise and vibration are assessed within ES Chapter 14: Noise and Vibration (**application document 6.2.14**) along with the identification of additional mitigation measures.
Light	There may be a need for construction task lighting where works are required outside of daylight hours (see paragraphs 4.4.22 to 4.4.25).	The CEMP sets out good practice measures for reducing light emissions. With these good practice measures in place there are unlikely to be significant effects due to construction lighting. Further details can be found in ES Chapter 6: Landscape and Visual (**application document 6.2.6**).
Heat	No heat is anticipated to be generated on the project.	This is not assessed in the ES.
Radiation	Minimal radiation is anticipated to be generated on the project restricted to x-raying of welded joint.	This is not assessed in the ES.
Waste	The anticipated waste that would be generated on the project is outlined in Table 4.5. No significant effects are anticipated in relation to waste.	This is not assessed in the ES. National Grid has produced a MWMP (**application document 7.7**) detailing how it proposes to manage waste on the project.

4.5 Overhead Line Removal

Introduction

4.5.1 The existing 132kV overhead line would be removed between the tension (angle) pylon south-east of Burstall Bridge (approximately 2.5km south of Bramford Substation) and the diamond crossing (south of the existing 400kV overhead line near Twinstead), a distance of approximately 25km. The 132kV overhead line removal would take place after the GSP substation was operational.

4.5.2 In addition, five spans and five pylons of the existing 400kV overhead line would be removed between Twinstead Tee and the proposed CSE compound at Stour Valley West, a distance of approximately 2km. The latter is likely to be towards the end of the project after the Stour Valley West CSE compound has been constructed.

Enabling Works

4.5.3 Construction activities for the removal of the overhead lines would begin with the preparation and installation of temporary access routes to each existing pylon site. It is assumed that the 132kV removal can be undertaken using vehicles of a similar size to farm machinery and therefore for the purposes of the ES, it is assumed that the temporary access routes for the removal of the 132kV overhead line would either use existing tracks or use trackway matting (assumed to be 4m wide) to protect the soil and avoid the need for soil stripping.

4.5.4 Where the temporary access route would cross a hedgerow, it is assumed that a 5m gap would be coppiced to ground level (i.e. no excavation of the rootzone) to allow access across the hedgerow. Root protection (e.g. geotextile) matting would be used to protect the roots of hedgerows, although existing gaps would be used where available.

4.5.5 It is assumed that the temporary access routes for removal of the 400kV overhead line to the north of Stour Valley West CSE compound would require a stone access route due to the weight of the crane needed to dismantle the larger pylons. The stone access route itself would be 7m wide with 4m alongside for soil storage. The topsoil and relevant depth of subsoil would be stripped and stored separately in accordance with the good practice measures outlined within Chapter 11 of the CEMP (**application document 7.5**). It is assumed that where the temporary access route crosses a hedgerow, that an 8m gap would be required and the roots would need to be excavated, although existing gaps would be used where available.

Dismantling the Overhead Line

132kV Overhead Line Removal

4.5.6 The working area around each pylon to be removed would be cleared and, where appropriate, fenced to keep the public and any livestock away from the construction work. Fittings, such as dampers and spacers, would be removed from the pylons and lowered to the ground. The conductors would also be lowered to the ground and cut into small sections or wound onto cable drums and removed from site. Temporary back stays may need to be installed behind a couple of the pylons prior to commencement of the conductor removal works, this would be confirmed and detailed by the overhead line removal contractor.

4.5.7 Where space allows the legs of the pylons would be cut, and the pylon pulled to the ground using a tractor or similar sized vehicle. This method is used where there is sufficient room to pull the pylon over without damaging roads, utility services, and fixed boundary features such as hedges. Generally, foundations would be removed to approximately 1.5m below ground level, as has been undertaken on similar National Grid projects such as Richborough Connection, and subsoil and topsoil reinstated.

4.5.8 Scaffolding could be used at road crossings to avoid the need for road closures or traffic management during the overhead line removal. It is assumed that PRoW would generally remain open during the overhead line removal, other than when the conductors would be lowered to ground (assumed to be approximately two weeks).

4.5.9 The contractor would retain vegetation where practicable in accordance with LV01 and would follow the methodology set out in the LEMP (**application document 7.8**). It is assumed that there would be limited vegetation lost during the removal of the 132kV overhead line, as works would lie within the existing maintenance swathe. Where the 132kV overhead line is to be removed at Dollops Wood, a commitment (EM-E02) has been made to confine construction activities to the existing maintenance swathe and for the conductors to be lowered down and pulled out. Light vehicles would use existing tracks within the woodland.

4.5.10 The sections of the pylon would be cut/broken up as they are lowered to the ground using a steelwork breaker or mechanical shears fitted to an excavator. The cut sections of the pylon would be removed from site for reuse or recycling.

400kV Overhead Line Removal

4.5.11 The temporary works for the removal of the 400kV overhead line would be similar to the 132kV overhead line. There are a number of methods that can be used to remove the pylons depending on available space and surrounding features. A tractor or a large mobile hydraulic crane may be used to fell or dismantle the pylon either whole or in parts. Where a crane is used, a crane pad would be positioned at the pylon base. This would be sized according to crane size/site constraints and may be constructed on a temporary stoned area following topsoil removal. Topsoil would be stored for use during reinstatement.

4.5.12 Other methods include the use of a mobile winch and derrick which are typically used where there is limited space around the pylon and/or where the fell method is not possible due to safety or environmental constraints. Under this method the pylon would be dismantled in sections with parts individually lowered to the ground.

4.5.13 Under each method, the sections of the pylon would be cut and broken using a steelwork breaker or mechanical shears fitted to an excavator. The cut sections of the pylon would be placed into waste skips, which could be located within the crane pad or on temporary track way joining the crane platform where used. The cut sections would be removed from site for reuse or recycling.

4.5.14 For the removal of the 400kV overhead line (conductors) through the potential ancient woodland area near Ansell's Grove (PoAWS10) and to the north of Henny Back Road, an embedded measure has been made to limit the works to the existing maintained swathe within the woodland. There would be no temporary access route installed within the woodland and no vehicle access would be required within the woodland (EM-G11).

4.6 Proposed 400kV Overhead Line

Introduction

4.6.1 This section describes works required to construct 400kV overhead lines, which in general comprises new overhead line between Bramford to Twinstead. It also includes the realignment of the existing 400kV overhead line onto new pylons, for example near Bramford Substation and to the north and west of Hintlesham Woods SSSI.

4.6.2 The reinforcement would comprise of approximately 18km of overhead line, consisting of approximately 50 new steel-lattice pylons (typically 54m tall) and aluminium conductors.

It could take up to six months for the installation of pylons where there are no site constraints. There may be concurrent works in different locations and there may be periods of time between activities when no works take place. For example, there may be a gap between pylon construction and the conductor stringing, where the latter depends on a planned outage. It is assumed that PRoW affected would be reopened during any gaps in the works programme, subject to suitable safety measures being in place.

Enabling Works

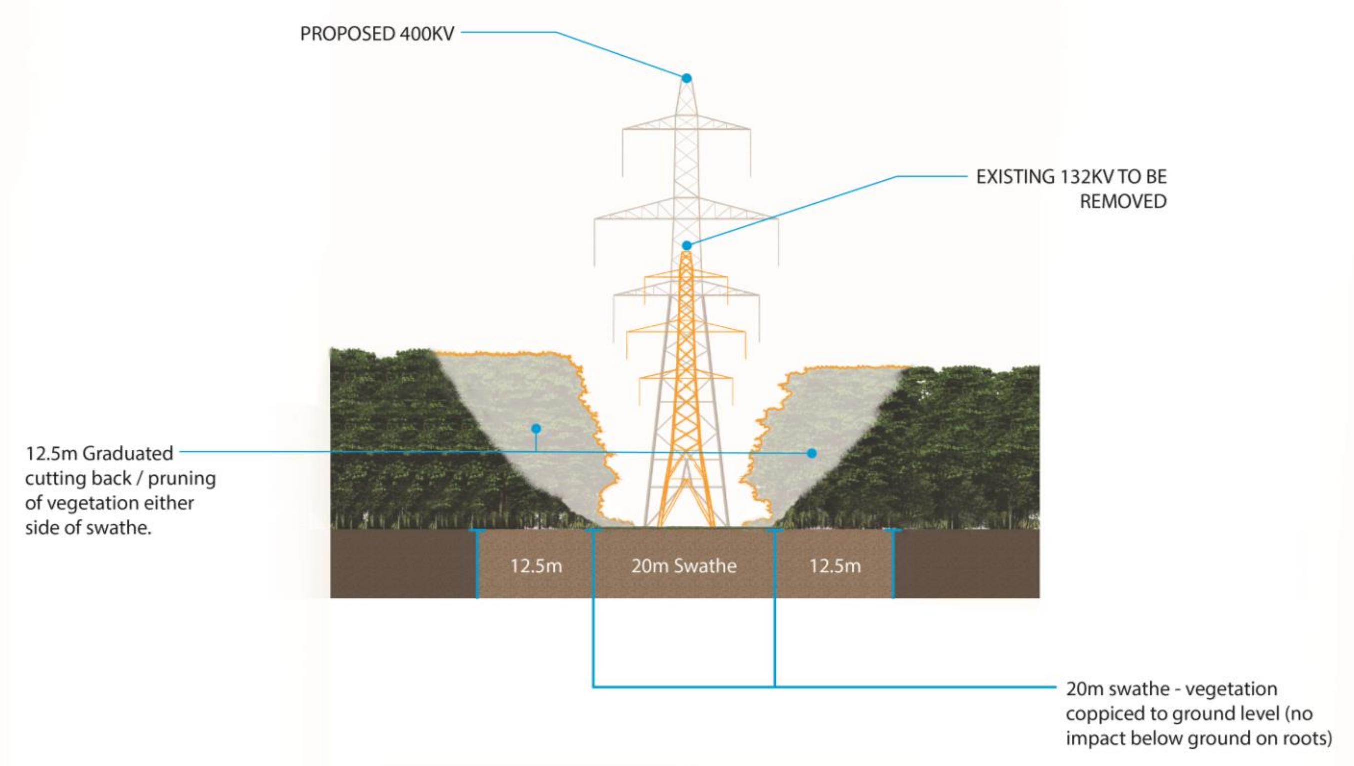
4.6.3 In general, the overhead line working areas would not be fenced and would be managed locally during construction to secure the area safely for both construction workers and members of the public. Appropriate fencing would be used where there was a specific need, for example to keep livestock out of the working area.

4.6.4 Temporary access routes would be installed to access each pylon location. As a crane would be required to install the pylons and piling may be used for the foundations, the ES assumes that the temporary access routes for proposed 400kV overhead line would be a stone access route. The stone access route itself would be 4m wide with a further 4m width alongside this for soil storage. The topsoil and relevant depth of subsoil would be stripped and stored separately in accordance with the good practice measures outlined within Chapter 11 of the CEMP (**application document 7.5**).

4.6.5 Where the temporary access route crosses perpendicular to a hedgerow, it is assumed that existing gaps would be used where available. Otherwise, a 5m gap (with roots removed) would be created in the hedgerow for the temporary access route i.e. gap on either side of the 4m temporary access route to avoid vehicular damage to the hedgerow.

4.6.6 Woodland areas crossed by the proposed 400kV overhead line conductors would have a 20m swathe coppiced to ground level (no removal of roots) to facilitate construction activities. The trees would be graduated cut for an additional 12.5m on either side of the 20m swathe to accommodate installing the conductors onto the arms of the pylons. This is shown in Illustration 4.2. Further details on vegetation removal can be found in the LEMP (**application document 7.8**).

Illustration 4.2 – Sketch of 400kV Overhead Line Construction Within Woodland



Pylon Construction

4.6.7 A working area would be set up around each pylon with vegetation removed (including tree roots) from this area. The working area is assumed to be 40x40m for each suspension (line) pylon and 80x80m for each tension (angle) pylon. For the purposes of the ES, a temporary stone pad is assumed to be required adjacent to each new pylon location on which to place plant such as cranes and piling rigs, as described in good practice measure GG23 in the CoCP (**application document 7.5.1**).

4.6.8 The base of the pylons and the crane pad would be stripped of the topsoil and subsoil using a suitably sized 360 excavator. This would include the separation of topsoil and subsoil to maintain soil quality during storage. The soil would be stored within a designated stockpile, as described in Chapter 11 of the CEMP (**application document 7.5**). It is anticipated that a geotextile membrane would be placed over the crane pad before placing the imported stone and capping which would raise the pad to the required working level.

4.6.9 The foundation design would depend on the ground conditions and could be:

- Standard foundations: These involve using an excavator to dig down to the required depth, typically 6m deep. Sheet piles would be pushed down to hold back the soil to allow the surrounding soil to be excavated. The bottom of each of the four legs would be encased in concrete and reinforcing bar; or
- Percussive piled foundations: This involves using a hammer or vibration method to push the piled foundations into the ground. The piles are covered in concrete cap. This is often noisy and create vibrations at nearby receptors.

4.6.10 The ES assumes that percussive piling would be required at all pylon locations as a reasonable worst case assumption in the noise and groundwater assessments.

4.6.11 Pre-mixed concrete would be delivered to site using HGV and would be poured into the foundation formwork. Once the concrete has cured, the timber struts and shuttering would be removed. The excavation is then backfilled with subsoil, and the sheet piles removed before replacing the topsoil.

Pylon Erection

4.6.12 The steelwork for the pylons would be delivered to site by HGV in numbered parts and the conductors would be wrapped around large drums. The steelwork would be bolted together on the ground (Photograph 4.2a) and each pylon would be assembled in sections beginning with each leg being fastened to the stubs. The pylon would be erected using a mobile crane to lift the assembled steelwork into position (Photograph 4.2b). Linesmen help guide the sections into place and bolt the pylon together.

Photograph 4.2a – Steelwork Preparation on the Ground; and 4.2b – Pylon Erection

Installation of the Conductors

Enabling Works

4.6.13 Scaffolding would be placed at crossings (e.g. roads and watercourses) along the alignment so that the conductors can be raised safely over these features. Each scaffold would be designed for the individual crossing that requires protection. It would be made from steel scaffolding, with a net made up of steel wire bonds that are anchored from scaffold to scaffold. Polypropylene netting is pulled across using karabiners to connect it to the steel wire bonds. The scaffold would be capable of withstanding a conductor being dropped on it in the unlikely event that this were to occur. Examples of scaffolding are shown in Photograph 4.3a and 4.3b.

4.6.14 Stop and go boards would typically be used to manage traffic under road crossings during scaffold set up while A-roads may require a police presence. The scaffolding installation is assumed to take approximately two weeks and is likely to be undertaken at the same time as the bellmouth construction, where these are at a similar location. For the purposes of the ES, it is assumed that all roads within the overhead line section would remain open during the construction other than during the installation/removal of bellmouths and scaffolds/netting

4.6.15

Photograph 4.3a – Scaffold Protecting a Road; and 4.3b – Protecting an 11kV Pole Line

Conductor Installation

4.6.16 Insulators would be fastened to the pylons in preparation for installing the aluminium conductors. These provide the necessary insulation between the conductors and the pylon supports.

4.6.17 A pulling site (to pull conductors from one pylon to the next) would be established at one end of the section with the conductors running out from a tensioning site at the other end of the section to keep the wires off the ground. The conductors are usually installed in sections for example between tension (angle) pylons and stringing typically takes two weeks per section. The pulling of conductors would be undertaken using a winch/tensioner machine. Photograph 4.4a and b show examples of conductor pulling machinery. As noted in paragraph 4.6.2, there may be a period of time between pylon construction and conductor stringing while waiting for an agreed outage.

Photograph 4.4a and 4.4b – Machinery Associated with Conductor Pulling on Trackway

4.6.18 Pilot wires would be used to pull conductors between pylons. These are usually installed using a tractor winch and spreader bar, which pulls each bond out in turn. When the conductor is fully 'run out', it would be fastened at its finished tension and height above ground by linesmen working from platforms on the pylons and suspended from the conductors. Additional fittings, such as spacers (to prevent the conductors from touching each other) and dampers (to prevent oscillations in the overhead line), would be fitted to the conductors. An earth wire runs along the top of the pylons and contains optical fibres to allow transmission of data around the system. Once the overhead line is constructed, the temporary access routes and working areas at the pylon sites would be removed and the ground reinstated to its former condition.

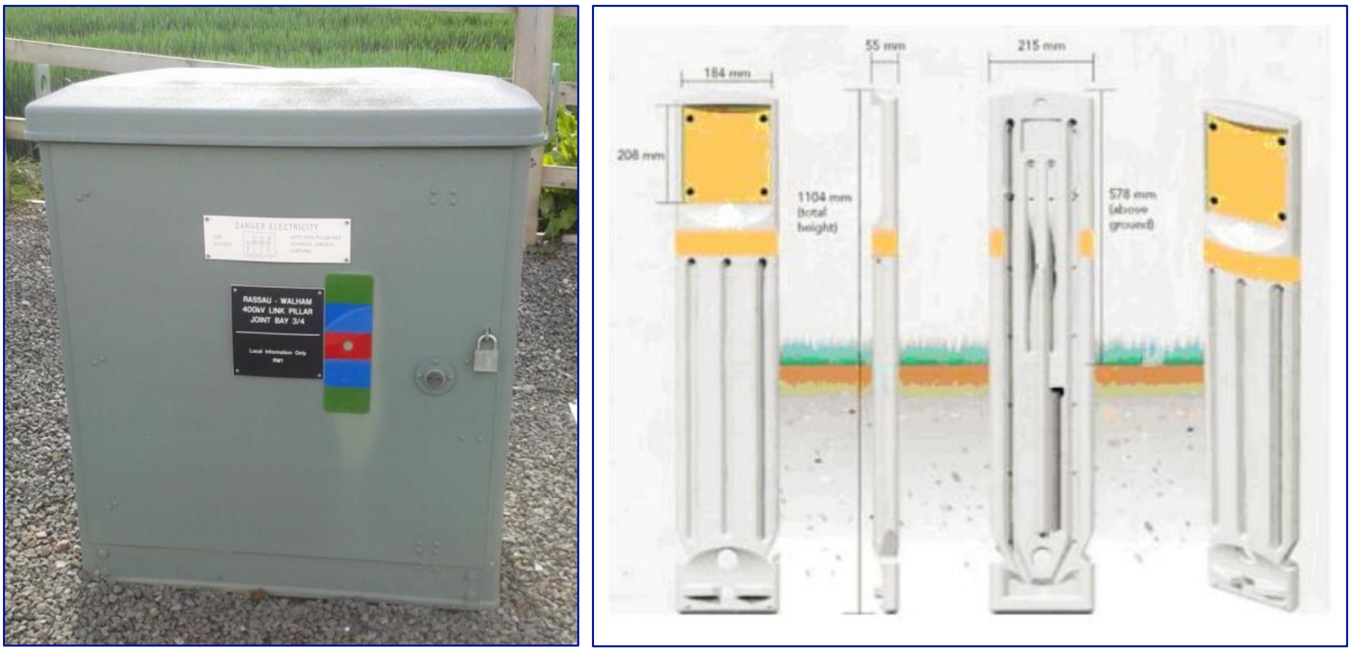
4.7 Underground Cable (Including CSE Compounds)

Introduction

4.7.1 There would be approximately 11km of underground cable system, predominantly within Section E: Dedham Vale AONB and parts of Section G: Stour Valley. Four CSE compounds would be required to facilitate the transition between the overhead and underground cable technology, one at the end of each underground cable section. Each CSE would be within a fenced compound, and contain electrical equipment, support structures, a small control building and a permanent access route.

4.7.2 Cable lengths would need to be jointed together at joint bays along the cable alignment (nominally every 500m – 1km). Link pillars would be required above ground at each joint bay; these above ground structures measure approximately 1m by 0.4m and are approximately 1m in height (Photograph 4.5a). These would be located at or near to field boundaries where practicable. In addition, marker posts (Photograph 4.5b) would be required for example where cables run across or along the railway, across agricultural land, change direction and at joint positions.

Photograph 4.5a – A Typical Link Pillar; and 4.5b – Example of a Marker Post



4.7.3 The Order Limits are generally 100m wide where opencut ducting methods are proposed and there are limited site constraints. Within this, the working area would be approximately 80m wide with 20m to provide flexibility (LoD) for site constraints during detailed design and construction.

4.7.4 The working area (and therefore the Order Limits) need to be wider in some areas to accommodate features such as road, rail and watercourse crossings and for additional storage where the Order Limits are narrowed due to a site constraint. For example, the Order Limits are wider near the River Stour trenchless crossing to allow soil to be stored outside of the floodplain where practicable (EM-G05). The Order Limits are also wider at trenchless crossings to accommodate both the additional working areas and as the cables need to be spaced further apart due to the added depth to dissipate heat.

Enabling Works

4.7.5 A temporary 7m wide stone access route would be constructed along the working area to provide access for construction vehicles, including cable drum deliveries. This would limit construction vehicles using the local road network. It is assumed that the temporary access route would generally lie within the middle of the cable swathe to provide access to both sides of the working area, as shown on Design and Layout Plans Cable Working Cross Section (**application document 2.11.9**).

4.7.6 The temporary access route would require crossing points on the local road network. It is assumed that local roads would remain open but with traffic control measures in place, for example stop go boards, for the duration of the underground cable installation. It is assumed that the temporary access routes would be constructed ahead of the planned duct excavation works and that it would be in place for the duration of construction.

4.7.7 The local road network within Section G: Stour Valley comprises many narrow lanes and is unsuitable for HGV in many locations. Therefore, a 7m wide temporary access route (with 4m wide soil storage to the side and passing places) is proposed off the A131 to the north of Collins Road near Little Maplestead. The temporary access route would be used for the HGV access and the cable drum deliveries to the underground cable section to the west of the Ansell's Grove trenchless crossing. This would avoid the need for works to the local road network to widen and straighten corners, such as at Cripple Corner.

4.7.8 The cable working area would be demarcated and secured by temporary fencing appropriate to the location, for example, provision of stockproof fencing in grazing areas. Gated entrances would be installed at the entrance to the working area, to secure the site. Where appropriate, and in accordance with good practice measure W16 in the CoCP (**application document 7.5.1**), pre-construction field drainage would be installed within the working area to help reduce the risk of water-logging. The proposed cable trenches would be marked on the ground using GPS.

Standard Installation

4.7.9 It is assumed that the underground cables would be constructed to create two circuits. Each circuit would be made up of three electrical phases. Three individual cables are assumed for each phase. This would total 18 high voltage underground transmission cables. It is assumed that each cable would be within a separate containment (duct) see the Design and Layout Plans Cable Working Cross Section (**application document 2.11.9**). The sequence to create each duct is anticipated to consist of three site teams working in sequence; an excavation team working ahead of a duct; a team to install the ducts; and a backfill team.

4.7.10 Once the site is secured, the working areas would be stripped of the upper layers of soil, including separation of topsoil and subsoil to maintain soil quality during storage. It is assumed that soil would be stripped from the full width of the cable section and stored for reuse after installation. The underground cable trenches would be installed by using an opencut method to construct the trench using a 360° excavator. Any excavated soils would be placed or stockpiled at a minimum distance of 1.5m from edge of excavation.

4.7.11 Temporary dewatering may be required relating to extracting rainwater or localised surface water from excavations during construction, as described in Section 4.4. It is anticipated these would be local discharges to ground (using settlement tanks or other appropriate filtration) and not to watercourses.

4.7.12 The ducts would be lifted into the trenches using an excavator. The trench surrounding the ducts would be filled with cement-based sand and a polymeric cable protection would cover the width of the trench. The cables would generally be buried at a depth of approximately 0.9m from finished ground level to the top of the protective slab. Topsoil and subsoil would be replaced over the top of the polymeric cable protection.

4.7.13 The assumption is that between them, the teams can excavate, install the ducts and backfill approximately 60m per day for a typical opencut section where there are no constraints. The cables would potentially be pulled through the ducting at a much later date, rather than straight away after the ducts are installed.

4.7.14 The underground cables would be delivered to the working area using specialist low loading articulated lorries to the access point at either end of the underground cable sections (see paragraph 4.4.27 for details). The cable would be wrapped around cable drums and a crane may be used to offload these from the construction vehicles. The underground cables would be pulled off the drums onto rollers in the trenches using winches. The cables would then be pulled through the ducts and would need to be jointed together at joint bays. The finished joints would be protected by a glass fibre box filled with resin or bitumen.

Assumptions of Cable Crossings

Hedgerows and Tree Belts

4.7.15 There is only one woodland area crossed by the underground cables using standard installation methods, as others have been avoided through the options appraisal process (see ES Chapter 3: Alternatives Considered (**application document 6.2.3**)). The woodland area that is crossed by the underground cable (Habitat ID H_A_1029) in Section G: Stour Valley. Embedded measure EM-G09 in the REAC (**application document 7.5.2**) commits to limiting the underground cable working width to 60m at this location.

4.7.16 Where the underground cables need to cross hedgerows or tree belts perpendicular to the alignment it is assumed that a 60m gap (including excavation of roots) would be required i.e. excluding soil storage areas from the working width. This may require an increase in the next working area to allow additional soil storage. The vegetation loss assumptions are shown on the Trees and Hedgerows to be Removed or Managed Plans (**application document 2.9**).

Watercourses

4.7.17 Where the underground cables cross watercourses (except the River Stour and Box which are to be crossed using a trenchless method, see Table 4.7), these would be dammed using sandbags and over-pumped to create a dry working area during installation of the ducts. Water in the dammed section would be pumped into the undammed section of the watercourse to create a dry working area using a silt sock (emptied as necessary) to prevent sedimentation.

4.7.18 A trench would be cut into the dry channel using a 360° excavator and the cables would be installed to be at least 1m below bed level. The ducts would be laid in each trench and then concrete would be placed to surround and cover the ducts and the protection cover laid over the top of the duct.

4.7.19 There are a number of minor watercourses that would need to be crossed by the underground cables using an opencut method, as shown on ES Figure 4.1: The Project (**application document 6.4**). It is assumed that up to 80m of the channel would be opencut to allow installation of the cables but that over-pumping would occur over a 100m section. The works would be timed to avoid periods of high-water flow, where practicable and would take up to eight weeks for the majority of minor watercourses on the project. Once installation is complete, the banks would be reinstated and the temporary dam removed.

Roads

4.7.20 Where the underground cables cross a B-road and they are not considered to be too narrow, it is expected that they would be installed by excavating a trench in one lane, while the other lane remains open using traffic management, such as a temporary traffic light system. The ducts would be installed in the trench within the closed half of the road. The trench would then be backfilled and the lane would be reopened to traffic. The work would then be repeated on the other side of the road. The cables would be pulled through the ducts when both halves are complete.

4.7.21 Given their narrow width in many locations, smaller roads are likely to require full road closures with diversion routes, although access would be maintained for residents and landowners (good practice measure AS03 in the CoCP (**application document 7.5.1**)). The proposed diversion routes are shown on the Access, Rights of Way and Public Rights of Navigation Plans (**application document 2.7**). Installation of the cables at each road crossing (B-roads and smaller roads) is anticipated to last for approximately two weeks.

Trenchless Methods

4.7.22 Four trenchless crossings are proposed on the project, where the underground cable would be installed using a drilling or boring method to avoid sensitive surface features. There are different methods that could be used to construct the trenchless crossings. Each method would have a different construction footprint and potentially different environmental effects. For the purposes of the assessment, particularly the geology and noise chapters, it is assumed that a HDD would be used.

4.7.23 HDD is a technique whereby a hole is drilled along a prescribed alignment. The excavated path is supported and carefully enlarged to a diameter sufficiently sized to then allow a permanent casing to be pulled from one side of the crossing to the other side in one continuous process. Drilling fluids and muds are required to provide sufficient lubrication when pulling the permanent casing into the excavated hole.

4.7.24 The trenchless crossing involves a launch pit or drive site, where the drill starts, and a receiving pit at the end where the drill resurfaces. Illustrative designs are presented in Design and Layout Plans Horizontal Directional Drill (**application document 2.11.15**) and have been used as the assumptions assessed within the ES.

4.7.25 A drill pit would be required for each drill (assumed to be 19 drills at each crossing) and would be approximately 2m x 2m in size and approximately 1.2m deep. Table 4.7 outlines the assumed length, depth and drill direction assessed within the ES topic chapters (Chapters 6-14). The alternative drill direction has also been considered in the sensitivity analysis in Section 11 of each ES topic chapter (Chapters 6-14).

Table 4.7 – Assumptions Used for the Assessment of the HDD

Location	Assumed Length	Assumed Depth	Assumed Drill Direction
River Box	100m	6m	East to west
River Stour	525m	6m	West to east
Sudbury Branch Railway Line	415m	6m	East to west
Ansell's Grove	602m	6m	East to west

4.7.26 Before the HDD can commence, a working area would be established at either end of the drill section. This would involve removing and stockpiling the topsoil and where necessary the subsoil. This would create a level site for operation of vehicles and machinery, for the storage of materials and would be similar to other site compound areas. Controls would be put in place to prevent drilling muds and fluids escaping through site run off.

4.7.27 The HDD equipment would arrive by HGV low-loader and anchors would be used to hold the drilling rigs stable. These usually take the form of concrete blocks with steel beams cast inside to hold the front of the drilling rigs in position. Drilling fluids would be used to remove spoil and to support and lubricate the drill path. The drilling fluid is returned to the launch pit through the mud return line. All wet arisings from the operation would be removed and disposed of during the drilling operation or recycled for re-use on site.

4.7.28 Upon completion of the first drill, work would commence to install the other drills using the same approach. Once the drill is enlarged to the required size, the product pipe would then be connected to the reamer via a swivel for installation. The drill operator would pull the rods and reamer back towards the launch pit and the pipe installation process would begin. The drill may need to undertake a number of passes to make the hole wide enough to allow the ducts to be pulled through. The cables would be pulled through the ducts using a cable pulling rig. The subsoil and topsoil would be reinstated in the pits once the installation is complete.

Cable Sealing End Compounds

4.7.29 Four CSE compounds are proposed on the project, one at each interface between the new overhead line and the new underground cable (see Photograph 4.6). It is assumed in the ES, that construction would begin with the preparation and installation of the permanent access road to the CSE compound and any other temporary access routes required for construction. Following this, the working area would be stripped of soil and a stone pad would be installed for the mobile crane.

4.7.30 Full line tension gantries are proposed at each CSE compound. A typical design is provided in the Design and Layout Plans Pylon Designs (**application document 2.11.10**). These would be constructed in a similar way to the overhead line pylon construction noted in Section 4.6, with either a piled or concrete foundation and the gantry being lifted into position by a crane. The cable troughs would also be excavated and the underground cables and/or ducts would be channelled through the troughs onto the CSE structures.

Photograph 4.6 – Typical Cable Sealing End Compound

4.7.31 The CSE require a clean and controlled environment whilst being installed. Therefore, it is assumed that a weatherproof covered scaffold structure would be erected over the CSE during installation. Once constructed, the cables would be tested using a high voltage cable testing lorry from the CSE compound.

4.7.32 Percussive piling may be required at the CSE compounds. This would be confirmed through a programme of ground investigations which would in turn inform the foundation designs. For the purposes of assessment, piling is assumed at all CSE compounds.

4.8 GSP Substation

Introduction

4.8.1 The GSP substation would include two super grid transformers to convert the voltage from 400kV to 132kV, for onward transmission and distribution to the local distribution network. The GSP substation would include associated works, including replacement pylons and underground cables to tie the substation into the existing 400kV and 132kV networks. This would be the first component of the project to be constructed, as it is required to be operational prior to the removal of the 132kV overhead line.

4.8.2 A single circuit sealing end compound would be required to the west of Waldegrave Wood. This would be approximately 30m by 30m in size and would house a small number of high voltage plant equipment items in addition to a steel gantry to receive downleads from the replacement 400kV pylon. The GSP substation also requires works to the existing overhead lines to tie the GSP substation back into the 400kV and 132kV lines.

Enabling Works

4.8.3 Vegetation would need to be removed during construction to facilitate the works. The contractor would retain vegetation where practicable in accordance with LV01. No tree removal is proposed in either Butler's or Waldegrave Woods and a ditch around each woodland effectively restricts the roots extending into the Order Limits. There may be some trimming of the upper branches to maintain safety clearances and allow for operational conductor swing. In addition, short sections of hedgerow would need to be removed along the A131 and Old Road to provide access for the bellmouths. The vegetation loss assumptions are shown on the Trees and Hedgerows to be Removed or Managed Plans (**application document 2.9**).

4.8.4 Construction activity would begin with site preparation including setting up the temporary accommodation, parking and laydown area and fencing to secure the site. The permanent access route would be installed to connect the proposed GSP substation to the A131 and would be designed to relevant highways standards. It is assumed that this would generally be made of concrete and would include a gated entrance to secure the site during construction. It would require a permanent culvert crossing of the minor watercourse to the west of the GSP substation site, which would be installed in a similar manner to the temporary access route crossings described in Section 4.4.

4.8.5 Where appropriate, and in accordance with good practice measure W16 in the CoCP (**application document 7.5.1**), pre-construction field drainage would be installed within the working area to help prevent possible waterlogging of the working area. This may require the need for short term extraction of rainwater or localised surface water during construction to enable the landowner's current drainage system to continue working throughout the period of construction.

4.8.6 A new permanent low voltage electrical connection would need to be provided to the GSP substation to provide power for the GSP substation security lighting and the electric fence. This would involve the installation of a new underground cable from Gentry Farm Road across the field to the east of the A131. This would either be constructed within the road or along the eastern side of the A131 to avoid impacting tree roots in Butler's Wood.

GSP Substation Construction

4.8.7 The initial preparatory works are anticipated to comprise the removal of the top layer of ground and laying a temporary stone capping layer to provide a clean and stable working platform. Typically, the topsoil and a layer of subsoil would be excavated within the footprint and this would be replaced with clean imported granular fill to form the surface of the compound. It is anticipated that excavated material would be reused on site for example, in the low mounds proposed to help screen the site (EM-H04). A series of copper earth tapes would be installed below the ground to create an earth mat to distribute any electrical charge transferred to the ground by earthed equipment and infrastructure in the proposed GSP substation.

4.8.8 The permanent foul, oily water, including below ground oil separator, and surface water drainage systems would be installed once the preparatory works are complete. In addition, concrete pad foundations and steel supports would be installed for the electrical equipment if required due to ground conditions. The majority of electrical equipment would be mounted on steel posts fixed to concrete foundations.

4.8.9 Reinforced concrete bunds would be installed for each super grid transformer and would comprise a perimeter concrete wall, a base slab continuous with the wall and a central plinth for supporting the super grid transformers. The bunds act as a secondary oil containment measure. Concrete for the foundations and bunds would be ready-mixed, brought to site in lorries and placed using small plant such as cranes and excavators.

4.8.10 The single circuit sealing end compound would be constructed in a similar way to the proposed GSP substation but is much smaller and only houses a small number of high voltage plant equipment items in addition to a steel gantry to receive downleads from the replacement 400kV pylon. The single circuit sealing end compound does not include any buildings or oil containing equipment and no drainage systems require to be installed. Access to the single circuit sealing end compound would be via a proposed permanent access road onto the A131.

4.8.11 A number of associated works would be required to facilitate operation of the proposed GSP substation. The construction of these works would involve the following:

- An existing 400kV pylon to the south-west of the proposed GSP substation is to be removed and replaced by a new 400kV pylon to the west of the existing pylon. Downleads would be installed on the replacement pylon to connect it to the proposed 400kV single circuit sealing end compound. Replacing the pylon would require a temporary overhead line diversion to be installed on the 400kV overhead line during construction, requiring the building of temporary foundations and pylons to the north of the existing overhead line. A crane would be used to build the new pylon, which would be built in sections, on new foundations;
- A proposed 400kV underground cable would be installed connecting the overhead line works to the 400kV single circuit sealing end compound;
- An existing 132kV pylon needs to be replaced with a CSE platform pylon in the same location, which would be bulkier and larger and would include downleads. This would be constructed similar to the 400kV pylon above, with a temporary overhead line diversion in place during the works. Replacing the pylon would require a temporary overhead line diversion to be installed on the 132kV overhead line during construction, requiring the building of temporary foundations and pylons next to the existing overhead line;
- Two new 132kV underground cables are required to connect the proposed GSP substation with the existing 132kV overhead line to the south. It is assumed that the cables would be laid in trenches, approximately 1.5m deep and 0.55m wide and would be a minimum of 4m apart and may potentially be in a single excavation; and
- The fibre optic wire carried by the pylons requires a temporary diversion during the works. For the purposes of the ES, it is assumed that this would be placed alongside the existing overhead line and then put back on the overhead line when completed.

4.8.12 Once construction is completed, the temporary works, including the temporary pylons, would be removed and the working area reinstated. Once all of the equipment is installed, commissioning tests would be undertaken to check that the individual items of plant and the system as a whole works as required. Following successful testing, the substation would be connected to the electricity transmission system ready for operation.

4.8.13 In addition to the works noted above, there would be minor works to the replace the arcing horns on existing pylons on the existing 400kV overhead line. These are on pylons within both Section G: Stour Valley and Section H: GSP Substation for approximately 2km east and west of the proposed GSP substation. The arcing horns are on the pylons and are used to help protect the line from lightning or electrical faults. The replacement of the arcing horns would be undertaken using ropes, with new arcing horns winched up and fixed into place by the rope access team and using light vehicles for access;

4.9 Operation and Maintenance

Introduction

4.9.1 This section describes the permanent features that would remain during operation. It also describes the activities that are anticipated during the operational stage including site inspections and routine maintenance.

General Operation

Materials and Waste During Operation

4.9.2 The project would require limited materials and generate limited waste during operation, other than at the end of the design life of project components, when these would be replaced. At the end of life of project components, the materials consumed and wastes produced would be similar to those identified during construction. Existing National Grid processes and systems encourage the application of the waste hierarchy on maintenance projects.

Assumptions on Energy Consumption

4.9.3 During operation, energy consumption would be limited to the energy required to operate the line, the CSE compounds and the GSP substation. The components are designed to meet energy efficiency standards and National Grid has existing policies to identify measures to reduce its operational energy consumption through efficient design. 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.

4.9.4 Sulphur hexafluoride (SF_6), a particularly potent greenhouse gas, would be required in the circuit breakers at the GSP substation and at Bramford Substation, as is commonly used at many substations across the country. National Grid is undertaking research and development to find a suitable alternative to SF_6, however, there is no suitable alternative at the present time for use at the GSP substation or within the circuit breakers at Bramford Substation. SF_6 is considered within ES Appendix 4.3: Greenhouse Gas Assessment (**application document 6.3.4.3**) and is also discussed further in ES Appendix 4.1: Good Design (**application document 6.3.4.1**).

Emissions and Residues

4.9.5 The Infrastructure Planning (EIA) Regulations 2017 require an ES to present the likely residues and emissions that are expected to be produced by a project during construction and operation. Table 4.8 outlines the types of residues and emissions anticipated during operation, and outlines where these are assessed within the ES. In all cases, if the assumptions used within the EIA were to change and a consent was deemed necessary, then the relevant consents would be sought from the discharging body as necessary.

Table 4.8 – Likely Residues and Emissions During Operation

Residue / Emission	ES Assumptions	ES Chapter Cross-Reference (If Applicable)
Emissions to water	The GSP substation would include permanent surface and foul drainage systems. It is anticipated that hard standing areas would be drained to the surface water drainage system. This would typically use French drains, which are small ditches filled with granular material to allow rainwater to flow away from a site. The drainage system would be protected from accidental oil discharges from the site by interceptor units. All remaining areas are likely to contain porous surfacing to allow surface water to naturally infiltrate without the need for formal drainage.	The permanent drainage design would be in accordance with the requirements of the Essex County Council Sustainable Drainage System Design Guide (2020) and would include allowances for climate change in accordance with current Environment Agency requirements (W12 in the CoCP). With this measure in place, no emissions are anticipated that would generate significant effects to water. Further details can be found in ES Chapter 9: Water Environment (**application document 6.2.9**).
Emission to air	Operation and maintenance are anticipated to require a very small number vehicles therefore there are unlikely to be significant emissions to air. The GSP substation and the circuit breakers at Bramford Substation could require the use of SF_6.	Emissions to air during operation are not assessed in the ES. SF_6 is considered in ES Appendix 4.1: Good Design (**application document 6.3.4.1**) and also in ES Appendix 4.3: Greenhouse Gas Assessment (**application document 6.3.4.3**).
Emissions to soil/subsoil	No emissions to soil/subsoil are anticipated during operation.	This is not assessed in the ES.
Noise and vibration	Operational noise was scoped out in the Scoping Report (**application document 6.5.1**).	This is not assessed in the ES, but further evidence is provided within ES Appendix 14.3: Overhead Line Noise Assessment (**application document 6.3.14.3**) and ES Appendix 14.4: GSP Substation Noise Assessment (**application document 6.3.14.4**).
Light	Operational lighting would be limited to security lighting at the GSP substation, which would be motion-sensor activated and only triggered in exceptional circumstances (see Section 4.4). Therefore, operational lighting was scoped out at the Scoping Stage.	This is not assessed in the ES.
Heat	No heat is anticipated to be generated on the project during operation.	This is not assessed in the ES.
Radiation	No radiation is anticipated to be generated on the project during operation.	This is not assessed in the ES.
Waste	No significant quantities of waste are anticipated on the project during operation.	This is not assessed in the ES.

Proposed 400kV Overhead Line

Operation

4.9.6 The project would involve approximately 18km of overhead line comprising approximately 50 steel pylons (similar to the design of pylons used on the existing 400kV overhead line) and triple Araucaria conductors or alternative technology that performs to the same or better standard in relation to noise on standard lattice pylons (EM-P03). The design of the proposed 400kV overhead line has been developed to parallel the existing 400kV overhead line where practicable.

4.9.7 The proposed pylons are typically lattice pylons, with three arms on either side of a central pylon body, the longest arm being the middle of the three as shown on the Design and Layout Plans Pylon Designs (**application document 2.11.10**). Suspension (line) pylons would typically have a single insulator string hanging vertically downwards from each crossarm end to carry the conductor bundle. A tension (angle) pylon would typically have one insulator string per conductor (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.

4.9.8 The average height for a pylon would be approximately 54m from ground level (compared to approximately 30m for the existing 132kV pylons). The extra height means there can be a larger spacing (typically 360m subject to site constraints) between pylons (fewer overall) compared to the existing 132kV overhead line. Pylon extensions may be required in some locations depending on topography and to allow extra height to clear existing features. The pylon heights assumed in the ES can be found in the table of parameters, that can be found at the end of the Work Plans (**application document 2.5**).

4.9.9 The proposed colour tone for the pylons would be the standard National Grid pylon colour, '*BS4800 00 A5 05 Goose Grey*', which is used on other National Grid lattice pylons across the country. A light grey colour, for the external surface of the pylon, generally achieves the best balance between reducing visibility and visual effects when seen against the sky.

4.9.10 The pylon base footprint would typically be 10m by 10m. Indicative pylon locations have been assumed for the assessment, as shown on ES Figure 4.1: The Project (**application document 6.4**), however, National Grid is seeking consent for horizontal and vertical LoD within which the final alignment would lie and is not seeking approval for a specific alignment (including pylon locations).

Operational Safety Clearances

4.9.11 National Grid needs to maintain statutory safety clearances from the overhead line conductors at all times in accordance with the Energy Networks Association guidance (2016). These clearances are based on the distance between the conductor and other objects. The conductors therefore need to be of a sufficient height above ground and vegetation regularly removed to avoid contravening these clearances. The minimum clearance for 400kV conductors at the point of energisation is 5.2m plus three-years of vegetation growth (distance varies based on the vegetation type).

4.9.12 The exact position of the conductors and insulators carrying them is dynamic. The position changes due to factors such as windy weather conditions (blowout or sway), tension of conductors and surrounding air temperature and electrical carrying load (sag). The amount of lateral movement varies depending on how close to the pylons the conductors is. Close to pylons the lateral movement is limited due to the static point of the insulator on the pylon. In the middle of conductors the potential lateral movement is far greater.

4.9.13 Given the need to maintain electrical clearances and the dynamic nature of the conductors a 60m width (30ms either side of the centre line) has been assumed where vegetation would need to be removed, coppiced or pruned. Movement of pylons within the LoD would mean the associated vegetation management corridor would also consequently move.

Maintenance

4.9.14 The typical lifespan of an overhead line would be at least 40 years, depending on use and location. Over this time, the overhead line would be subject to annual inspections similar to what is already undertaken for the existing 400kV overhead line. These inspections would be undertaken either from the ground (using a small van) or from the air by helicopter or drone to check for visible faults or signs of wear (as is already undertaken on the existing 400kV overhead line). The inspections would confirm when refurbishment is required and indicate if plant/tree growth or development were at risk of affecting safety clearances.

4.9.15 The overhead line is constructed using a variety of materials, from concrete and steel for the foundations, steelwork for the pylons, glass insulators, and aluminium for the conductors. All these materials have an expected lifespan, which varies depending on how the overhead line is used and where it is located. The conductors, insulators and fittings would normally be replaced after approximately 40 years.

4.9.16 There are two main types of refurbishment:

- A full refurbishment: This involves the replacement of all the conductors, earth wire, insulators and the associated fittings that hold the conductors and insulators in place. It may also include other maintenance such as painting or replacing the pylon steelwork and possible upgrade of foundations. It may also include other maintenance such as painting or replacing the pylon steelwork and maintenance to the foundations. During refurbishment there would be activity along the overhead line, especially at tension (angle) pylons where the new conductor is installed and the old conductor taken down. Full refurbishment would typically be undertaken after the end of the project design life (40 years), although pylons have a typical life expectancy of approximately 80 years (well beyond the project's design life); and
- Fittings-only refurbishment: This would be undertaken if the conductors were still in good condition, and involves removing and replacing the insulators, their associated fittings and the spacers that keep the conductors separate in the spans between pylons. The insulators and fittings have a life expectancy of approximately 20–40 years.

4.9.17 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.

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

Underground Cable

Operation

4.9.19 The project includes two sections of 400kV underground cables (Section E: Dedham Vale AONB and parts of Section G: Stour Valley) approximately 11km in length. The underground cables would be approximately 150mm diameter, made of a copper core, cross-linked polyethylene insulation, seamless corrugated aluminium sheath and polyvinyl chloride outer sheath. It is assumed that there would also be fibre-optic cables alongside the electricity cables for temperature monitoring and providing a communication path for the transmission lines protection and control.

4.9.20 There would be at least 0.9m between the top of the protective tile and the finished ground level. The cables would have a ‘Danger Electric’ sign on the upper surface to protect them from future excavation works. Drainage would be designed into the cable swathe to avoid ponding or surface water build up along the swathe.

4.9.21 It is anticipated that there would be up to six link pillars per section of underground cable. The link pillars would lie adjacent to each cable joint bay, anticipated to be located close to field boundaries and fenced off with stock-proof fencing. No permanent access routes are required to the link pillars or cable joint bays but a gate would be required for access.

4.9.22 The CSE compounds would be set within a relatively flat area, typically 85m x 50m, surrounded by electrified palisade security fencing. The CSE compounds would contain cable terminations, electrical equipment, support structures and a small control building. Full line tension gantries are proposed at each of the CSE compounds. These would be approximately 15m in height as described in the table of parameters which can be found at the end of the Work Plans (**application document 2.5**).

4.9.23 There would be a single-track (up to 5m wide) permanent access road plus passing places to connect the CSE compound to the local road network, which would provide access for operation and maintenance. This is assumed to have a gate at the bellmouth but is unlikely to be fenced until the security fencing at the CSE compound. Embedded planting would be provided around each CSE to help filter and soften views of the site.

4.9.24 All four CSE compounds would be served with a low voltage power supply to provide power to the alarm system and the electrified fencing. They would not have permanently installed lighting and if access is required and lighting is required it would be portable task lighting brought onto site. The CSE compounds would have porous surfacing (such as soakaways or French drains) to allow surface water to naturally infiltrate to greenfield rates without the need for formal drainage. No permanent discharges are anticipated.

Maintenance

4.9.25 Underground cables and the CSE compounds have a typical life expectancy of at least 40 years. Over this time, the cables and CSE compounds would be subject to regular checks. Inspections using the fibre-optic cables that were installed alongside the underground cables during construction, would be undertaken approximately every three years. This would identify whether cable repairs were required. The inspections of the CSE compounds would confirm when refurbishment is required and indicate if vegetation growth or development were at risk of affecting safety clearances.

4.9.26 The CSE compound would contain equipment that would be monitored remotely. Site inspections would include visual checks for signs of damage or wear of the condition of non-mechanical equipment, structures and buildings. Mechanical (manually operated) earth switches would require inspection and servicing as part of these visits.

4.9.27 When a repair is needed, the area where the fault is located would be accessed using a temporary access route made up of crushed stone. A working area would be established, similar to that used for construction, and the ground would be excavated. If a cable needs to be replaced, then that section of the cable (between two joint bays) would need to be removed and new joints constructed. The refurbishment of the CSE compound would be similar to those described during construction.

GSP Substation

Operation

4.9.28 The GSP substation would include a permanent compound area approximately 270m x 50m in size. It is anticipated to have a 2.4m high palisade security fence with 3.4m high electric pulse fence installed to the rear of the palisade to secure the site and avoid trespass. There would be a number of small modular container type buildings installed on site to house electrical equipment, together with small modular self-contained office/welfare units for both National Grid and UKPN.

4.9.29 The GSP substation would include two super grid transformers within reinforced concrete bunds, comprising a perimeter concrete wall, a base slab continuous with the wall and a central plinth for supporting the transformers. There would also be a noise enclosure around the transformers to reduce operational noise. Other equipment and features include protection isolation equipment, switching devices, cooler banks for each transformer, a diesel generator for emergency back-up power and a water tank for emergency firewater supply.

4.9.30 The majority of electrical equipment would be mounted on steel posts fixed to concrete foundations. Top of electrical equipment, and busbars connecting equipment, are typically up to 9m above ground level. There would be one taller steel line landing gantry structure within the GSP substation, which supports the downleads off the pylon to the south-east; this would be approximately 15m high as described in the table of parameters which can be found at the end of the Work Plans (**application document 2.5**).

4.9.31 A permanent bellmouth junction would be constructed on the A131 to highway standards. This would have a gated access and would connect to a surfaced track (assumed as concrete with appropriate drainage where appropriate), which would provide access for the periodic maintenance activities at the GSP substation. This would be up to 5m wide. It is assumed that the permanent access route would not be fenced until the point it reaches security fencing around the GSP substation.

4.9.32 The GSP substation would require security lighting, which would be used outside of daylight hours. This would require a trigger (i.e. would not be continuous) and be on a timer. Such security lighting would be low lux level light-emitting diode type luminaires with directable light output and passive infrared sensor motion activated lighting at the access gates to facilitate safe entry at night. It is assumed that closed-circuit television would not be required at this site.

4.9.33 The GSP substation would include permanent surface and foul drainage systems. It is anticipated that hard standing areas would be drained to the surface water drainage system. This would typically use French drains, which are small ditches filled with granular material to allow rainwater to flow away from a site. The drainage system would be protected from accidental oil discharges from the site by interceptor units. The drainage design would be in accordance with the requirements of the Essex County Council Sustainable Drainage System Design Guide (2020) and would include allowances for climate change in accordance with current Environment Agency requirements (good practice measure W12 in the CoCP). All remaining areas are likely to contain porous surfacing to allow surface water to naturally infiltrate without the need for formal drainage.

4.9.34 There would be no permanent discharges required but a waste/foul water system would be used on site, comprising short pipes from the two amenities buildings to two separate cesspools that would be periodically emptied as required. Wastewater generated would be very limited given the site would be unmanned and the wastewater would only come from use of facilities in the amenity buildings.

4.9.35 The GSP substation would include a 400kV single circuit sealing end compound to the west of Waldegrave Wood to enable a new underground 400kV cable connection. This would be separately fenced outside of the main GSP substation footprint and would include a permanent access route linking it to the main GSP substation compound. The single circuit sealing end compound would be smaller than the double circuit CSE compounds proposed on the overhead line sections of the project, as it would only house a small number of high voltage plant equipment items in addition to a steel gantry to receive downleads from the replacement 400kV overhead line pylon. It would not include any buildings or oil containing equipment and no drainage systems require to be installed.

4.9.36 The proposed GSP substation would be connected to the existing 400kV overhead line via an existing pylon to the south-east of the site and a new replacement pylon to the south-west of the site, which would connect into the single circuit sealing end compound. There would be two 132kV underground cables to the west of Waldegrave Wood, to connect the GSP substation to the existing 132kV overhead line to the east of Wickham St Paul, via a new CSE platform pylon, replacing the existing pylon on the 132kV overhead line.

4.9.37 Low mounds are proposed to the west of the A131 and to the west of the proposed GSP substation. These would be planted to help screen the GSP substation in views from the road and from Wickham St Paul (EM-H04). The western mound is anticipated to be approximately 2.5m tall with graded west facing slopes (approximately 1:11 gradient) while the eastern mound is approximately 1.5m tall with graded east facing slopes (approximately 1:4 gradient). Embedded planting is proposed to the west of the GSP substation and further planting would be undertaken to improve the hedgerow along the A131 to help screen the site (EM-H02). Offsets between embedded landscape planting and components of the proposed GSP substation are required to protect equipment. Further details on the planting can be found in the LEMP (**application document 7.8**).

Maintenance

4.9.38 The GSP substation would be unmanned during operation. Routine site visits would be required to visually inspect condition of equipment, structures and buildings for signs of damage or wear. It is anticipated that the routine maintenance would be undertaken on an annual cycle for each circuit. This involves electrical isolation of the equipment and checks to the equipment. In addition, there would be maintenance of the auxiliary systems which would be tested monthly and maintained as required. For example, the back-up diesel generator would be required for a short period of time using the associated load bank, on a routine basis. This varies from manufacturer to manufacturer but is normally around 5-10 minutes, once a month. This checks that the back-up diesel generator would start correctly, keeps the various bearings lubricated and can highlight any starting or running issues.

4.9.39 If the GSP substation required refurbishment or replacement works, this would be similar to the construction activities but on a smaller scale and would involve vehicles to bring workers and materials to the site for the repairs and the removal of old equipment.

4.10 Decommissioning

Introduction

4.10.1 This section describes what would happen once the project reaches the end of its design life and/or were no longer required. It is split into the overhead line, underground cables (including the CSE compounds) and GSP substation. It also summarises the assessment of the environmental effects associated with decommissioning.

4.10.2 There are no plans to decommission the project. While the design life of the project is currently at least 40 years, this is likely to be significantly extended given the probable increase in electricity demand in the future and the typical life of some components being longer than 40 years (for example a pylon would typically last 80 years before requiring full refurbishment). The design life of the project could be extended with regular maintenance and refurbishment of each component.

4.10.3 It is assumed that decommissioning would only be undertaken if there were substantial changes to how electricity is transmitted around the country or significant changes to the sources of generation and areas of demand. If at such a time National Grid determines that it would no longer require all or part of the project, the regulatory framework, good industry practices and the future baseline may 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.

4.10.4 As part of any decommissioning strategy, there would need to be engagement with UKPN as the Distribution Network Operator of the 132kV overhead line (or future network operator), to discuss how power would be maintained to the local network in the event of decommissioning the 400kV line and the GSP substation. Therefore, the decommissioning strategy would likely require an options appraisal looking at the network requirements and techniques available at that time. As part of the options appraisal, National Grid would seek feedback from consultees.

4.10.5 In the event that, at some future date, the authorised development, or part of it, is to be decommissioned, a written scheme of decommissioning would be submitted for approval by the relevant planning authority at least six months prior to any decommissioning works, as per Requirement 12 in the draft DCO (**application document 3.1**). The decommissioning works would follow National Grid processes at the time for assessing and avoiding or reducing any environmental impacts and risks. The following paragraphs explain the decommissioning methods which may be used and confirm that the works would be no worse than those assessed for construction.

Overhead Line

4.10.6 Decommissioning sections of the overhead line would follow the same methods set out in Section 4.5, which describe the removal of existing sections of the existing 132kV and 400kV overhead lines during construction of the project.

4.10.7 For the pylons, the fittings such as spacers and dampers would be removed from the conductors. It is anticipated that the conductors would then be winched onto drums in a reverse process to that described for construction. The fittings would be removed from the pylons and lowered to the ground. The pylons would be dismantled by crane, with sections cut and lowered to the ground for further dismantling and removal from site. The foundations would be excavated to approximately 1.5m below ground level, and subsoil and topsoil reinstated.

Underground Cable

4.10.8 Decommissioned underground cables could be left in the ground with any above ground structures such as link pillars removed. Cables could also be removed from the ducts using the jointing bays. These works are anticipated to be localised and short term in duration. Access to the above ground features requiring removal would likely be provided by trackway matting or another alternative. Once works are completed, any temporary access routes and working areas required during decommissioning would be removed and the site reinstated to its former use.

4.10.9 The above ground features of the CSE compounds would be removed by dismantling the gantries and conductors and removing any other above ground features. The foundations at the CSE compounds would be excavated to approximately 1.5m below ground level, and subsoil and topsoil reinstated. Any temporary access routes and working areas required would be removed and the site reinstated to its former use.

GSP Substation

4.10.10 In the event that the GSP substation is to be decommissioned, discussions would be held with UKPN (or future network operator), to agree alternative requirements for providing power to local communities and businesses.

4.10.11 The above ground features of the GSP substation would be removed by dismantling the pylons and conductors. Any above ground buildings would be demolished and taken off site for suitable disposal along with any other above ground features. The foundations of the GSP substation would be excavated to approximately 1.5m below ground level, and subsoil and topsoil reinstated. Any access routes and working areas required would be removed. All materials would be disposed of according to the waste hierarchy.

Environmental Effects of Decommissioning

4.10.12 As there are no current plans to decommission the project, an assessment of effects associated with decommissioning is not presented in Chapters 6 to 15 of the ES. However, Table 4.9 summarises the assessment of the likely significant effects associated with decommissioning for each environmental topic based on existing information. Potential impacts of decommissioning are likely to be similar to construction but with a lower magnitude of effect. Table 4.9 assumes that standard good practice measures, such as those set out within the CoCP (**application document 7.5.1**) would be implemented during decommissioning activities, as these would be typical measures employed on large National Grid contracts.

4.10.13 Table 4.9 does not take into account changes to the baseline environment, outside of those noted within the future baseline section of Chapters 6 to 15, as there could be a number of scenarios that occur which could change the baseline prior to any decommissioning activities. However, it is noted that the baseline environment could change and would be assessed at the time of decommissioning.

4.10.14 Table 4.9 demonstrates that there are unlikely to be any new or different significant effects anticipated during decommissioning than those identified during construction in Chapters 6 to 15, and in many cases the effects are likely to be of a lower significance than construction due to the anticipated lower magnitude of effects anticipated during decommissioning.

Table 4.9 – Summary of Decommissioning Assessment

Topic	Summary Assessment
Landscape and Visual	The removal of the overhead line would be the same as outlined within Section 4.5 (Overhead Line Removal) therefore the effects would be the same. The exception would be in relation to Dedham Vale AONB and most of the Stour Valley as the underground cable would remain in situ, therefore there would be no effects associated with removal. There would be construction vehicles present within the landscape and views but these would be temporary and transient throughout the project area. Removal of the above ground features including the overhead lines, CSE compound and GSP substation could have beneficial effects on views and the landscape character of the area. However, these are unlikely to be significant.
Biodiversity	The footprint of any decommissioning works is likely to be smaller than the ground disturbed during construction of the project and the effects would be no worse than those identified during construction. In addition, decommissioning works are likely to take place within the maintained swathe which would further reduce effects. There could be effects to protected species and habitats at the time of decommissioning, however these are likely to be managed through standard good practice measures and/or the measures set out in the relevant consents at the time, for example, European Protected Species licences. Therefore, there are unlikely to be any significant effects to biodiversity during decommissioning.
Historic Environment	The footprint of any decommissioning works is likely to be smaller than the ground disturbed during construction of the project. As the ground within this area would already have been disturbed during construction, it is unlikely that archaeological remains would be present. Therefore, there are unlikely to be any significant effects to archaeology during decommissioning. Removal of the above ground features including the overhead lines, CSE compound and GSP substation could have beneficial effects on heritage assets through the removal of modern development within their setting. However, these are unlikely to be significant. There is also the potential for decommissioning works to have a temporary adverse effect on heritage assets through the introduction of noise and visual intrusion within their setting during construction. However, this would be temporary and unlikely to be significant.

Topic	Summary Assessment
Water Environment	The removal of the overhead line would be the same as outlined within Section 4.5 (Overhead Line Removal). There is the potential for short-term temporary effects to watercourses (e.g. pollution risks) and land drainage during decommissioning. However, these effects would be managed by standard good practice measures applied at the time. Therefore, there are unlikely to be any significant effects to the water environment during decommissioning.
Geology and Hydrogeology	The removal of the overhead line would be the same as outlined within Section 4.5 (Overhead Line Removal). There is the potential for short-term temporary effects to hydrogeology (e.g. pollution risks from contaminated land) during decommissioning. However, these effects would be managed by standard good practice measures applied at the time. Therefore, there are unlikely to be any significant effects on the geology and hydrogeology during decommissioning.
Agriculture and Soils	The removal of the overhead line would be the same as outlined within Section 4.5 (Overhead Line Removal) The footprint of any remaining decommissioning works such at the CSE compounds and GSP substation would lie within National Grid land and would affect a smaller area than the soils disturbed during construction of the project. Therefore, there are unlikely to be any significant effects on agriculture and soils during decommissioning.
Traffic and Transport	The decommissioning works would generate traffic associated with the construction vehicles required to transport materials off site and associated staff vehicles. The decommissioning works are likely to involve a much smaller workforce than during construction (as cables could remain in situ). Therefore, there are unlikely to be any significant effects on traffic and transport during decommissioning.
Air Quality	Emissions to air may be generated by construction activities such as vehicle exhausts and generators. However, at a time when decommissioning takes place (at least 40 years hence) it is likely that improvements would have been made to vehicles and machinery to limit air quality emission generated. There may also be dust arising from construction activities. However, these effects would be managed by standard good practice measures applied at the time. Therefore, there are unlikely to be significant effects on air quality during decommissioning.
Noise and Vibration	The activities required during decommissioning, such as demolition of buildings at the GSP substation and the cutting and dismantling of pylons, could generate noise for short periods of time at a local level. However, this is unlikely to exceed the noise levels assessed within the construction phase. In addition, at a time when decommissioning takes place (at least 40 years hence) it is likely that improvements would have been made to vehicles and machinery to limit noise generated. If noise levels exceed thresholds, it is assumed that best practicable means would be employed, including mufflers to reduce effects at source. Therefore, there are unlikely to be significant effects on noise and vibration during decommissioning.
Cumulative Effects	The intra-project cumulative effects would depend on the potential effects identified from the different aspects at the time. However, it is unlikely that the effects would be different to those identified during construction and therefore there would be no new or different significant effects for the decommissioning phase when compared to construction of the project. The inter-project cumulative effects assessment would depend on the proposed developments within the vicinity at the time of decommissioning. Therefore, an assessment of inter-project cumulative effects is not possible at the current time.

Page intentionally blank

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com