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Bramford to Twinstead

2.1 Preliminary Environmental Information Report

Volume 1 Main Report

January 2022



nationalgrid

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1. INTRODUCTION

1.1 Overview

- 1.1.1 National Grid Electricity Transmission plc (here on referred to as National Grid) owns, builds and maintains the electricity transmission network in England and Wales. Under the Electricity Act 1989, National Grid holds a transmission licence, under which it is required to develop and maintain an efficient, coordinated and economical electricity transmission system. National Grid is also required to consider ways to preserve amenity under Schedule 9 of the Act.
- 1.1.1 National Grid intends to submit an application for an order granting development consent to reinforce the transmission network between Bramford Substation in Suffolk, and Twinstead Tee in Essex (Figure 1.1). This would be achieved by the construction and operation of a new 400 kilovolt (kV) electricity transmission line over a distance of approximately 29km (18 miles), the majority of which would follow the general alignment of the existing overhead line network.
- 1.1.2 The reinforcement would comprise of approximately 19km of overhead line (consisting of up to 55 new pylons and conductors) and approximately 10km of underground cable system consisting of up to 20 cables (comprising 18 transmission cables and two fibre cables) with associated joint bays and above ground link pillars. See Chapter 4: Project description for details.
- 1.1.3 Four cable sealing end (CSE) compounds would be required to facilitate the transition between the overhead and underground cable technology. The CSE would be within a fenced compound, and contain electrical equipment, support structures, a small control building and a permanent access track.
- 1.1.4 It is proposed that approximately 27.5km 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 2.5km of the existing 400kV overhead line to the south of Twinstead Tee). To facilitate the overhead line removal, a new grid supply point (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 and underground cables to tie the substation into the existing 400kV and 132kV networks.
- 1.1.5 The Bramford to Twinstead project ('the project') meets the threshold as a Nationally Significant Infrastructure Project (NSIP), as defined under Part 3 of the Planning Act 2008, hence National Grid requires a development consent order (DCO) in order to construct and operate the project. Some parts of the project, such as the underground sections and the GSP substation, constitute associated development.
- 1.1.6 The GSP substation forms part of the proposed development pursuant to the DCO and hence is currently taken into account in this Preliminary Environmental Information (PEI) Report and as part of the work to progress the application for development consent for the project. However, National Grid is also considering the option of applying for planning permission for the GSP substation under the Town and Country Planning Act in advance of submission of an application for development consent. This will include accompanying electric line works sought via separate consenting routes where necessary (e.g. pursuant to the Electricity Act 1989), and qualifying works via Section 37 (s37) exemptions and permitted development. In this scenario, National Grid would seek planning permission

pursuant to the Town and Country Planning Act for the GSP substation from Braintree District Council, alongside seeking s37 consent from the Secretary of State (Department of Business, Energy and Industrial Strategy - BEIS). Consultation feedback received during this statutory consultation regarding the GSP substation will be considered prior to any such applications.

1.2 Need for the Project

- 1.2.1 The project initially commenced in 2009, when a need to reinforce the network between Bramford Substation and Twinstead Tee was identified. National Grid considered alternative strategic options to reinforce the network and alternative route corridors, as part of the options appraisal process. The options appraisal process is summarised in the Project Development Options Report (National Grid, 2022), which is published as part of the statutory consultation material.
- 1.2.2 The reinforcement was necessary to support the connection of new generation projects in East Anglia, primarily new nuclear and wind. National Grid identified that the existing transmission system in East Anglia would not be sufficient to meet connection demand going forward. The options appraisal process was accompanied by extensive consultation with statutory bodies, relevant organisations and the wider public to gather feedback on the proposals.
- 1.2.3 The project team was preparing for the statutory consultation in 2013, when changes to the planned dates of when new power generation would come online in East Anglia, including significant delays to the proposed Sizewell C nuclear power station, meant that the project was paused at the end of 2013.
- 1.2.4 Since the project was paused, there has been a significant shift in energy policy across the UK. The UK has set a world-leading target to tackle climate change, which includes an ambition to deliver 40 gigawatt (GW) of offshore wind farms connected to the electricity transmission network by 2030 and achieve net zero emissions by 2050 (BEIS, 2020). This has led to a shift towards offshore renewable generation of power (60% of which is expected to come ashore along the East Coast) away from coal powered generation in the north and the Midlands. The UK is also transporting more power with countries across the North Sea, using interconnectors. These factors have driven a change in the energy landscape across the UK and, in particular, East Anglia where reinforcement of the transmission network is required to deliver this change.
- 1.2.5 The existing electricity transmission network in East Anglia was developed in the 1960s and has historically been able to meet demand. However, due to the changes noted above in terms of delivering net zero emissions, the existing network in East Anglia does not have the capability to reliably and securely transport all the energy that will be connected by 2030, whilst operating to the standards it is required to. Work undertaken in 2020, which included reviewing the project need and the timing of the project drivers, indicated that the Bramford to Twinstead project should be 'un-paused', and work towards the delivery of the project should be recommenced.
- 1.2.6 There are still a limited number of physical routes for power to flow in and out of the region which limits the amount of additional generation that can currently be accommodated. There are three existing electricity transmission lines feeding into the existing Bramford Substation from the north and east, carrying power from the existing Sizewell B nuclear power station and offshore wind farms, whereas west of Bramford, out to Twinstead Tee, there is currently only one electricity transmission line taking that power out to the wider

network. This creates a bottleneck which significantly constrains the amount of power that can currently be carried westward on the network from Bramford, when new sources of energy are connected.

- 1.2.7 Reinforcing the network between Bramford and Twinstead would create two independent double circuit transmission routes west of Bramford – one from Bramford to Pelham, and one from Bramford to Braintree to Rayleigh to Tilbury. While additional network reinforcement will be needed elsewhere in East Anglia, it is essential that the network between Bramford and Twinstead Tee is reinforced to provide the vital capacity needed. Other reinforcements will not take away the need to add capacity to this part of the network.
- 1.2.8 The network is currently capable of transferring 3.5GW of power out of the region. By 2030, around 24.5GW of generation is contracted to connect from offshore wind farms, new nuclear and interconnectors with countries across the North Sea. This means that there needs to be up to 17.9GW of transfer capability out of the region by 2030. Upgrading the existing network by adding power control devices, upgrading and rewiring existing lines, only increases the transfer capability of the existing network to around 6GW. Adding to the network is therefore necessary to deliver the capability needed to carry cleaner greener energy on to homes and businesses across the country. The network reinforcement between Bramford and Twinstead Tee is critical in all future energy scenarios and it needs to be in place by 2028. Further details can be found in the Network Options Assessment (National Grid 2021d).
- 1.2.9 The network reinforcement would also provide greater security to the network in the region and reduce the risk of outages (a period of interruption to electricity supply) from limited network availability. If the network is not reinforced, outages could result in a greater risk of widespread supply interruptions. The transmission network needs to be able to maintain a minimum level of security of supply, as defined within the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS). The principle underlying the NETS SQSS is that the network should have sufficient spare capability or 'redundancy' such that credible planned or unplanned outage conditions do not result in widespread supply interruptions.
- 1.2.10 There is a clear need for the project, driven by the change in energy generation across the region in order to meet Government net zero targets. In addition, the reinforcement of the network would reduce the risk of outages, which could result in widespread disruptions. This will maintain NETS SQSS compliance and provide a secure supply of energy into the future. This leads to an overarching conclusion that there is a clear requirement for significant, strategic reinforcement of the network between Bramford and Twinstead.

1.3 Alternatives Considered

- 1.3.1 The PEI Report cross references to the Project Development Options Report (National Grid, 2022), which sets out how the project has evolved to the current alignment. The Project Development Options Report was initially published as part of the non-statutory consultation (National Grid, 2021a) and has been updated as part of the statutory consultation materials to cover the changes to the design that have occurred since the non-statutory consultation. All references to the Project Development Options Report going forward in the PEI Report, relate to the updated version published in 2022.

- 1.3.2 The Project Development Options Report (National Grid, 2022) describes the alternatives that were considered to meet the project need. This included a long list of strategic options, route corridors and different alignments. The previous options appraisal work resulted in an 'Indicative Alignment', which was presented in the 2021 non-statutory consultation in spring 2021 and was also presented in the Scoping Report (National Grid, 2021b) in May 2021.
- 1.3.3 National Grid has reviewed the responses raised during the 2021 non-statutory consultation and on the 2021 Scoping Report and has considered the proposed changes and comments suggested in the responses. The Project Development Options Report (National Grid, 2022) presents the design changes considered as a result of the non-statutory consultation and which of these National Grid has taken forward. The Non-statutory Consultation Report (National Grid, 2021c), which has been provided as part of the engagement material during the Statutory Consultation, provides further information on comments raised and how these have been considered.

1.4 Terminology

- 1.4.1 As noted in Section 1.1, the project is an NSIP and National Grid will be submitting an application for development consent to build the project.
- 1.4.2 A Development Consent Order (DCO) grants the beneficiary of the DCO permission to construct, operate, maintain and decommission the authorised development. In addition, a DCO may apply, modify or exclude an existing statutory provision where it relates to the authorised development. As such, the DCO will also include legislative provisions in relation to; highway works; public rights of way (PRoW); Traffic Regulation Orders; discharging water; dealing with human remains; tree works (including those protected by a Tree Preservation Order and important hedgerows); the compulsory acquisition of land; the temporary use of land and any additional legislative provisions, as required.
- 1.4.3 The application will identify the Order Limits, which will include the working areas to install the overhead line and underground cables, including the permanent and temporary land take. The draft Order Limits are shown on the General Arrangement Plans in Figure 3.2 of the statutory consultation material. The draft Order Limits replace the Scoping Boundary that was used when setting out the scope of the environmental assessment in the Scoping Report (National Grid, 2021b). The topic specific study areas (e.g. landscape and visual) are described in each of the topic chapters based on the draft Order Limits.
- 1.4.4 This PEI Report uses the term 'Draft Alignment' for describing the route of the proposed reinforcement. This has been developed as a result of consultation feedback, ongoing engineering design, environmental assessment work to date and landowner discussions. The Draft Alignment is a concept to help communicate the potential route of the reinforcement. However, as this is a NSIP, National Grid will be seeking consent for horizontal and vertical Limits of Deviation (LoD) within which the final alignment would lie. National Grid will not be seeking approval for a specific alignment (including pylon locations). This will provide flexibility during detailed design and construction for unforeseen circumstances, such as unsuitable ground conditions or ecological constraints. Further details can be found in Chapter 4: Project Description.
- 1.4.5 The working width and working area are also terms used within this PEI Report to help define areas where construction could occur within the draft Order Limits. For example, the draft Order Limits within the underground cables sections are typically 100m wide. However, within that 100m, there would be a 80m construction working width (or area

when considered along a given length of the section). The additional 20m is included within the draft Order Limit width to provide flexibility for any unforeseen conditions.

- 1.4.6 The report also refers to outages, which are agreed period of time when a live electricity line can be taken out of service so that works can be safely undertaken to the line. Outages need to be timed for periods of lower electricity demand (usually the summer) and/or when there is spare capacity on other parts of the network to transmit electricity supply. Outages are required where parts of the live electricity lines require works.

1.5 Geographical Context

- 1.5.1 The project is located in the east of England (Figure 1.1). The project 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 proposed GSP substation and the western part of the project lie in Braintree District (Essex).
- 1.5.2 The project is located in an area that is predominantly rural, with large parts of the land under arable use. Ipswich, the county town of Suffolk, lies approximately 5km to the east of Bramford Substation. The towns of Hadleigh and Sudbury lie approximately 1km and 4km to the north of the project respectively. There are also villages such as Boxford and Leavenheath, as well as a number of hamlets and individual properties within or near to the draft Order Limits.
- 1.5.3 There is an existing 400kV overhead line operated by National Grid between Bramford and Twinstead, which continues on to Braintree and Rayleigh. There is also an existing 132kV overhead line that is operated by the Distribution Network Operator, which is UK Power Networks in the east of England. UK Power Networks distributes electricity at lower voltages to industrial, commercial and domestic users.
- 1.5.4 The draft Order Limits cross parts of the Dedham Vale Area of Outstanding Natural Beauty (AONB), which is designated as an exceptional example of a lowland river valley. The landscape comprises a broadly flat plateau dissected by several river valleys. These give rise to lower-lying valley areas surrounded by areas of higher ground. The river valleys run in a broadly northwest–southeast direction and include the River Brett, River Box and River Stour.
- 1.5.5 The draft Order Limits also cross Hintlesham Woods Site of Special Scientific Interest (SSSI). This is designated as one of the largest remaining areas of ancient coppice woodland in Suffolk. The project passes close to a number of listed buildings, including the Church of St Mary (Burstall), Hintlesham Hall (Hintlesham), the Parish Church of the Holy Innocents (Lamarsh) and the Parish Church of St Barnabas (Alphamstone) which are all grade I listed.
- 1.5.6 For ease of reference in project documentation, the project was initially split into seven sections based on the landscape character and feedback from consultation. These were described in the Connection Options Report (National Grid, 2012a) and assisted in making the gathering, environmental assessment and presentation of environmental information more manageable during the options appraisal. Sections A and B (eastern extent of the project) were subsequently combined as the landscape characteristics were considered similar.

- 1.5.7 The sections presented within the Connection Options Report were:
- Section AB – Bramford Substation/Hintlesham;
 - Section C – Brett Valley;
 - Section D – Polstead;
 - Section E – Dedham Vale up to the AONB boundary;
 - Section F – Leavenheath/Assington; and
 - Section G – Stour Valley.
- 1.5.8 This PEI Report uses the same geographical sections as the Connection Options Report to describe the project. It also includes Section H: GSP Substation, which has been added to aid the description of the project at this location. National Grid intends to use the same references for reporting in the Environmental Statement (ES).

1.6 Purpose of this Report

- 1.6.1 Regulation 12(2) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations) defines the PEI as information that has been compiled by the applicant and *‘is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development)’*.
- 1.6.2 Advice Note 7 (Planning Inspectorate, 2020) in paragraph 8.4 states that *‘There is no prescribed format as to what PEI should comprise and it is not expected to replicate or be a draft of the ES... A good PEI document is one that enables consultees (both specialist and non-specialist) to understand the likely environmental effects of the Proposed Development and helps to inform their consultation responses on the Proposed Development during the pre-application stage.’*
- 1.6.3 This PEI Report is intended to give consultees an understanding of the potential likely significant effects to enable them to prepare well-informed responses to the statutory consultation. All conclusions and assessments are by their nature preliminary and are based on the proposed project design and assumptions described within this PEI Report. All assessment work has and continues to apply a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed. The final assessment will be presented within the ES submitted with the application. This will take into account the representations made during the statutory consultation and ongoing engineering design informed by the EIA process.
- 1.6.4 This PEI Report identifies which effects may be potentially significant. It considers potential effects before mitigation (though including any measures embedded into the design of the project to reduce environmental impacts) and residual effects after the proposed mitigation that has been identified to date to reduce the potential effects. These potential effects will be taken forward as part of the EIA and additional mitigation may be identified as the design develops further. Therefore, likely significant effects provisionally identified at this preliminary stage may later be found to be not significant following completion of the mitigation strategy when reported in the ES.
- 1.6.5 Individuals who are interested in reviewing the environmental assessment methodology that will be used in the EIA should refer to the Scoping Report (National Grid, 2021b), which is available on the National Infrastructure Planning website at:

<https://infrastructure.planninginspectorate.gov.uk/projects/eastern/bramford-to-twinstead/?ipcsection=docs>.

- 1.6.6 The structure of this PEI Report can be found in Table 1.1. Each of the technical chapters presents the preliminary environmental information for the aspects within that topic e.g. biodiversity (topic) includes consideration on water voles (aspect). This covers a description of the scope of the topic chapters, the preliminary environmental information comprising the baseline, a summary of the likely significant effects prior to mitigation (but including any measures embedded into the design), the proposed mitigation measures and a description of the potential residual effects that may be significant following implementation of the proposed mitigation.
- 1.6.7 This PEI Report has been prepared in accordance with Advice Note 7 (Planning Inspectorate, 2020). This states that the EIA process should be proportionate and should only scope-in aspects that are likely to result in significant environmental effects. The Scoping Opinion (Planning Inspectorate, 2021a) sets out what the Planning Inspectorate recommends should be scoped in and out of the environmental assessment. Further details can be found in Chapter 3: Scoping Opinion and Consultation. National Grid will submit an ES as part of the application for development consent.

Table 1.1: Structure of this PEI Report

Chapter/Appendix	Content
Volume 1: Main Report	
1. Introduction	An introduction to the project and the purpose and structure of the PEI Report.
2. Regulatory and Planning Policy Context	A review of the legislation and policy relevant to the project.
3. Scoping Opinion and Consultation	A summary of the Scoping Opinion provided by the Planning Inspectorate on the scope of the assessment for the project. A description of the consultation activities that have been undertaken on the project to date with environmental consultees, and the key themed responses.
4. Project Description	A description of the project including permanent features and associated temporary works. It describes the general characteristics of the project and outlines areas of uncertainty in relation to design parameters.
5. EIA Approach and Method	A description of the overall EIA methodology that is proposed to be used on the project, including temporal durations and approach to mitigation.
6–14. Topic Chapters	There is a chapter for each environmental topic, providing a summary of the existing (baseline) environment and a projection of how the baseline is anticipated to change in the future using currently available project information. Each topic chapter identifies the aspects that are scoped into the EIA (based on the Scoping Opinion) and describes the preliminary environmental assessment that has been undertaken to identify the likely significant effects both before and after mitigation.
15. Cumulative Effects	A description of the approach to the cumulative effects assessment (CEA) including the potential for significant environmental effects from different

Chapter/Appendix	Content
	EIA topics on the same receptor group, and potential cumulative effects with the project and other developments.
16. Conclusion	Provides a summary table setting out the likely significant effects for each aspect and the proposed mitigation measures.
Volume 2: Appendices	Contains additional information supporting the chapters above.
Volume 3: Figures	Contains supporting figures.

- 1.6.8 The PEI Report includes the current version of the Outline Code of Construction Practice (CoCP), in Appendix 4.1. This contains the good practice measures that would be implemented on the project. These measures have been assumed to be in place during the drafting of the PEI Report and the associated preliminary assessments. Each good practice measure has been assigned a reference number, for example (GG01). These references are used within the report to aid cross referencing to the full description of the measure in the Outline CoCP.
- 1.6.9 This PEI Report has been developed in parallel with other regulatory environmental studies, namely the Habitats Regulations Assessment (HRA) and the Water Framework Directive (WFD) Assessment. Appendix 7.2 contains the Final HRA Screening Report and Appendix 9.2 contains the WFD Screening Report.

1.7 Transboundary Effects

- 1.7.1 There is a requirement under the EIA Regulations 2017 to consider transboundary effects i.e. those effects that could affect receptors within other European Economic Area States. A screening exercise was undertaken by National Grid as part of the scoping process and was submitted to the Planning Inspectorate in May 2021. The Planning Inspectorate has undertaken the transboundary screening on behalf of the Secretary of State for the purposes of Regulation 32 of the EIA Regulations 2017 (Planning Inspectorate, 2021b). This concluded that the project '*is unlikely to have a significant effect either alone or cumulatively on the environment in a European Economic Area State*'. The Transboundary Screen Matrix will be included as an appendix to the ES.

2. REGULATORY AND PLANNING POLICY CONTEXT

2.1 Introduction

- 2.1.1 This chapter sets out a summary of the key environmental legislation and national policy relevant to the project. This chapter is supported by Appendix 2.1: Local Planning Policy, which provides an overview of local planning policies that, although not directly applicable, have been considered as potentially important and relevant by the project.
- 2.1.2 A Planning Statement will be produced to support the application for development consent and will provide a full planning policy review and will set out how the project has met the relevant planning policy.

2.2 The Infrastructure Planning (EIA) Regulations 2017

- 2.2.1 The EIA Regulations 2017 categorise developments according to their requirement for an EIA. Schedule 1 lists developments for which an EIA is always required, whereas Schedule 2 lists those that may or may not require an EIA depending on the characteristics and location of the development, and the significance of potential effects. Paragraph 20 of Schedule 1 identifies the following project type: '*Construction of overhead electrical power lines with a voltage of 220kV or more, and a length of more than 15km*'. The project comprises a 400kV electricity transmission line over a distance of approximately 29km, of which approximately 19km is overhead line. It therefore falls under Schedule 1 and requires a statutory EIA.
- 2.2.2 Regulation 5(2) states that the EIA must '*identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors:*
- *population and human health;*
 - *biodiversity, with particular reference to species and habitats protected under Directive 92/43/EEC and 2009/147/EC;*
 - *land, soil, water, air and climate;*
 - *material assets, cultural heritage and landscape; and*
 - *the interaction between the factors referred to in sub-paragraphs (a) to (d).'*
- 2.2.3 These factors are considered within the topic-specific chapters (Chapters 7 to 14). Human health is scoped out as a standalone assessment and considered within Chapter 15: Cumulative Effects, where there is the potential for significant effects. See Chapter 3: Scoping Opinion and Consultation for more details.
- 2.2.4 Regulation 5(4) states that the EIA should include, where relevant, '*the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development*'. This was considered within Chapter 17: Major Accidents within the Scoping Report, which proposed to scope out this topic. Further details are presented in Chapter 3: Scoping Opinion and Consultation. The Planning Inspectorate accorded with this proposed scoping out in their in the Scoping Opinion (2021a), subject to provision of an updated Major Accidents and Disasters baseline. This can be found in Appendix 3.1 to this PEI Report.
- 2.2.5 Schedule 4(5)(e) states that a description should be included of the significant effects arising from the cumulation of effects with other existing and/or approved projects, taking

into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources. This requirement is addressed within Chapter 15: Cumulative Effects.

2.3 Electricity Act 1989

2.3.1 Section 9(2) of the Electricity Act 1989 places general duties on National Grid as a licence holder *'to develop and maintain an efficient, co-ordinated and economical system of electricity transmission...'*. In addition, Section 38 and Schedule 9 of the Electricity Act 1989 requires National Grid, when formulating proposals for new transmission lines and other works, to:

'...have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and shall do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.'

2.3.2 National Grid's Schedule 9 Statement (2006) sets out how the company will meet the duty placed upon it by the aforementioned legislation. This includes:

- only seeking to build new transmission lines and substations where the existing transmission infrastructure cannot be upgraded to meet transmission security standards;
- seeking to avoid nationally and internationally designated areas where new infrastructure is required; and
- minimising the effects of new infrastructure on other sites valued for their amenity.

2.3.3 Further details on how National Grid is meeting its duties under the Electricity Act 1989 will be presented in the Planning Statement prepared as part of the documents submitted with the application for development consent.

2.4 Environment Act 2021

2.4.1 The Environment Act provides a framework for improving environmental management across a wide spectrum of environmental issues including waste and resources, water quality, biodiversity and air quality. It aims to deliver long-term targets to improve environmental conditions and reduce pollution, which will need to be considered by the project. The Environment Act includes a requirement for NSIPs to deliver biodiversity gain as part of the application and for the areas of biodiversity gain to be maintained for a specified period. National Grid is seeking to deliver 10% biodiversity net gain on the project and has set out initial locations in Section 4.2. National Grid is currently working with other organisations to identify how this can best be implemented and also the securing mechanisms for maintaining habitats for the specified period.

2.5 Countryside and Rights of Way Act 2000

2.5.1 AONB are designated solely for their landscape qualities, for the purpose of conserving and enhancing their natural beauty. They are designated under Section 82 of the Countryside and Rights of Way Act 2000 to secure their permanent protection against development that would damage their special qualities. National Grid, as a statutory undertaker, has a duty under Section 85 of the Act which states *'In exercising or performing any functions in relation to, or so as to affect, land in an AONB, a relevant*

authority shall have regard to the purpose of conserving and enhancing the natural beauty of the AONB’.

- 2.5.2 Section 89 of the Countryside and Rights of Way Act 2000 requires a Management Plan to be produced for each AONB. These are statutory documents and are capable of being important and relevant in decision making. The Dedham Vale AONB and Stour Valley Management Plan 2016-2021 is the current adopted plan (Dedham Vale AONB and Stour Valley Project, 2016b). A consultation draft of the 2021–2026 plan is due to be adopted shortly (Dedham Vale AONB and Stour Valley Project, 2021).
- 2.5.3 The Management Plan covers the Dedham Vale AONB and also the Stour Valley Project Area. The Stour Valley is not currently designated, although an application has been submitted to Natural England to extend the Dedham Vale AONB to include parts of the Stour Valley. On the Stour Valley Project Area, the Statement of Significance within the Management Plan says, *‘Much of the Stour Valley project area shares similar characteristics to the Dedham Vale AONB, particularly the area nearest the existing AONB’*. Further details on the Statement of Significance and the special qualities of the AONB can be found within Chapter 6: Landscape and Visual and Appendix 6.1: Landscape and Visual Baseline.

2.6 National Planning and Energy Policy

Planning Act 2008

- 2.6.1 The project is an NSIP which will require development consent under the Planning Act 2008. Section 104 of the Planning Act 2008 outlines the importance of National Policy Statements (NPS) to the decision-making process when applications for development consent are under consideration. Section 104 (2) states, inter alia:
- ‘In deciding the application, the [Secretary of State] must have regard to*
- a) *any national policy statement which has effect in relation to development of the description to which the application relates (a “relevant national policy statement”)*
- *any other matters which the [Secretary of State] thinks are both important and relevant to [the Secretary of State’s] decision.’*
- 2.6.2 In addition, Section 104 (3) states, inter alia:
- ‘The [Secretary of State] must decide the application in accordance with any relevant national policy statement, except to the extent that one or more of subsections (4) to (8) applies’.*
- 2.6.3 The two relevant NPS for the project are the Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a) and the NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011b). Paragraph 1.4.2 of NPS EN-1 states that *‘The [Planning] Act empowers the IPC [Infrastructure Planning Commission] to examine applications and make decisions on ... electricity lines at or above 132kV. For this infrastructure, EN-1 in conjunction with the Electricity Networks NPS (EN-5) will be the primary basis for IPC decision making’*. The Planning Inspectorate now performs the function of the IPC.
- 2.6.4 The government has just finished consulting on draft replacements of the Energy NPS, including NPS EN-1 (BEIS, 2021a) and NPS EN-5 (BEIS, 2021b). The NPS are likely to be designated prior to submission of the application for development consent. If this were

to occur, then the newly designated NPS would form the policy basis for project decisions presented within the application. This PEI Report continues to reference the 2011 NPS, as they remain the relevant government policy and as the individual policy wording within the consultation drafts could change prior to designation. The ES will reference the designated NPS at that time, as that will form the primary policy basis for decision making. National Grid will continue to review policy changes, including the final wording of the adopted NPS, and whether this affects the scope of assessment presented within the EIA.

Overarching National Policy Statement for Energy (EN-1) (2011)

- 2.6.5 NPS EN-1 sets out the Government's overarching policy with regard to the development of NSIPs in the energy sector. It outlines high-level objectives, policy and regulatory framework. NPS EN-1 emphasises the need for new energy projects to contribute to a secure, diverse and affordable energy supply. This is to support the Government's policies on sustainable development, in particular by mitigating and adapting to climate change.
- 2.6.6 Section 3.7 of NPS EN-1 states that current scenarios show significant potential increases in generation and changes in direction of net electricity flows from eastern England to centres of demand in the Midlands and southeast England. Paragraph 3.7.7 of NPS EN-1 states that *'these kinds of flows of power cannot be accommodated by the existing network. Accordingly, new lines will have to be built'*. It also acknowledges, in paragraph 3.7.10, that *'in most cases, there will be more than one technological approach by which it is possible to make such a connection or reinforce the network (for example, by overhead line or underground cable) and the costs and benefits of these alternatives should be properly considered as set out in EN-5 ... before any overhead line proposal is consented'*.
- 2.6.7 NPS EN-1 sets out detailed policies in respect of matters such as air quality and emissions, biodiversity, dust and odour, flood risk, historic environment, landscape and visual, land use, noise and vibration, socio-economics, traffic and transport and waste management. These policies have been taken into account in the preparation of this PEI Report and the relevant policy is set out in each of the topic chapters.

National Policy Statement for Electricity Networks Infrastructure (EN-5) (2011)

- 2.6.8 NPS EN-5 relates to electricity networks, and Part 2 includes specific policies including consideration of good design, biodiversity and geological conservation, landscape and visual, and noise and vibration. In particular, Paragraph 2.2.6 of EN-5 reiterates the duties on developers under Section 9 and Schedule 9 of the Electricity Act 1989, both in relation to developing and maintaining an economical and efficient network and in formulating proposals for new electricity networks infrastructure, to *'have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest...'*. These policies have been taken into account in the relevant PEI Report chapters.

National Planning Policy Framework (2021)

- 2.6.9 The National Planning Policy Framework (NPPF) was updated in July 2021 (Ministry of Housing, Communities and Local Government (MHCLG), 2021). Paragraph 5 of the NPPF (MHCLG, 2021) identifies that it does not contain specific policies for NSIPs. These are determined in accordance with the decision-making framework in the Planning Act

2008 (as amended) and relevant NPS for major infrastructure, as well as any other matters that are relevant (which may include the NPPF). While EN-1 and EN-5 remain the prime decision-making documents, where they do not provide guidance, each chapter will consider whether there is important and relevant guidance in the NPPF that may require consideration by the decision-making authority.

2.6.10 The NPPF states that ‘*Great weight should be given to conserving and enhancing landscape and scenic beauty in... AONB, which have the highest status of protection in relation to these issues... The scale and extent of development within all these designated areas should be limited while development within their setting should be sensitively located and designed to avoid or minimise adverse impacts on the designated areas*’ (MHCLG, 2021, paragraph 176).

2.6.11 The Government’s Planning Practice Guidance (PPG) web-based resource was launched in February 2014 and is updated by the MHCLG as necessary. This consists of a number of separate PPGs (with different dates) that provide guidance across different topics, including EIA, flood risk, historic environment and natural environment. The latter states in paragraph 42:

‘Land within the setting of these areas [AONBs] often makes an important contribution to maintaining their natural beauty, and where poorly located or designed development can do significant harm. This is especially the case where long views from or to the designated landscape are identified as important, or where the landscape character of land within and adjoining the designated area is complementary. Development within the settings of these areas will therefore need sensitive handling that takes these potential impacts into account’ (MHCLG, 2019c).

2.6.12 At this stage, it is not possible to confirm if such secondary guidance will be considered important or relevant by the Secretary of State, and it is therefore included for completeness to allow the Secretary of State to make such a determination.

Holford Rules

2.6.13 Guidelines on overhead line routing were first formulated in 1959 by Sir William, later Lord, Holford, as advisor to the Central Electricity Generating Board. Holford developed a series of planning guidelines in relation to amenity issues, that have subsequently become known as the ‘Holford Rules’ and remain a valuable tool in selecting and assessing potential route options as part of the options appraisal process. A summary of the Holford Rules can be found in Table 2.1. These have been an important consideration during the development of the Draft Alignment and whether certain sections should be undergrounded. The Holford Rules are also expressly considered as part of NPS EN-5.

Table 2.1: The Holford Rules

Rule	Description
Rule 1	Avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the first line in the first place, even if the total mileage is somewhat increased in consequence.
Rule 2	Avoid smaller areas of high amenity value, or scientific interests by deviation; provided that this can be done without using too many angle towers, i.e. the more massive structures which are used when lines change direction.

Rule	Description
Rule 3	Other things being equal, choose the most direct line, with no sharp changes of direction and thus with fewer angle towers.
Rule 4	Choose tree and hill backgrounds in preference to sky backgrounds wherever possible; and when the line has to cross a ridge, secure this opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where it does not, cross directly, preferably between belts of trees.
Rule 5	Prefer moderately open valleys with woods where the apparent height of towers will be reduced, and views of the line will be broken by trees.
Rule 6	In country which is flat and sparsely planted, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, so as to avoid a concentration or 'wirescape'.
Rule 7	Approach urban area through industrial zones, where they exist; and when pleasant residential and recreational land intervenes between the approach line and the substation, go carefully into the comparative costs of the undergrounding, for lines other than those of the highest voltage.

Horlock Rules

- 2.6.14 National Grid devised the Horlock Rules in 2003, and these were subsequently updated in 2006. The Horlock Rules provide guidelines for the siting and design of new substations, or substation extensions, to avoid or reduce the environmental effects of such developments. In summary, like the Holford Rules, they facilitate consideration of environmental and amenity considerations within the design and siting of new substation infrastructure. These were considered during the identification of potential locations for the proposed GSP substation. Further details can be found in the Project Development Options Report (National Grid, 2022).

2.7 Local Planning Policies

- 2.7.1 As set out in Section 2.5, the NPS are the primary basis for decision-making, but the Secretary of State must also have regard to any other matters which they think are both important and relevant to the decision, and this could include local planning policies. Therefore, local planning policies have also been considered in the development of this PEI Report. Further information on these policies can be found within Appendix 2.1: Local Planning Policy.

2.8 National Grid Policy and Guidance

- 2.8.1 National Grid has its own policies and processes that are followed when developing projects. The key policies that are applicable to this project are as follows:
- Our Stakeholder, community and amenity policy (National Grid, 2016): This document describes the ten commitments that National Grid has made to the way that electricity and gas works are carried out in the UK. This includes setting out how National Grid will meet its amenity responsibilities and how stakeholders and communities are involved on projects.

- Our approach to Options Appraisal (National Grid, 2012b): This document describes the options appraisal process that is followed when developing new gas and electricity infrastructure projects. It follows a staged approach to the assessment and sets out the considerations when making decisions as to which option should be taken forward.

2.8.2 National Grid also has an extensive range of process and guidance documents that govern how projects are designed and implemented. Specific documents are referenced later in the PEI Report chapters where relevant.

3. SCOPING OPINION AND CONSULTATION

3.1 Introduction

3.1.1 This chapter sets out responses to the feedback from the Planning Inspectorate contained within the Scoping Opinion (Planning Inspectorate, 2021a). It also summarises the consultation that has been undertaken on the project to date, including feedback received during the 2021 meetings with statutory consultees and the comments received in response to the non-statutory engagement and the Scoping Report.

3.2 Planning Inspectorate Scoping Opinion

3.2.1 National Grid submitted the Scoping Report (National Grid, 2021b) for the project to the Planning Inspectorate on 10 May 2021. The Planning Inspectorate provided a Scoping Opinion on behalf of the Secretary of State on 18 June 2021 (Planning Inspectorate, 2021a). This included a number of items that National Grid is to consider when producing the ES and the application for development consent.

3.2.2 Table 3.1 summarises the key points raised within the Scoping Opinion and how National Grid has or intends to address these points. National Grid has tried to address these points at PEI Report stage where information is available. Otherwise, comments will be addressed within the ES. Points raised in relation to specific ES technical assessments are summarised and responded to in the relevant technical chapter of this PEI Report.

Table 3.1: General Items Raised in the Scoping Opinion

Reference from Scoping Opinion/ Aspect	Comment in the Scoping Opinion	Project Response
1.2-1.3 Consultation	The ES should demonstrate consideration of the points raised by the consultation bodies.	The ES will include a table summarising the scoping responses from the consultation bodies and how these have been addressed.
2.3.1-2.3.5 Description of the Proposed Development	Further details are to be provided about the temporary and permanent works including construction compounds, accesses and methods.	Chapter 4: Project Description provides further details. Further details will also be provided in the Project Description chapter of the ES.
2.3.7 Decommissioning	The Inspectorate considers that a high-level environmental assessment of the decommissioning of the project should be provided in the ES. This should include the estimated timescales for the life span of the project and the process and methods of decommissioning.	Further details regarding the life span of the project and a high-level assessment of decommissioning are included within Chapter 4: Project Description. The high-level environmental assessment concludes that there would be no new or different significant effects compared to those identified in the chapter assessments during construction. This will be updated, as required, and included within the ES.

Reference from Scoping Opinion/ Aspect	Comment in the Scoping Opinion	Project Response
2.3.8-2.3.10 Alternatives	The Inspectorate would expect the ES to provide details of the reasonable alternatives studied and the reasoning for the selection of the chosen option(s), including a comparison of the environmental effects. This should include consideration of how much of the cable is overhead line and how much is undergrounded.	The Project Development Options Report (National Grid, 2022) provides a summary of the options considered to date including the proposed location of the CSE compound at Dedham Vale East and the routing of the underground cables at Dollops Wood. A summary of the main alternatives considered will be presented within the ES.
2.3.11-2.3.13 Flexibility	The Applicant should make every attempt to narrow the range of options and the ES should explain which elements of the project have yet to be finalised, e.g. the number of new/replacement pylons and their locations, and the LoD for the new overhead line and underground cable.	The design will continue to be refined through the EIA process, reducing the number of options under consideration. The ES will define the LoD and will describe the parameters that are/are not fixed, such as indicative pylon locations. Further details on the project's approach to flexibility can be found in Chapter 4: Project Description and Chapter 5: EIA Approach and Method.
3.1-3.2, 3.35, 3.3.11, 3.312 Scope of the Assessment	The ES (and HRA) should provide reference to how the delivery of measures proposed to prevent/reduce adverse effects is secured and whether relevant consultation bodies agree on the measures proposed. The ES should also describe any proposed monitoring of significant adverse effects.	The ES will include a list of the measures proposed to prevent/reduce adverse effects. This will include the proposed securing mechanisms and any required monitoring. National Grid will seek to agree the measures and monitoring through further consultation and engagement with relevant consultees. This process will be recorded within the relevant Statements of Common Ground.
3.3.9 Residues and emissions	The EIA Regulations require an estimate, by type and quantity, of expected residues and emissions produced during the construction and operation phases, where relevant.	Chapter 4: Project Description summarises the expected residues and emissions produced during the construction and operation phases. These are assessed within the relevant assessment chapters. Further details will be provided within the ES.
3.3.10 Waste	The ES should include an estimate of the quantities of waste that are likely to be produced during construction, operation and decommissioning and the ES should assess the impact where this is likely to give rise to significant effects.	Chapter 4: Project Description summarises the types of wastes that the project is expected to produce during the construction, operation and decommissioning phases. Further details will be provided within the ES.

Reference from Scoping Opinion/ Aspect	Comment in the Scoping Opinion	Project Response
3.3.13-3.3.14 Risks of major accidents and/or disasters	The Applicant should make use of appropriate guidance (e.g. Advice Note 11) to better understand the likelihood of an occurrence and the project's susceptibility to potential major accidents and hazards.	Advice Note 11 (Planning Inspectorate, 2017c) has been referenced when undertaking the scoping assessment for Major Accidents and Disasters, along with other appropriate guidance. The updated information is provided in Appendix 3.1.
3.3.15 Climate and climate change	The ES should include a description and assessment (where relevant) of the likely significant effects the project may have on climate (e.g. having regard to the nature and magnitude of greenhouse gas (GHG) emissions and the vulnerability of the project to climate change.	Chapter 1: Introduction summarises the need case for the project and shows how it is supporting the UK's transition to net zero. Details of the likely construction materials have been included within Chapter 4: Project Description. The ES will contain a simple estimate of the GHG emissions associated with the construction phase of the project and potential opportunities to save carbon. Appendix 3.1 sets out how the project is designed to withstand extreme climate events and the Flood Risk Assessment (FRA) at application will set out the project's vulnerability to climate change.
3.3.16 Climate and climate change	The ES should describe and assess the adaptive capacity that has been incorporated into the project, e.g. designs that are more resilient to risks from climate change.	Chapter 4: Project Description sets out how the project is resilient to climate change. Further details will be provided within the ES. Appendix 3.1 sets out how the project is designed to withstand extreme climate events and the FRA at application will set out the project's vulnerability to climate change.
3.3.17-3.3.20 Transboundary Effects	The Inspectorate is not aware that there are potential pathways of effect to any European Economic Areas but recommends that the ES should include an up-to-date Transboundary Screening Matrix	An up-to-date Transboundary Screening Matrix will be provided within the ES.

Socio-Economics, Recreation and Tourism

- 3.2.3 The Scoping Report (National Grid, 2021b) set out the scoping assessment for Socio-economics, Recreation and Tourism (Chapter 15 of the Scoping Report). The Scoping Report assessed the potential for likely significant effects for different aspects, including potential effects on job creation and the availability of a local workforce, effects on tourism and recreation and amenity and also on navigation.
- 3.2.4 The Scoping Report concluded that the project would be unlikely to result in significant effects for any of the individual aspects within the Socio-economics, Recreation and Tourism chapter, when taking into account the embedded and good practice measures.

However, the scoping assessment acknowledged that there could be likely significant effects when these aspects are considered cumulatively across EIA chapters (intra-project) and in combination with other proposed developments (inter-project).

- 3.2.5 The EIA Regulations only require an assessment of the likely significant effects within an ES and the decision-making process. Therefore, in accordance with a proportionate approach to the assessment, National Grid proposed that a standalone Socio-economics, Recreation and Tourism chapter should be scoped out of the ES but that aspects would be considered within the cumulative effects assessment (CEA), where these have the potential to result in a significant effect.
- 3.2.6 The Scoping Opinion (Planning Inspectorate, 2021a) broadly agreed with the scoping out of aspects in relation to Socio-economics, Recreation and Tourism as a standalone chapter but identified that further information was required in some areas to support this conclusion. These specific comments are presented in Table 3.2 along with a response to indicate how and where this would be addressed in the ES or other documentation.

Table 3.2: Matters Raised in the Scoping Opinion on Socio-economics, Recreation and Tourism

Reference/Aspect	Comment in the Scoping Opinion	Project Response
4.10.3 Electromagnetic Disturbance	The Inspectorate agrees that this matter can be scoped out of the ES on the basis that the design of the project is compliant with relevant legislation and a Certificate of Conformity will be produced. The ES should explain how any effects attributable to the project would be addressed during operation.	The provisions of the current Electromagnetic Compatibility (EMC) Directive (EU Directive 2014/30/EU) are met through using good engineering practice and applying the relevant technical standards. In addition, the EMC performance of the existing system has been certificated as compliant by a Competent Body following appropriate on-site testing. Therefore, the project would present no issues with television or radio interference under normal operating conditions. This will be reconfirmed within the ES and a separate document outlining compliance will be submitted as part of the application for development consent.
4.10.4-4.10.5 Socio- economics, recreation and tourism	It is noted that the baseline conditions presented in the Scoping Report utilise some historic data from 2017–2019; it is understood that there is more recent data available, which should be reviewed as part of the preparation of the ES to confirm that there are no likely significant effects.	National Grid has reviewed the references provided by consultees in response to the Scoping Report. Two additional sources are referenced by Babergh and Mid Suffolk District councils in their scoping response. One was used for the Scoping Report and the other draws on the same VisitEngland 2016 data. Socio-economics, recreation and tourism data relating to 2020 are not

Reference/Aspect	Comment in the Scoping Opinion	Project Response
4.10.6 Effects on the local economy during construction	The Inspectorate notes that the project may source construction materials and supplies locally, which could have an impact on the local economy. The Inspectorate acknowledges the likelihood of it generating significant effects in this matter is low. However, limited information is presented about the current value of this sector and the likely contribution of the project to it. Further information should be provided to conclude that this matter would not give rise to significant effects.	currently available. In addition, 2020 would be considered an anomalous year given COVID-19 restrictions and how this affected the tourism sector. The ES will include any appropriate updated baseline data.
4.10.14-4.10.15 Effects to planning and development during construction and operation	The ES should confirm whether there is potential for significant effects in respect of potential future access to any land falling within the Mineral Safeguarding Areas (MSA) as designated in the Essex Minerals Local Plan. If there are no likely significant effects, the Inspectorate therefore agrees that this matter can be scoped out of the ES.	Effects relating to MSA is assessed within Chapter 10: Geology and Hydrogeology. The initial assessment presented within this PEI Report indicates that there are no likely significant effects to minerals. Further details will be presented within the ES.
4.10.16 Effects on access to community services	It would be beneficial if the ES could include confirmation of the number and capacity of healthcare facilities within the study area.	A list of healthcare facilities and their capacity is included in Appendix 15.1: Cumulative Effects Supporting Information. This will also be provided within the ES.
4.10.20 Water based navigation during construction	The Inspectorate agrees that it is unlikely that works to install the trenchless crossing at the River Stour would result in significant effects to recreational users and navigation. However, the Inspectorate does not consider that sufficient information has been provided to confirm this conclusion, and the ES should include information about the number, type and frequency of users, and any closures or restriction of access that would be required and, if so,	Chapter 4: Project Description includes details about the proposed trenchless crossing at the River Stour. The ES will contain further details about the number, type and frequency of users based on desk-top sources. The project does not intend to restrict access to the River Stour for navigation.

Reference/Aspect	Comment in the Scoping Opinion	Project Response
	when these would be scheduled to understand the impact.	
4.10.23 Community service providers	<p>The information presented on community facilities appears to be inconsistent with the baseline described in other chapters, e.g. air quality.</p> <p>The ES should present a consistent description of the baseline and where any additional community facilities are identified that could be subject to likely significant effects, these should be scoped into the ES.</p>	Appendix 15.1: Cumulative Effects Supporting Information, describes the community facilities within or adjacent to the draft Order Limits. This list will be updated as required and included within the ES and consistency checked with other chapters, such as air quality.

3.2.7 The updated Socio-economics, Recreation and Tourism baseline information is presented in Appendix 15.1: Cumulative Effects Supporting Information, as it would be providing baseline information supporting the CEA, as set out in the Scoping Report (National Grid, 2021b). The ES will include any further updated baseline information and will also refresh the scoping assessment to reconfirm whether any likely significant effects are likely to result from the updated data. It is anticipated that there would be no likely significant effects and that Socio-economics, Recreation and Tourism will remain scoped out of the ES as a standalone chapter.

Health and Wellbeing

3.2.8 The Scoping Report (National Grid, 2021c) set out the scoping assessment for Health and Wellbeing (Chapter 16 of the Scoping Report). The Scoping Report concluded that the project was unlikely to result in significant effects, when taking into account the embedded and good practice measures.

3.2.9 The Planning Inspectorate agreed that effects relating to electromagnetic fields (EMF) could be scoped out of the assessment, on the basis that the project will comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines and DECC (now BEIS) Codes of Practice (see Scoping Opinion ID 4.11.1 and 4.11.2). This will be evidenced in a separate document submitted with the application for development consent.

3.2.10 The Scoping Report concluded that in relation to general health and wellbeing, the effects are related to contributory factors already considered by other environmental chapters of the ES. No likely significant effects were identified during operation, and this was proposed to be scoped out. The Planning Inspectorate agreed with this conclusion.

3.2.11 Many of the potential effects on health and wellbeing relating to construction can be found in the individual chapters, for example Chapter 13: Air Quality and Chapter 14: Noise and Vibration. Signposting to the relevant chapters is included in Appendix 15.1: Cumulative Effects Supporting Information, along with additional baseline information requested within the Scoping Opinion (Planning Inspectorate, 2021 a).

3.2.12 Where there is potential for an intra-project effect from the project (i.e. where a receptor is potentially affected by more than one source of environmental impact resulting from the same development) during construction, this will be considered within the intra-project

CEA (see Chapter 15). Therefore, the Scoping Report concluded that health and wellbeing would not require separate reporting in the ES.

- 3.2.13 The Scoping Opinion (Planning Inspectorate, 2021a) made some specific comments to be considered within the ES. These are presented in Table 3.3 along with a response to indicate how and where this would be addressed in the ES or other documentation.

Table 3.3: Matters Raised in the Scoping Opinion on Health and Wellbeing

Reference/Aspect	Comment in the Scoping Opinion	Project Response
4.11.3 Health and Wellbeing during operation	The Inspectorate notes that the relevant sections of the Scoping Report have concluded that there are no likely significant effects to human (health) receptors from the project during operation. The Inspectorate considers that a standalone assessment of health and wellbeing during operation is not required on that basis.	Noted; no standalone assessment of health and wellbeing during operation will be provided within the ES. Potential for effects relating to human health will however still be considered in the ES chapters (e.g. noise and air quality).
4.11.4 Scope of the assessment	The Inspectorate notes that impacts of the project during construction on human health receptors will be assessed as part of separate EIA chapters. The Scoping Report states that where there is potential for intra-project (and inter-project) effects on a human health receptor, that this will be assessed as part of the CEA.	The ES will consider those impacts which could potentially result in a likely significant effect on health receptors during the construction phase in the separate chapters (e.g. noise and air quality). The CEA will assess for the potential for intra-project (and inter-project) effects on a human health receptor.
4.11.5 Baseline conditions	Limited information is presented in the Scoping Report regarding the baseline for health and wellbeing within the study area. The ES should include a description of the baseline for health and wellbeing by reference to appropriate data sources such as general population data, environmental information and health status, cross referencing to data contained elsewhere in the ES where appropriate.	Appendix 15.1: Cumulative Effects Supporting Information provides a combined baseline assessment for health and wellbeing and for socio-economics, recreation and tourism, as many of the data sources overlap. It also contains the signposting to the relevant EIA chapters, which assess the effects on human health. This information will be included within the ES.

Major Accidents and Disasters

- 3.2.14 The Scoping Report (National Grid, 2021b) set out the scoping assessment for Major Accidents and Disasters (Chapter 17 of the Scoping Report). The Scoping Report concluded that there were unlikely to be significant effects in relation to either the vulnerability of the project to a major accident or disaster, or as a result of the project

causing a major accident or disaster. The Planning Inspectorate agreed with this conclusion (reference 4.12.1 and 4.12.2). However, the Planning Inspectorate noted that two major hazard pipelines had not specifically been considered and that an updated scoping assessment should be included within the ES to support this conclusion.

- 3.2.15 National Grid has reviewed the location of the two major hazard pipelines. The first is to the west of Hintlesham Hall in the overhead line Section AB: Bramford Substation/Hintlesham, and the second is located in the underground cable section near to the Stour Valley East CSE Compound in Section G: Stour Valley. The second pipeline was specifically noted in paragraph 17.5.6 of the Scoping Report, although as a high-pressure gas main rather than specifically as a major accident hazard pipeline.
- 3.2.16 The presence of services, including high-pressure gas mains, was considered as part of the 'Human error (buried strike to existing buried services)' line within Appendix 17.1 of the Scoping Report. However, for clarity, Appendix 3.1 to this PEI Report updates the baseline to specifically note the two major hazard pipelines and also provides an update to the scoping assessment to include a specific line regarding risk of service strike to a major hazard pipeline. This appendix will also be reviewed as part of the EIA process as the project progresses and included within the ES.

3.3 Consultation with Environmental and Planning Organisations

Overview

- 3.3.1 National Grid undertook non-statutory consultation in spring 2021. The feedback from the consultation and the project response to the key themes are summarised in the Non-statutory Consultation Report (National Grid, 2021c).
- 3.3.2 To avoid overlap and duplication with the Non-statutory Consultation Report, this section focuses on the consultation that has been undertaken with environmental organisations, through specific consultee workshops and thematic meetings. It also considers the key comments received in response to the Scoping Report. These are discussed by topic in the subsections below.

Landscape and Visual

- 3.3.3 Initial meetings have been held with the local planning authorities, Dedham Vale AONB and Stour Valley Partnership, and Natural England. National Grid has set up thematic meetings for landscape and visual to seek consistent agreement between the relevant consultees.
- 3.3.4 A key response received from a number of consultees, including the Dedham Vale AONB and Stour Valley Partnership and Suffolk County Council, was a request to treat the Stour Valley as if it was designated as an AONB for the purposes of the assessment. The Stour Valley is not currently designated, although it is included within the Dedham Vale AONB and Stour Valley Management Plan (Dedham Vale AONB and Stour Valley Project, 2016b). In addition, an application has been submitted to Natural England to extend the Dedham Vale AONB to include parts of the Stour Valley, although National Grid has been advised that there is not yet a proposed extension boundary. This may be decided prior to submission of the application for development consent.
- 3.3.5 As the Stour Valley is not currently designated, and there is no proposed extension boundary plan or timetable for this to occur, within the assessment it has been assumed to be currently not designated; this is in accordance with the advice of Natural England.

Relevant parts of the Stour Valley will be assessed as part of the setting of the Dedham Vale AONB and any significant beneficial and adverse effects reported in the ES. However, National Grid recognises that the Stour Valley has '*similar picturesque landscape qualities to Dedham Vale*' (Land Use Consultants, 2018) and this has led to a commitment being made to underground cables through a large portion of the Stour Valley. National Grid recognises that the Stour Valley forms an important part of the setting of Dedham Vale AONB and this is considered as part of the wider setting of the existing designated area.

- 3.3.6 A further general landscape and visual comment raised by a number of consultees was regarding the importance of identifying representative viewpoints, seeking an explanation as to how these would be chosen and requesting that these are agreed with the local planning authorities. The method for selecting representative viewpoints was presented in Appendix 6.3 of the Scoping Report (National Grid, 2021b). Representative viewpoints have been agreed with the local planning authorities and Dedham Vale AONB and Stour Valley Partnership.
- 3.3.7 Table 3.4 summarises the other key points raised about the potential landscape and visual effects and assessment of the project.

Table 3.4: Landscape and Visual Non-statutory Consultation

Matter Raised	Forum and Date	Project Response
Essex County Council		
Request further details of the substation located at a site known as 'Wickham Plateaux'.	Non-statutory consultation May 2021	The location and proposals regarding the GSP substation are provided within Chapter 4: Project Description.
Requested information on, and assessment of, the impact due to maintenance of the underground sections of the project.	Non-statutory consultation May 2021	Information on maintenance is provided within Chapter 4: Project Description. The proposed maintenance activities are assessed within each topic chapter in the PEI Report.
Dedham Vale AONB and Stour Valley Partnership		
National Grid, as a statutory undertaker, will need to present how it has had regard to the AONB in the options appraisal and designs. The assessment should include an assessment of project impacts on the Natural Beauty and Special qualities of the AONB and Stour Valley Project Area.	Non-statutory consultation May 2021	National Grid will present how regard has been given to the AONB in the Planning Statement submitted with the application for development consent. The ES (particularly the landscape and visual assessment) will consider the project impacts on the Natural Beauty and Special qualities of the AONB and Stour Valley Project Area.
The project should give great weight to the Dedham Vale AONB and Stour Valley Management Plan. The assessment should set out how the	EIA Scoping Response June 2021	The assessment has, and will continue to, take account of the Dedham Vale AONB and Stour Valley Management Plan. The project will continue to work with Dedham Vale AONB and Stour Valley Partnership to identify opportunities

Matter Raised	Forum and Date	Project Response
proposals will support delivery of the Management Plan.		to support the delivery of the Management Plan, e.g. through the delivery of biodiversity net gain.
Any assessment of landscape effects on the Special Landscape Areas (SLA) should draw on evidence from the relevant Landscape Character Assessments that cover each of the SLA.	EIA Scoping Response June 2021	The assessment has and will continue to take account of the relevant Landscape Character Assessments. Further information is available in Appendix 6.1: Landscape and Visual Baseline.

Suffolk County Council

The sensitivity of receptor groups and components of the receiving landscape will need to be agreed upon with relevant consultees prior to the EIA being undertaken.	EIA Scoping Response June 2021	The sensitivity of visual receptor groups has been discussed with the relevant consultees. The methodology for identifying sensitivity was set out in the Scoping Report and is based on the Guidelines for Landscape and Visual Impact Assessment 3 (GLVIA3) (Landscape Institute and Institute of Environmental Management and Assessment (IEMA), 2013).
Given the scale and repetitive nature of this project in its design and layout, combined and sequential visual effects are likely to occur in some locations. These will need to be identified and assessed.	EIA Scoping Response June 2021	Combined and sequential effects will be considered within the ES as part of the landscape and visual assessment and where relevant, also within the CEA.

Natural England

The EIA should detail the measures to be taken to ensure the building design will be of a high standard, as well as detail of layout alternatives together with justification of the selected option in terms of landscape impact and benefit.	EIA Scoping Response June 2021	The proposed designs are described within Chapter 4: Project Description. The Project Development Options Report (National Grid, 2022) describes the alternatives considered and the justification for the chosen option, including the landscape impact and benefit.
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Biodiversity

- 3.3.8 Initial meetings have been held with the local planning authorities, Dedham Vale AONB and Stour Valley Partnership, and Natural England. National Grid has set up thematic meetings for biodiversity to seek consistent agreement between the relevant consultees.
- 3.3.9 A number of consultees stated that the project should seek to enhance the environment, for example delivering biodiversity net gain (BNG). National Grid has committed to delivering 10% BNG and is working with consultees through the thematic meetings to identify specific locations. The proposals for BNG will be presented as part of the application for development consent.

- 3.3.10 A number of consultees have requested information about the approach to surveying for habitats and protected species. The project set out its scope of surveys within the Scoping Report (National Grid, 2021b). These followed good practice guidelines for each survey type. National Grid is seeking agreement of the survey scope with Natural England, as the Competent Authority and protective species licence grantor. The final methodologies will be presented at the ecology thematic meetings. In addition, National Grid has agreed with Natural England to use a District Level Licence approach to great crested newts (see Chapter 7: Biodiversity for further detail).
- 3.3.11 Table 3.5 summarises the key points raised during consultation in relation to potential biodiversity effects and assessment of the project.

Table 3.5: Biodiversity Consultation

Matter Raised	Forum and Date	Project Response
Essex County Council		
The project should provide sufficient information on non-significant impacts to protected and priority species and habitats, and appropriate mitigation and compensation measures should be provided.	EIA Scoping Response June 2021	The ES will report on likely significant effects to protected and priority species and habitats and any required mitigation and/or compensation measures. A Legislation Compliance Report will be included within the ES setting out the legal compliance measures for protected species.
Underground provision should not disproportionately adversely affect designated sites or other protected and priority species and habitats.	EIA Scoping Response June 2021	The effects to designated sites were considered as part of options appraisal and routing. The likely effects to designated or other protected and priority species and habitats are reported in Chapter 7: Biodiversity.
Suffolk County Council		
The ecological mitigation hierarchy of avoid, mitigate, compensate, enhance should be employed.	EIA Scoping Response June 2021	The ES will include an assessment of habitats and species. This will employ the mitigation hierarchy.
The assessment should consider potential impacts on: watercourses; groundwater flows; ecological connectivity; the robustness of existing habitats; and the extent and mechanisms for mitigation, compensation, and enhancement.		The ES will report likely significant effects (and any required mitigation) to watercourses, groundwater, ecological connectivity and existing habitats. It will also set out how the project proposes to deliver 10% BNG.
Natural England		
The works on-site and near to Hintlesham Woods' new section of overhead line, could damage or destroy the SSSI's interest features if avoidance and mitigation	Non-statutory consultation May 2021	Ecological surveys are being undertaken at Hintlesham Woods SSSI to help inform the designs and construction method at this location. National Grid is working with Natural England and the Royal Society for the Protection of Birds

Matter Raised	Forum and Date	Project Response
measures are not suitably adopted, both during and post construction.		(RSPB) to understand the potential effects on interest features. Two options are presented at Statutory Consultation to seek feedback on what happens at this location. The preferred option will be assessed in the ES.
Impacts to Dollops and other Ancient Woodland along the route or adjacent to the project, should be considered in line with paragraph 180 of the NPPF, and apply Natural England and the Forestry Commission Standing Advice in relation to ancient woodland and ancient and veteran trees.	Non-statutory consultation May 2021	As a result of the non-statutory consultation responses and further design work, National Grid is no longer proposing works within or next to Dollops Wood. National Grid is following the Standing Advice and is seeking to maintain a 15m buffer from ancient woodland where practicable. Any likely significant effects to ancient woodland will be assessed in the ES.
Biodiversity receptors which could experience a likely significant effect as a result of the project should not be identified by arbitrary distances, they should be identified by the consideration of any potential impact pathways.	EIA Scoping Response June 2021	The Scoping Report has used distances to guide data collection and to set survey areas. However, the assessment presented within the ES will be based on potential impact pathways.
The biodiversity assessment should consider: <ul style="list-style-type: none"> • increased height of pylons on bird collisions; • lighting during construction and operation; and • dust effects on sensitive ecological receptors. 	EIA Scoping Response June 2021	These matters are considered within Chapter 7: Biodiversity.
The GSP substation between Butler's Wood and Waldegrave Wood would likely fragment the woodland and mitigation should look at increasing connectivity between the woodlands.	Meeting June 2021	The two woodlands are currently separated by an area of arable field. National Grid has committed to undertake planting to help reconnect the two areas of woodland to the west of the proposed GSP substation (see Chapter 4: Project Description).
Natural England has confirmed that draft protected species licences will be required at application in order to secure the Letters of No Impediment (LONI).	Meeting June 2021	Draft European Protected Species (EPS) licences will be provided to Natural England as part of the application for development consent and will be used to secure the LONI.

Matter Raised	Forum and Date	Project Response
Environment Agency		
<p>If open cut methods are used at main rivers for the underground cable sections; appropriate surveys would need to be undertaken, including fish surveys, and the timing of works agreed in locations where trenching is proposed for the underground cable sections. The project should also seek to agree a plan for re-instatement and opportunities to improve habitat.</p>	<p>Non-statutory consultation May 2021</p>	<p>National Grid is proposing a trenchless crossing at the River Stour and an open cut option at the River Box in the underground sections (see Chapter 4: Project Description).</p> <p>National Grid is continuing to work with the Environment Agency to agree the details and scope of surveys and timings required at open cut crossings.</p> <p>Watercourse crossing methods would be agreed through the Flood Risk Activity Permits.</p>
Royal Society for the Protection of Birds		
<p>Requested details of construction activities in Hintlesham Woods, including timing of works, working areas and construction methods.</p>	<p>Meeting June 2021</p>	<p>Details of proposals within Hintlesham Woods SSSI are provided within Chapter 4: Project Description. Two options are presented at Statutory Consultation to seek feedback on what happens at this location. The preferred option will be assessed in the ES.</p>

Historic Environment

- 3.3.12 Initial meetings have been held with the local planning authorities (including the County Archaeologists) and Historic England. National Grid has set up thematic meetings for the historic environment to seek consistent agreement between the relevant consultees.
- 3.3.13 National Grid presented the proposals for archaeological evaluation on the project at a thematic meeting in May 2021 and with the Essex County Archaeologist (also acting on behalf of Suffolk County) in September 2021. National Grid has outlined its proposed strategy to archaeological evaluation based on the feedback from these meetings in Appendix 8.2: Archaeological Framework Strategy.
- 3.3.14 Both Essex and Suffolk County Councils requested that the project undertakes an assessment of geoarchaeological and palaeoenvironmental potential. National Grid has commissioned a study looking at the geoarchaeological and palaeoenvironmental potential within the study area. The results of this work and any recommendations will be included in the ES.
- 3.3.15 Table 3.6 summarises the key points raised during consultation in relation to the potential historic environment effects and assessment of the project.

Table 3.6: Historic Environment Consultation

Matter Raised	Forum and Date	Project Response
Essex County Council		
The EIA should include an assessment of the effects due to changes to groundwater, such as drying out of archaeological features and the potential for physical impacts to historic buildings.	EIA Scoping Response June 2021	These matters are considered within Chapter 8: Historic Environment.
The assessment of setting should follow the process set out within GPA3 (The Setting of Heritage Assets) and should fully consider all the attributes of setting and the attributes of the proposal which could impact the significance of heritage assets. The assessment of setting should also cross-reference viewpoints within the LVIA to aid in the assessment.	EIA Scoping Response June 2021	The ES will present the assessment on setting of heritage assets and will include consideration of heritage viewpoints to aid the presentation of the assessment. This will cross-reference to viewpoints within the Landscape and Visual Impact Assessment (LVIA) as appropriate.
Suffolk County Council		
Historic hedgerow assessments should be undertaken to see if directional drilling can be used to preserve them.	EIA Scoping Response June 2021	National Grid is undertaking habitat surveys to identify the Important Hedgerows (including those meeting the historic criteria) to understand the number of hedges and their locations. The ES will present the potential effects to these and any proposed mitigation.
Protected lanes should form part of the dataset for consideration as part of this scheme.	EIA Scoping Response June 2021	These have been considered and further details can be found in Chapter 8: Historic Environment.
Historic England		
Key views from the Hintlesham Hall should be considered to aid in the best placement of the second line of pylons to minimise the visual harm. Landscape mitigation measures to screen the pylons from view of Hintlesham Hall should work with elements of the known historic landscape and aim to restore these elements where possible.	Non-statutory consultation May 2021	An initial mitigation plan is being developed following a site visit to Hintlesham Hall, including suitable placement of vegetation planting to work with the existing elements within the historic landscape; this will be presented to Historic England and their feedback sought.

Matter Raised	Forum and Date	Project Response
The ES should report the impacts on Grade II listed buildings and non-designated features of historic, architectural, archaeological or artistic interest.	EIA Scoping Response June 2021	Grade II listed buildings and non-designated heritage assets are considered in Chapter 8: Historic Environment.
The assessment of setting should be a matter of qualitative and expert judgement which cannot be achieved solely by use of systematic matrices or scoring systems (i.e. within Design Manual for Roads and Bridges (DMRB) Guidance).	EIA Scoping Response June 2021	The assessment presented within the ES will be based on matrices that are fully supported by technical and qualitative judgement to explain the overall conclusions.
The EIA should use the ideas of benefit, harm and loss, as set out in the NPPF, to lay out 'what matters and why' in terms of the heritage assets' significance and setting, together with the effects of the development upon them.	EIA Scoping Response June 2021	The assessment presented within the ES will use the ideas of benefit, harm and loss when describing the effects of the project on heritage assets and their setting.

Water Environment, Geology and Hydrogeology

- 3.3.16 National Grid has set up thematic meetings for the water environment (including hydrogeology) to seek agreement between the relevant consultees including the Environment Agency and the Lead Local Flood Authorities (LLFA).
- 3.3.17 National Grid has committed to producing a FRA, which will identify any required measures to reduce increases to flood risk during both construction and operation. This will consider flooding from both surface water and fluvial flooding (see Chapter 9: Water Environment for details). The consultees have also requested information to be provided on construction and operational drainage proposals. Current details are described in Chapter 4: Project Description and further details will be added to the equivalent chapter within the ES.
- 3.3.18 Table 3.7 summarises the key points raised about the potential water environment, geology and hydrogeology.

Table 3.7: Water Environment, Geology and Hydrogeology Consultation

Matter Raised	Forum and Date	Project Response
Essex County Council		
A Mineral Resource Assessment (MRA) is required as part of application. This should be prepared using the Pan-European Standard for Reporting of Exploration Results, Mineral Resources and Reserves Standard	Non-statutory consultation May 2021	A standalone MRA is not proposed for the project, as this is considered to be disproportional to the level of effect from the project and is also not a requirement of NSIPs. However, the impacts on minerals have been considered and included in Chapter 10: Geology and Hydrogeology and will also be assessed within the ES.
Suffolk County Council		
The Scoping Report has missed some water environment features/datasets: <ul style="list-style-type: none"> • Drinking Water Protected Areas; • Drinking Water Safeguard Zones; and • Groundwater Vulnerability Map. 	EIA Scoping Response June 2021	These datasets have been considered as part of the baseline presented within Chapter 9: Water Environment and Chapter 10: Geology and Hydrogeology.
Environment Agency		
The upper end allowance should be assessed for climate change in the fluvial Flood Zone 3a. There will be an update to these allowances (due in July 2021).	Non-statutory consultation May 2021	The updated peak river flow allowances are not relevant to the project given that all permanent above ground infrastructure would be located in Flood Zone 1. The climate change allowances were published in July 2021. The allowance for rainfall intensity did not change (still at 40%) This will be adopted within the operational drainage design. Further information will be available in the FRA submitted with the ES.
The Environment Agency would want to see and agree the method statement, including the proposed mitigation measures such as flows and pollution controls, safety and emergency procedures, and timing of works, for the open cut crossings in the cable sections.	Non-statutory consultation May 2021	Commitment W01 in Appendix 4.1: Outline CoCP states all works within main rivers or ordinary watercourses will be in accordance with a method approved under environmental permits issued under the Environmental Permitting Regulations or the protective provisions of the DCO for the benefit of the Environment Agency and the LLFA.
Section D of the project appears to go over Layham Quarry Authorised Inert Landfill. The project should consider the location of the	Non-statutory consultation May 2021	The existing overhead lines currently cross Layham Quarry Authorised Inert Landfill. The likely effects due to the project interaction with the landfill with regard to pollution risk are

Matter Raised	Forum and Date	Project Response
overhead lines in relation to pollution risk from this landfill.		considered within Chapter 10: Geology and Hydrogeology. Further information will be provided in the ES.
The project traverses Source Protection Zones (SPZ) 2 and 3. Directional drilling and cable jointing should consider the risk to both surface water and groundwater.	Non-statutory consultation May 2021	Impacts on SPZ2 and SPZ3 are considered within Chapter 10: Geology and Hydrogeology. Further information will be provided in the ES.
All groundwater abstractions along the cable excavations should be identified. A Hydrogeological Impact Assessment and additional mitigation may be required for any shallow abstraction identified within close proximity to the cable excavations.	EIA Scoping Response June 2021	The effects on existing groundwater abstractions are assessed in Chapter 10: Geology and Hydrogeology. Further information will be provided in the ES.
The EIA should assess the potential for adverse effects from drilling mud break out at locations of trenchless crossings.	EIA Scoping Response June 2021	The Outline Construction Environmental Management Plan (CEMP) will set out measures to reduce the risk of mud break out from drilling and will also set out the emergency measures that would be put in place should this occur.
The trenchless crossing of the Stour will only be acceptable if it can be undertaken without adverse impact on groundwater quality or flow.	EIA Scoping Response June 2021	The effects on groundwater quality and flow are assessed in Chapter 10: Geology and Hydrogeology.
Where open cut crossings are made to watercourses, we would expect significant river corridor enhancements to be carried out to leave the section of river in a better state after the cable laying.	EIA Scoping Response June 2021	Commitment GG07 in Appendix 4.1: Outline CoCP states that land used temporarily will be reinstated where practicable to its pre-construction condition and use. The methods will be approved under environmental permits issued under the Environmental Permitting Regulations or the protective provisions of the DCO for the benefit of the Environment Agency and the LLFA.

Traffic and Transport

- 3.3.19 Initial meetings have been held with the local planning authorities and National Highways (formerly Highways England). National Grid has set up thematic meetings for traffic and transport to seek agreement between the relevant consultees.
- 3.3.20 A Transport Assessment will be produced to support the application for development consent. The Transport Assessment will include the proposed construction access routes and will assess the effects of the construction traffic on the local and strategic road networks. The Transport Assessment will include estimates of the construction traffic numbers and also the vehicles associated with the construction workforce. An Outline Construction Traffic Management Plan (CTMP) will be produced as part of the application

for development consent. This will set out proposed construction routes, traffic management measures and any good practice or additional mitigation measures.

3.3.21 Table 3.8 summarises the key points raised during consultation in relation to potential traffic and transport effects and assessment of the project.

Table 3.8: Traffic and Transport Consultation

Matter Raised	Forum and Date	Project Response
Essex County Council		
Request the plan for final routing to the development site and information pertaining to the management of the rural road network safely and efficiently during the construction phase.	Non-statutory consultation Response May 2021	The indicative construction routes are shown on Figure 12.2. The effects on the rural road network are assessed with Chapter 12: Traffic and Transport.
Requested construction vehicle standards be provided for consultation.	Thematic Meeting March 2021	Appendix 4.1: Outline CoCP contains commitment GG12 which relates to vehicle standards.
Requested a five-year assessment of traffic collisions be made.	Thematic Meeting March 2021	A five-year assessment of traffic collisions will be used for the Transport Assessment. However, the data relating to 2020/21 is unlikely to be representative due to the COVID-19 pandemic. Therefore, the data will be discussed with the relevant Highways Authority, to confirm whether it should be used as part of the ES baseline.
Any potential impacts on residents and their amenity due to transformer and other heavy goods delivery made at night along the route will need to be considered in any assessment.	EIA Scoping Response June 2021	The need for night movements of construction vehicles will be discussed with the relevant Highways Authority. Potential significant effects will be considered within the ES along with any proposed mitigation.
Request clarifications on source of impact magnitude.	EIA Scoping Response June 2021	The impact magnitude thresholds are based on similar projects and have been discussed with relevant Highways Authorities at the Traffic and Transport thematic meetings.
Suffolk County Council		
Request that the project make a commitment that the contractor does not exceed traffic volumes assessed in the ES.	Thematic Meeting March 2021	The Outline CTMP will set out appropriate measures that would be put in place to manage effects relating to traffic during construction.
Expect that survey/evidence of walkers, cyclists, and horse riders (WCH) should be used to support the assessment.	Thematic Meeting March 2021	WCH Surveys have been conducted during September and October 2021 and the results will be presented within the ES.

Matter Raised	Forum and Date	Project Response
Impacts to Public Rights of Way (PRoW) during construction must be adequately mitigated. There has been increased use of the PRoW network and enhancements to the network may be needed to offset impacts.	Non-statutory consultation May 2021	Chapter 4: Project Description sets out the current assumptions regarding PRoW during construction. Commitment TT03 in Appendix 4.1: Outline CoCP states that all designated PRoW crossing the draft Order Limits will be managed with access only closed for short periods while construction activities occur. Any required temporary diversions will be clearly marked at both ends with signage explaining the diversion, the duration of the diversion and a contact number for any concerns.
Request that sustainable alternatives are considered such as transportation of construction materials by sea or rail where possible and use of electric vehicles	Thematic Meeting March 2021	Alternative transport options are limited due to the rural nature of the area and lack of port, rivers, canals and mainline railways close to the draft Order Limits. This is discussed further within Chapter 12: Traffic and Transport.
The categorisation of the sensitivity of links should be agreed upon with the relevant Highways Authority. This should include a plan showing the links identified for the assessment and the proposed sensitivity of these links.	EIA Scoping Response June 2021	National Grid is seeking to agree the sensitivity of links through the Traffic and Transport thematic meetings. The agreed links will be presented on a plan supporting the Transport Assessment.
The proposed method for determining sensitivity is not agreed, as it reflects a highway scheme and not the traffic for a construction project. IEMA guidance should be used as a starting point, taking into consideration LA112, but it will require further discussion.	EIA Scoping Response June 2021	The construction traffic effects of the proposed reinforcement are similar to the construction of a linear road project. Therefore, LA 112 (Highways England <i>et al.</i> , 2020e) is considered to be a suitable assessment method, particularly as this is more up to date than the IEMA guidance (1993).

General Environment

3.3.22 Table 3.9 summarises the general points raised on other aspects of the environment through the non-statutory consultation and responses to the Scoping Report.

Table 3.9: General Environment Non-Statutory Consultation

Matter Raised	Forum and Date	Project Response
Natural England		
The EIA should quantify the likely extent of the impacts on soils and agricultural land including best and most versatile (BMV) agricultural land.	EIA Scoping Response June 2021	A survey is being undertaken to assess the quality and locations of BMV. The results of this survey will be presented within the ES.

Matter Raised	Forum and Date	Project Response
The project has the potential for significant adverse effects on soil during construction due to large scale soil removal, handling and storage, trafficking etc. The effects on soil should be assessed within the ES, both in terms of the impact of the development on BMV agricultural land and on the identified soil resources present and their associated delivery of ecosystem services.	EIA Scoping Response June 2021	The likely effects on soils and agricultural land, including BMV agricultural land and ecosystem services has been assessed and quantified in Chapter 11: Agriculture and Soils. Appendix 4.1: Outline CoCP contains a number of commitments regarding the protection and reinstatement of soil.
A detailed Agricultural Land Classification (ALC) survey is required to assess the land use implications of a proposed development where significant amounts of agricultural land are involved, in line with national planning policy and the NPS.	EIA Scoping Response June 2021	Locations that would have a permanent loss of soil will be subject to targeted soil and ALC surveys, in accordance with published guidelines (Ministry of Agriculture, Fisheries and Food, 1988). The results will be presented within the ES.
Essex County Council		
The project should prepare an appropriately detailed waste management strategy through a Site Waste Management Plan to address waste management issues.	Non-statutory consultation May 2021	Commitment GG21 in Appendix 4.1: Outline CoCP states that a Materials and Waste Management Plan will be produced. An outline version will be provided with the application for development consent.
Further discussions are required to better understand the magnitude of impacts, in particular the spatial extent and duration of effect that are used to derive the corresponding magnitude. As currently described, the ES is likely to underreport and underestimate potential localised impacts of significant duration. A better acknowledgement of the longevity of the temporary construction period is required.	EIA Scoping Response June 2021	Chapter 4: Project Description describes the spatial extent and duration of the project. These parameters have been used when assessing the likely significant effects within the ES chapters.
Alternatives should be appraised having regard to the respective socio-economic, transport and environmental effects alongside consideration of operational requirements. The ES should clearly articulate how alternatives have been evaluated in a balanced way.	EIA Scoping Response June 2021	The options appraisal process and consideration of alternatives, including reasons for selection of the options is presented in the Project Development Options Report (National Grid, 2022). A summary of the alternatives will also be presented in the ES.
The Scoping Report proposes to limit the consideration of associated developments to a 10km radius to assess cumulative impacts. Due to the increase in major developments and NSIPs within the region it is considered	EIA Scoping Response June 2021	Further justification for the study area is presented in Chapter 15: Cumulative Effects. Following the Scoping Opinion, National Grid will scope back in NSIPs up to 50km but will retain 10km for

Matter Raised	Forum and Date	Project Response
that this should be extended to 50km to correctly assess the development as here proposed on the wider area.		major applications for the reasons set out within Chapter 15: Cumulative Effects.

3.4 Next Steps

- 3.4.1 National Grid will continue to engage with the relevant consultees through the thematic meetings and additional targeted discussions where applicable. National Grid intends to submit Statements of Common Ground with key organisations in the Examination process. These will summarise the engagement undertaken and the matters that have been agreed through the consultation activities.

4. PROJECT DESCRIPTION

4.1 Introduction

- 4.1.1 This chapter sets out the emerging project description for the project that would be constructed and operated subject to an order granting development consent. This chapter presents the current proposals, which have developed as a result of the ongoing engineering design, landowner discussions, environmental assessment, and also feedback received during the non-statutory consultation in May 2021. The design will continue to evolve based on the feedback received during the Statutory Consultation and further ongoing environmental and design work. The final assessed design will be presented in the application for development consent.
- 4.1.2 As noted in Section 1.3, the Project Development Options Report (National Grid, 2022) presents the alternatives that were considered previously, as well as the changes considered as a result of the non-statutory consultation.
- 4.1.3 This chapter is split into the following sections:
- Section 4.2, An Overview of the Project: This gives an overview of the project's key features and describes the embedded and good practice measures built into the project, and areas of BNG;
 - Section 4.3, A Description of Each Section of the Project: This describes each section of the project (i.e. Section AB Bramford Substation/Hintlesham to Section H GSP Substation). It describes the geographical location of key project features;
 - Section 4.4, PEI Report Assumptions: This describes the current project assumptions that have been used for undertaking the preliminary assessment presented within this PEI Report, including construction programme, working hours, estimated construction workforce, number of vehicles and working methods;
 - Section 4.5, Good Design Principles: This describes the good design principles that have and will be taken regarding the design process including reducing use of raw materials and waste generation. It also sets out how the project has been designed to be resilient to climate change;
 - Section 4.6, Temporary Features (During Construction): This describes how the project would be constructed including the temporary work features, e.g. site compound and haul routes;
 - Section 4.7, Permanent Features (During Operation): This describes the permanent features of the project that would be in place during operation;
 - Section 4.8, Operation and Maintenance: This describes the activities that are anticipated during the operation stage including site inspections and routine maintenance; and
 - Section 4.9, Decommissioning: This describes what would happen once the project reaches the end of its design life and/or was no longer required.
- 4.1.4 This chapter should be read alongside the General Arrangement Plans (Figure 3.2 in the statutory consultation material) and it is accompanied by the following figure and appendix:
- Figure 4.1: Hintlesham Woods Options; and

- Appendix 4.1: Outline CoCP.

4.2 Overview of the Project

Introduction

- 4.2.1 This section gives an overview of the project's key features and describes the embedded and good practice measures built into the project, and areas of BNG.

General Overview

- 4.2.2 The Bramford to Twinstead 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 400kV electricity transmission line over a distance of approximately 29km.
- 4.2.3 The reinforcement would comprise of approximately 19km of overhead line, consisting of up to 55 new steel-lattice pylons (approximately 50m tall) and aluminium conductors (the line part). There would also be approximately 10km of underground cable system, consisting of up to 20 cables (comprising 18 transmission cables and two fibre cables) with associated joint bays and above ground link pillars.
- 4.2.4 CSE would be required to facilitate the transition between the overhead and underground cable technology. There would be four CSE; one at the end of each underground cable section, i.e. Dedham Vale East, Dedham Vale West, Stour Valley East and Stour Valley West. Each CSE would be within a fenced compound, and contain electrical equipment, support structures, a small control building and a permanent access track.
- 4.2.5 It is proposed that approximately 27.5km 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 2.5km of the existing 400kV overhead line to the south of Twinstead Tee). To facilitate the overhead line removal, a new GSP substation is required, and this is proposed at Butler's Wood, east of Wickham St Paul, in Essex. The proposed GSP substation would include two super grid transformers (SGT) 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.
- 4.2.6 As noted in Chapter 1: Introduction, the GSP substation is currently taken into account in this PEI Report, however, National Grid is also considering the option of applying for planning permission for the GSP substation under the Town and Country Planning Act in advance of submission of an application for development consent (see Section 1.1 for details).
- 4.2.7 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 the existing 400kV overhead line;
 - temporary land to facilitate construction activities including 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 including bellmouths for site access, pylons and overhead line

diversions, scaffolding to safeguard existing crossings, watercourse crossings and diversions of PRow;

- 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 BNG.

4.2.8 Further details on the key features associated with construction and operation can be found in Section 4.6 and 4.7 respectively.

Embedded and Good Practice Measures

4.2.9 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. The Project Development Options Report (National Grid, 2022) provides a summary of the options appraisal undertaken to date, including how the project has considered National Grid’s duties and environmental appraisal work in the project decisions.

4.2.10 National Grid has also embedded measures into the design of the project to avoid or reduce significant effects that may otherwise be experienced during construction and operation of the project. Embedded measures are those that are intrinsic to and built into the design of the project. Table 4.1 outlines the key embedded measures that have been incorporated into the design to date.

4.2.11 The design of the project will be continually reviewed in line with assessment work and consultation feedback as it progresses to the final design. The environmental assessment will continue to influence the design, whereby measures may be embedded into the design, to help avoid and reduce significant effects arising from the project. Table 4.1 will be updated in the ES to document any further embedded measures that have been developed and that are considered as part of the final design presented in the ES.

Table 4.1: Embedded Measures

Embedded Measures	Benefits
Whole Project/Route	
The project has committed to delivering 10% BNG.	This commitment means that the project will deliver a net improvement to biodiversity . This may be reported separately outside of the ES to avoid overlap or double counting of any required EIA mitigation.
Approximately 25km of the existing 132kV overhead line would be removed between Burstall Bridge and Twinstead Tee.	The project provides the opportunity to remove the existing 132kV overhead line, for a large proportion of the corridor.
The project would include triple Araucaria conductors 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 the best design for reducing the effects of line crackle (corona discharge) and would avoid

Embedded Measures	Benefits
The project would be designed in accordance with National Grid design standards and will be compliant with the guidelines and policies relating to EMF stated in NPS EN-5 (DECC, 2011b), including the ICNIRP guidelines (1998).	the generation of noise from the proposed overhead lines during operation.
The project would 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 projects.	Compliance with these guidelines and policies mean that the project will already have designed out potential effects from EMF to a level to meet health and safety standards.
Full tension line gantries are proposed at three of the proposed CSE compounds (not Stour Valley East).	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.
Full tension line gantries are proposed at three of the proposed CSE compounds (not Stour Valley East).	This removes the need for five terminal pylons across the project and associated impacts, particularly in relation to landscape and visual.
Section AB Bramford Substation/Hintlesham	
Pylons would be positioned, where practicable, to reduce effects on the key views from Hintlesham Hall.	Detailed discussions have taken place with Historic England both prior to project pause in 2013, and since project re-commencement to discuss the location of pylons in relation to the setting of Hintlesham Hall. These discussions are ongoing and will be presented in the ES as part of the embedded measures at this location.
The new 400kV overhead line would reuse the existing pylons at Hintlesham Woods SSSI (Option 1).	This would reduce loss of ancient woodland and interested features associated with the footprint of the project.
The new 400kV overhead line pylons would be positioned outside of Hintlesham Woods SSSI (Option 2).	This would reduce loss of ancient woodland and interested features associated with the footprint of the project.
Section C Brett Valley	
Scaffolding and netting would be used during construction for the conducting works over Hadleigh Railway Walk PRow.	This would maintain safe access for users of the PRow during construction works at this location.
Section D Polstead	
The design allows for an area of landscape planting around the CSE compound at Dedham Vale East.	National Grid has included land within the draft Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This will

Embedded Measures	Benefits
	reduce effects on views and on the setting of the Dedham Vale AONB.
Section E Dedham Vale AONB	
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 less overhead line within the landscape in Section E than the current baseline.
Section F Leavenheath/Assington	
Standard landscape planting has been included around the CSE compound at Dedham Vale West.	National Grid has included land within the draft Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This will reduce effects on views and on the setting of the Dedham Vale AONB.
Section G Stour Valley	
Approximately 2.5km of the existing 400kV overhead line would be removed to the south of Twinstead Tee.	The project provides the opportunity to remove the existing 400kV overhead line through parts of Section G: Stour Valley.
The project includes a section of underground cable through Section G (Stour Valley).	The Stour Valley, although not designated, is a valued landscape and has similar features to Dedham Vale AONB. It is also considered that parts of the Stour Valley are within the setting of Dedham Vale AONB. With the proposed underground cable and the removal of the existing 132kV overhead line, the project would result in one less overhead line within the most sensitive areas of the Stour Valley crossed by the project.
Standard landscape planting has been included around the CSE compound at Stour Valley East.	National Grid has included land within the draft Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This will reduce effects on views and the landscape character of the Stour Valley.
A trenchless crossing is proposed at the River Stour.	A trenchless crossing would avoid disturbance to the river habitats and geomorphological features and would also reduce disruption to recreation users such as canoeists.
A temporary bailey bridge would be provided to raise the haul route up over the river during construction, to accommodate small river craft using the river during construction.	The natural river would not be impeded, and flow can be maintained to avoid any reduction in capacity of the channel and changes to flows during construction. The temporary bailey bridge would allow construction access across the river but maintain passage for small river craft (e.g. kayaks) to reduce impacts on recreation.

Embedded Measures	Benefits
The draft Order Limits have been widened at the crossing of the River Stour where they cross the floodplain to accommodate soil storage and gaps in soil stockpiles.	The gaps in the stockpiles will prevent floodwater from being impeded and reduce the risk of flooding during construction, where works take place within the functional floodplain.
Standard landscape planting has been included around the CSE compound at Stour Valley West.	National Grid has included land within the draft Order Limits for landscape planting around the CSE compound to filter and soften views of the electrical infrastructure. This will reduce effects on views and the landscape character of the Stour Valley.

Section H GSP Substation

The GSP substation would include a noise enclosure around the transformers and this is built into the designs presented.	The noise enclosure is a good practice design measure that would provide a barrier around the transformers and reduce the noise levels at the boundary of the site.
Standard landscape planting has been around the GSP substation.	The landscape planting would help to soften views towards the GSP substation and reconnect the two separate blocks of ancient woodland.

- 4.2.12 An Outline CoCP has been developed setting out the good practice measures that will be undertaken on the project. This can be found in Appendix 4.1 and will continue to be updated where required. A final version will be included as part of the application for development consent and would be secured through a requirement within the DCO.

Environmental Mitigation and Biodiversity Net Gain

- 4.2.13 The EIA will identify locations where mitigation may be required to avoid or reduce likely significant effects. This would include, but not be limited to, landscape and visual mitigation such as tree planting and reinstatement of hedgerows.
- 4.2.14 In addition, as part of the proposals, National Grid has made a commitment to delivering a 10% BNG on this project (see Table 4.1). The Environment Act 2021 includes a requirement for NSIPs to deliver at least 10% biodiversity gain. The consultation draft of NPS EN-1 (Department for Business, Energy and Industrial Strategy also states that *‘although achieving biodiversity net gain is not an obligation for projects under the Planning Act 2008, energy NSIP proposals should seek opportunities to contribute to and enhance the natural environment by providing net gains for biodiversity where possible’*. Therefore, National Grid is working with appointed technical specialists, environmental organisations and landowners to identify potential opportunities for delivering areas of BNG, and where practicable also linked to wider environmental gains such as recreation improvement.
- 4.2.15 Preliminary areas identified for potential mitigation and BNG (called ‘Environmental Areas’) have been identified through a desk-based search and habitat condition survey site visits. These are shown on the General Arrangement Plans in Figure 3.2 of the statutory consultation material and are described in Table 4.2.

4.2.16 As further baseline data is collected, and initial discussions take place with consultees and landowners, the Environmental Areas will be refined. In addition, the biodiversity baseline will be quantified during the EIA and design process using the Biodiversity Metric 3.0 (Defra, 2021d). This information will be used to calculate the loss in biodiversity units as a result of construction of the project, as well as the number of biodiversity units which will need to be created to achieve a 10% BNG. This will also determine the land required to achieve those gains on the project. Therefore, some of the Environmental Areas may not be taken forward and others may only require minor enhancements such as hedgerow improvements rather than works to the whole Environmental Area. Final proposals will be included as part of the application for development consent.

Table 4.2: Preliminary Environmental Areas Identified For Mitigation and Enhancement

Environmental Area	Description	Reason for Considering This Location
Section AB Bramford Substation/Hintlesham		
ENV01 South of Bramford Substation	Land providing opportunities for biodiversity and landscape and visual mitigation and/or enhancements.	Mitigation planting/hedgerow thickening (either by natural regeneration or planting) may be beneficial to help filter and screen views of the project for PRow users. In addition, enhancement planting along the watercourse may enhance the experience of users of PRow and improve habitat connectivity.
ENV02 Hintlesham Hall	Area identified for proposed planting for heritage, biodiversity and landscape and visual mitigation and/or enhancements.	Hintlesham Hall was historically set in an area of parkland with a tree lined avenue leading from the hall through the former parkland. The former parkland has largely been eroded and put over to agricultural use. Mitigation planting could include planting thin strips of land adjacent to the driveway and strengthening planting around the pond to the north. In addition, enhancement planting along the historical avenue could help improve and enhance the parkland outside of the house to reflect the original design intent.
ENV03 Hintlesham Woods (North)	Area identified for biodiversity and landscape and visual purposes, situated to the north of Hintlesham Woods.	The area is adjacent to the SSSI, ancient woodland and RSPB reserve. There is the potential to use natural regeneration to establish planting to help filter and screen views. This would also help extend the existing habitats and improve habitat connectivity.
ENV04 Hintlesham Woods (West) to Wolves Wood	Area identified for biodiversity and landscape and visual purposes, situated to the northwest of Ramsey Wood and	The area is adjacent to the SSSI, ancient woodland and RSPB reserve. Mitigation planting may be beneficial to help filter and screen views of the project. In addition, enhancement planting/natural regeneration would help extend the existing habitats and enhance the habitat connectivity in the landscape. This also supports an

Environmental Area	Description	Reason for Considering This Location
	extending up towards Wolves Wood.	aspiration from RSPB to reconnect habitats in Hintlesham Woods and Wolves Wood.
ENV05 Hintlesham Woods (South)	Area identified for biodiversity and landscape and visual purposes, situated to the southwest of Ramsey Wood.	Mitigation planting/hedgerow strengthening may be beneficial to help filter and screen views, especially where the overhead lines converge. In addition, enhancement planting/ natural regeneration could provide an opportunity to strengthen field boundaries, extend existing habitats, enhance habitat connectivity and enhance the experience of users of PRoW.
ENV06 Townhouse Fruit Farm	Area identified for biodiversity and recreation purposes near Hadleigh Railway Walk.	There is also an opportunity to enhance existing habitats at this location and to enhance PRoW connections with Hadleigh Railway Walk.

Section C Brett Valley

ENV07 Brett Valley	Area identified for biodiversity and landscape and visual purposes at the River Brett.	Grassland regeneration of the watercourse and wetland habitats.
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Section D Polstead

ENV08 Dedham Vale East	Area identified for biodiversity and landscape and visual purposes at the CSE compound.	Land would be used for landscape planting to soften the effects of the Dedham Vale East CSE compound and to mitigate habitat loss.
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Section E Dedham Vale AONB

ENV09 River Box	Area identified for biodiversity and landscape and visual purposes at the River Box.	Enhancement planting would provide an opportunity to improve habitat connectivity with existing habitats between Broom Hill and Bushy Park Wood, both identified as ancient woodland. There is also an opportunity to enhance habitats along the River Box.
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Section F Leavenheath/Assington

ENV10 Dedham Vale West	Area identified for biodiversity and landscape and visual purposes at the CSE compound.	Land would be used for landscape planting to soften the effects of the Dedham Vale West CSE compound and to mitigate habitat loss. Enhancement planting would provide an opportunity to improve habitat connectivity between two disjointed parts of Millfield Wood, identified as ancient woodland.
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Environmental Area	Description	Reason for Considering This Location
ENV11 The Painters Trail.	Length of the Painter's Trail identified for both landscape and visual and historic environment purposes.	The Painter's Trail is a 69 mile (111km) long cycle trail across the region, linking sites with associations with famous artists. There is an opportunity to plant strategically positioned trees/hedgerows to soften and filter views of the project from the trail where this lies within or adjacent to the draft Order Limits.
Section G Stour Valley		
ENV12 Stour Valley East	Area identified for biodiversity and landscape and visual purposes at the CSE compound.	Land would be used for landscape planting to soften the effects of the Stour Valley East CSE compound and to mitigate habitat loss.
ENV13 Stour Valley West	Area identified for biodiversity and landscape and visual purposes at the CSE compound.	Land would be used for landscape planting to soften the effects of the Stour Valley West CSE compound and to mitigate habitat loss. In addition, enhancement planting could provide an opportunity to improve habitat connectivity between Pebmarsh House County Wildlife Site (CWS) and south of Alphamstone Complex CWS.
Section H GSP Substation		
ENV14 GSP Substation	Area identified for biodiversity and landscape and visual purposes at the GSP substation site.	The GSP substation is situated between Butler's Wood and Waldegrave Wood, both of which are ancient woodland and Essex CWS. Enhancement planting could provide an opportunity to reconnect the two woodlands, as well as providing landscape and visual screening to the PRoW to the west of the GSP substation.

4.3 Description of Each Project Section

Introduction

- 4.3.1 This section describes the geographical location of key project features in each of the seven sections of the project (i.e. Section AB Bramford Substation/Hintlesham to Section H GSP Substation).

Section AB Bramford Substation/Hintlesham (Overhead Line)

- 4.3.2 The proposed network reinforcement would start at the existing National Grid substation at Bramford. There are proposed ancillary works at Bramford Substation, including the installation of new shunt reactors to maintain the electrical operating parameters of the 400kV network and gantry structures to connect the overhead line into the substation. This work would take place within the boundaries of National Grid's operational land. This work would be undertaken under National Grid's permitted development rights and does not form part of the application for development consent.

- 4.3.3 The proposed 400kV overhead line would tie into the existing substation on the western boundary. This will require realignment of the existing 400kV overhead line and a new angle pylon, near Hill Farm to connect into Bramford Substation. The existing 400kV overhead line to the northeast 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 southwest from Bramford Substation to an 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.

Draft Alignment Options at Hintlesham Woods

- 4.3.5 National Grid is consulting on two options at Hintlesham Woods. These are both assessed within this PEI Report and are shown on Figure 4.1. The draft Order Limits encompass the working area required for both options, to allow flexibility for efficient delivery. Once a preferred option is selected, the draft Order Limits will be refined and the final Order Limits will be presented within the application for development consent. The two options being considered are:
- Hintlesham Woods Option 1 (as consulted on during the non-statutory consultation): The proposed 400kV overhead line would use the route and existing pylons of the 400kV overhead line through the woods, and the existing 400kV overhead line would be re-routed around to the north and west of the woods on newly constructed pylons. If this option was chosen, the total length of the project would be approximately 29km and would involve up to 55 new pylons. This option requires a section of approximately 700m of temporary overhead line, supported by temporary pylons for the duration of construction. There will also be a requirement for the modification of two existing pylons and the replacement of one pylon. As work would be required to the existing 400kV overhead line, it would require some components to be constructed during planned outages. The construction programme for this option would be approximately 12–18 months. Some visits would need to be undertaken in bird nesting season due to the timing of the required outages. The working area within the woods along the route of the existing 400kV overhead line would be approximately 40m wide. During operation, the swathe would be maintained at a reduced canopy height to avoid vegetation interfering with the overhead lines (as per the existing maintenance regime for the existing line);
 - Hintlesham Woods Option 2 (having regard to feedback raised during the non-statutory consultation this option is being explored): The proposed 400kV overhead line would parallel the existing 400kV overhead line to the south, with pylons located outside of the woodland and the conductors oversailing the woods. If this option was chosen, the total length of the project would be approximately 28km and would involve up to 52 new pylons. The two new pylons outside of the woodland could be up to 60m tall to accommodate the longer span length required to oversail the woodland. As this would not involve works to the existing 400kV overhead line, it would not be constrained by outage windows. Therefore, the construction programme would be significantly shorter than Option 1, and would allow for works to be conducted outside of bird nesting season. It is proposed that the Order Limits during construction within Hintlesham Woods would be up to 70m wide and would require a new swathe through the trees. During operation, both lines would be maintained at a reduced canopy height to avoid

vegetation interfering with the overhead lines (as per the existing maintenance regime for the existing 400kV overhead line).

- 4.3.6 Both options would involve coppicing the woodland to ground level for a width of 20m then tapering in height for a further 12.5m both sides of the overhead line (see Illustration 4.1 in Section 4.4) during construction. The works within the woodland are likely to be undertaken using light goods vehicles, such as a van.
- 4.3.7 Once to the south of Hadleigh Bee Farm, both options 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.
- 4.3.8 The existing 132kV overhead line running to the south of Hintlesham would be removed in its entirety through this section. This comprises the section between Cherryground (south of Burstall Bridge) to Hadleigh Railway Walk at the western end of Section AB. 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.

Section C Brett Valley (Overhead Line)

- 4.3.9 The proposed 400kV overhead line would run broadly parallel to the existing 400kV overhead line (which lies to the north of the proposed 400kV overhead line) between Hadleigh Railway Walk in 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)

- 4.3.10 The proposed 400kV overhead line would run broadly parallel to the existing 400kV overhead line, which lies to the north. 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.
- 4.3.11 The proposed 400kV overhead line would terminate at the proposed Dedham Vale East CSE compound, which would be located immediately west of Millwood Road, between two areas of woodland. This is a change in response to feedback received from the non-statutory consultation. Further details can be found in the Project Development Options Report (National Grid, 2022). 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 cables which run northwest from the CSE compound to the north of both Dollops Wood and Sprott's Hall to the boundary with Section E: Dedham Vale AONB at Holt Road.

Section E Dedham Vale AONB (Underground Cable)

- 4.3.12 Underground cables are proposed throughout this section (approximately 3.25km) and the existing 132kV overhead line would be removed entirely (approximately 3.1km), leaving only the existing 400kV overhead line, overhead in this section.
- 4.3.13 The underground cables would run in a southwest direction from Holt Road and to the northwest of Dollops Wood. They would pass underneath the existing 400kV overhead

line to the north of Bushy Park Wood. The underground cables would then cross the River Box using open cut techniques, before passing around the southern edge of Alder Carr and through a gap in the apple orchards at Boxford Fruit Farm. The section ends at Brick Kiln Hill on the B1068, where the cables would cross the road before turning northwest into Section F: Leavenheath/Assington.

Section F Leavenheath/Assington (Overhead Line)

- 4.3.14 The underground cables would continue from the section boundary at Brick Kiln Hill, in a northwest direction across the B1068 (Stoke Road). The cable would link with the Dedham Vale West CSE compound in the field to the northwest of Stewards Farm and a permanent access track would be constructed from Stoke Road.
- 4.3.15 The proposed 400kV overhead line would extend from the CSE compound in a southwest direction, crossing the A134 and lying to the south of the existing 400kV overhead line. The proposed 400kV overhead line changes to a more westerly direction to the east of High Road and 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)

- 4.3.16 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 track from the B1508 (St Edmund's Hill) near Dunstead Farm.
- 4.3.17 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 trenchless (drilled or bored) methods and the Sudbury Branch Railway Line would be crossed either by trenchless or open cut methods, depending on further consultation with Network Rail.
- 4.3.18 After the Sudbury Branch Railway Line, the cables would be routed across Henny Road and continue to the southwest, across St Edmunds Way PRow to Moat Lane. After crossing Moat Lane, the cables would turn again to the southwest, travelling down the steep contours of the valley between Henny Back Road and Moat Lane to connect to the Stour Valley West CSE compound between Henny Back Road and Pebmarsh Road.
- 4.3.19 Four pylons and four spans of the existing 400kV overhead line (approximately 2.5km) 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. There would also be some minor works to replace the arcing horns on the existing 400kV overhead line to the east and west of Twinstead Tee.

Section H Grid Supply Point Substation

- 4.3.20 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.

4.4 PEI Report Assumptions

Introduction

- 4.4.1 This section sets out the current project design and construction assumptions that have been used when drafting the PEI Report. It includes project-wide assumptions in relation to the construction programme, working hours, construction workforce and vehicles. It also includes assumptions associated with the working method, for example how sensitive features would be crossed. Any changes to the assumptions will be presented in the ES with the relevant assessment work updated as required.

Draft Order Limits and Limits of Deviation (LoD)

- 4.4.2 As noted in Chapter 1: Introduction, the project is an NSIP and Order Limits will be defined to encompass the land required temporarily to build the project and permanently to operate the project. The draft Order Limits include the LoD, which represent the maximum deviation for permanent infrastructure, such as the overhead line, pylons and underground cables. The LoD allow for adjustment to the final positioning of project features to avoid localised constraints or unknown or unforeseeable issues that may arise. The LoD will be defined within the ES.
- 4.4.3 The following assumptions have been made at the PEI Report stage:
- New overhead line sections: The draft Order Limits are generally 140m wide. These are based on an 80m by 80m working area around pylons (the location of which would not generally be defined at application), plus 30m LoD either side of the pylon, to allow flexibility for unforeseen circumstances and to cater for maximum conductor swing. The vertical limits of deviation would be 4m in height and could be any extent in depth underground;
 - CSE compounds and GSP substation: The draft Order Limits are shown on the General Arrangement Plans in Figure 3.2 of the statutory consultation material. The proposed works area could lie anywhere within the draft Order Limits (no defined LoD). The vertical LoD could be up to 10% higher than shown on the layout and elevation plans. The location and orientation may change anywhere within the draft Order Limits;
 - New underground cables sections: The draft Order Limits are generally 100m wide to accommodate an 80m wide working area to allow 20m flexibility for unforeseen circumstances. The draft Order Limits are wider at the trenchless crossing and other areas of constraint, to accommodate space for the additional temporary works. The underground cables (excluding the fibre optic cables) would be a minimum of 1m below ground level but could be to an unlimited depth;
 - Removal of the existing 132kV overhead lines: The draft Order Limits are generally 40m wide. There would be no LoD associated with this project component;
 - Removal of the existing 400kV overhead lines: The draft Order Limits are generally 100m wide to maintain a safe working area around each pylon. There would be no LoD associated with this project component. National Grid is seeking to refine the working area around the existing 400kV overhead lines for application.

Construction Programme

- 4.4.4 A number of different scenarios for construction phasing of the project are currently under consideration. Certain components of the project that could fall under alternative planning regimes may be consented and constructed earlier than would be the case if those parts of the project were only within the application for development consent. The construction period would be up to six years between 2022 and 2030, with differing potential start dates, depending on the different consenting approaches currently under consideration. The assessments presented in Chapters 6–15 of this PEI Report include a sensitivity analysis (generally in Section 7 of the chapter), based on an alternative start date to provide the most precautionary assessment. Further details on the phasing of the project will be set out within the ES.
- 4.4.5 While the phasing of the programme is yet to be confirmed, one of the first phases would be the construction of the GSP substation. This would need to occur prior to the removal of the existing 132kV overhead line. The duration of the civil construction activities associated with the GSP substation would take approximately six to eight months within an 18-month period. The 18-month period between commencement of construction and the start of operation of the proposed GSP substation is due to the allocated network outages associated with the temporary overhead line diversion during construction.
- 4.4.6 Further works would need to be undertaken including the replacement of the existing 400kV pylon to the north of Waldegrave Wood, removal of the 400kV temporary overhead line diversion, remaining mechanical and electrical works for the other SGT circuit and commissioning of that circuit. The exact timing of these works will be dependent on when outages can be taken.
- 4.4.7 The phases that follow construction and commissioning of the GSP substation would take approximately four years. This would firstly involve removal of the existing 132kV overhead line, as the proposed 400kV transmission line would use the same alignment in a number of locations. Installation of the new overhead line and underground cables would be undertaken following removal of the existing 132kV overhead line, and is likely to occur concurrently, with a rolling programme along the working area, enabling multiple sections to be undertaken at the same time.
- 4.4.8 Construction activities within the overhead line sections are expected to be constructed in phases, for example initial site set up, pylon construction, installation of conductors, testing and reinstatement. There may be concurrent works in different locations and there may be periods of time between phases when no works take place, for example while waiting for an agreed outage. However, some temporary features such as stone haul routes and temporary watercourse crossings may be in place for the duration of construction to maintain access to the working area and to reduce the number of heavy good vehicles (HGV) using the local road network.
- 4.4.9 The underground cables would also be constructed in phases, with the ducting potentially installed in one phase and the cables potentially pulled through the ducting at a later date. Depending on the location and conditions, approximately 100m of ducting would typically be constructed per day. Works at the trenchless crossing (River Stour) would take longer due to the number of drills required to install the cables beneath the river.
- 4.4.10 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.

Working Hours

- 4.4.11 For the purposes of the assessment in this PEI Report, it is assumed that the core working hours for construction would be:
- 07:00–19:00 Mondays to Fridays; and
 - 08:00–17:00 on Saturdays, Sundays and Bank Holidays.
- 4.4.12 The following operations may take place outside of the core working hours:
- installation and removal of conductors, cables, pilot wires and associated protection across highways, railway lines or watercourses;
 - completion of operations commenced during the core working hours which cannot safely be stopped;
 - any highway works requested by the highway authority as necessary to be undertaken outside of core working hours;
 - security monitoring and surveys;
 - testing or commissioning of any electrical plant installed as part of the authorised development;
 - trenchless crossing operations beneath highways, railway lines or watercourses;
 - the completion of works delayed or held up by severe weather conditions which disrupted or interrupted normal construction activities; and
 - deliveries of abnormal indivisible loads (AILs), for example the cable drums which may be outside of core working hours.

Assumed Construction Workforce and Vehicles for the PEI Report

Estimated Workforce

- 4.4.13 National Grid has estimated the number of workers that it would require on the project and how these would be spread across the construction programme. It assumes a reasonable worst case, that works could be undertaken in more than one section at the same time. This initial assessment indicates that the worker numbers could be up to 700 workers per day at peak (November 2027) across the project. The next highest peaks are November 2024 (during main site set up), June 2025 (when works would be taking place in a number of sections concurrently) and Dec 2027 (when the temporary works are being removed and the site reinstated), which have 420 staff per day. Otherwise, the worker numbers are predicted to generally average between 100–200 staff per day across the project for the remaining construction programme. The worker numbers are split roughly 45% on the overhead line sections and 55% on the underground cables. The GSP substation is likely to require a smaller workforce than the overhead line and underground cable sections and is estimated to be between 30 and 40 staff per day at peak.
- 4.4.14 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.

4.4.15 The numbers of workers will be reviewed as part of the ongoing design work and any final updates will be presented within the ES.

Estimated Construction Vehicles

4.4.16 National Grid has estimated the number of construction vehicles that it anticipates using on the project. The current numbers are based on a worst-case assumption, which assumes stone access roads are required throughout the overhead line sections. The current estimates assume around 300 vehicles (220 HGV and 80 light good vehicles (LGV)) per day at peak across the entire project, with between 150 and 200 vehicles per day on average.

4.4.17 The majority of vehicles movements are associated with the underground cable sections. There would also be AIL associated with the delivery of the transformers to the GSP substation and the cable drums. Further details on the current traffic assumptions, including potential construction routes, can be found in Chapter 12: Traffic and Transport. The ES will include the final traffic numbers that are estimated for the project based on the application designs.

4.4.18 A road condition assessment is being undertaken to identify the suitability of the road network for accommodating AIL and HGV. The routes are being discussed with National Highways, the local Highways Authorities at Essex and Suffolk County Councils, and the police. The ES will present details of any modifications to the road network to accommodate these vehicles.

Construction Assumptions Regarding Existing Features

4.4.19 The assessment set out within this PEI Report has made the following assumptions based on a reasonable worst-case scenario in relation to existing features, unless a specific embedded measure has been made otherwise (see Section 4.2 for details).

Practices Common to Overhead Line and Underground Cables

Land Drainage

4.4.20 Where appropriate, pre-construction field drainage would be installed within the working area to:

- help prevent possible water-logging of the working area and therefore the need for temporary dewatering during construction;
- enable the landowner's current drainage system to continue working throughout the period of construction;
- help prevent damage to the soil structure;
- aid recovery from construction activities; and
- help prevent any future drainage problems.

4.4.21 Landowners will be consulted on the design of the land drainage proposals. The design will pay particular attention to the need to reduce the risk so that the drains do not act as pathways for contamination or cause flooding off-site, consulting with the LLFA where necessary. Following construction, after regrading of the working area to reflect the original profile, a replacement drainage scheme would be installed within the working area, where appropriate.

4.4.22 A specialised drainage contractor will review the designs and provide advice to National Grid and the main works contractor during all relevant construction and reinstatement

activities. Permanent records of the land drainage locations will be made and passed to the landowners/occupiers.

Roads

- 4.4.23 During site set up, there is likely to be the need to undertake works to the bellmouth of the proposed access points (where the construction traffic would access the working area from the local road network). These works may include widening entrances to provide space for vehicle turning or trimming vegetation to improve visibility splays.
- 4.4.24 Lane closure and temporary traffic management may be required during the works to B-roads or larger. Smaller roads may require full closure with diversion routes provided. In both cases, works are likely to take up to two weeks during site set up, and a similar duration at the end to reinstate the bellmouth to the previous condition. Hedgerows and trees would be reinstated as soon as practicable, taking into account suitable planting seasons. It may be that some road works are undertaken at night to reduce impacts on local traffic. This will be discussed with the relevant Highways Authority.
- 4.4.25 National Grid is currently undertaking a baseline survey of the local road network and will discuss any required works with the relevant Highway Authority. Further details, including any proposed road closures and diversions will be set out within the Transport Assessment submitted with the application for development consent.

Public Rights of Way

- 4.4.26 National Grid has identified a number of PRoW that would be affected by construction of the project. Discussions with PRoW officers are ongoing to discuss the preferred method for managing, diverting or suspending the public right to use the respective PRoW (temporary closure). Proposed approaches are set out below, but it is recognised that specific approaches will need to be discussed with the PRoW officers for each crossing. These will be developed and are expected to be agreed ahead of the application for development consent, but in all instances would be confirmed before the works affecting the PRoW take place.
- 4.4.27 National Grid is considering four approaches for PRoW within the draft Order Limits as follows, and appropriate powers will be sought in the DCO:
- 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, a permissive diversion would be created within or adjacent to the working area (but within the draft Order Limits), while the PRoW which conflicts with the working area is 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 longer-term closure or diversion is required, specific solutions will be agreed with PRoW officers at the relevant planning authority (e.g. Essex and Suffolk County Councils).
- 4.4.28 These approaches will be considered in turn for each PRoW crossing, and, where there is a need for an alternative route then the preference would be to use nearby existing PRoW as alternative routes, as this is the safest method as it avoids the potential for

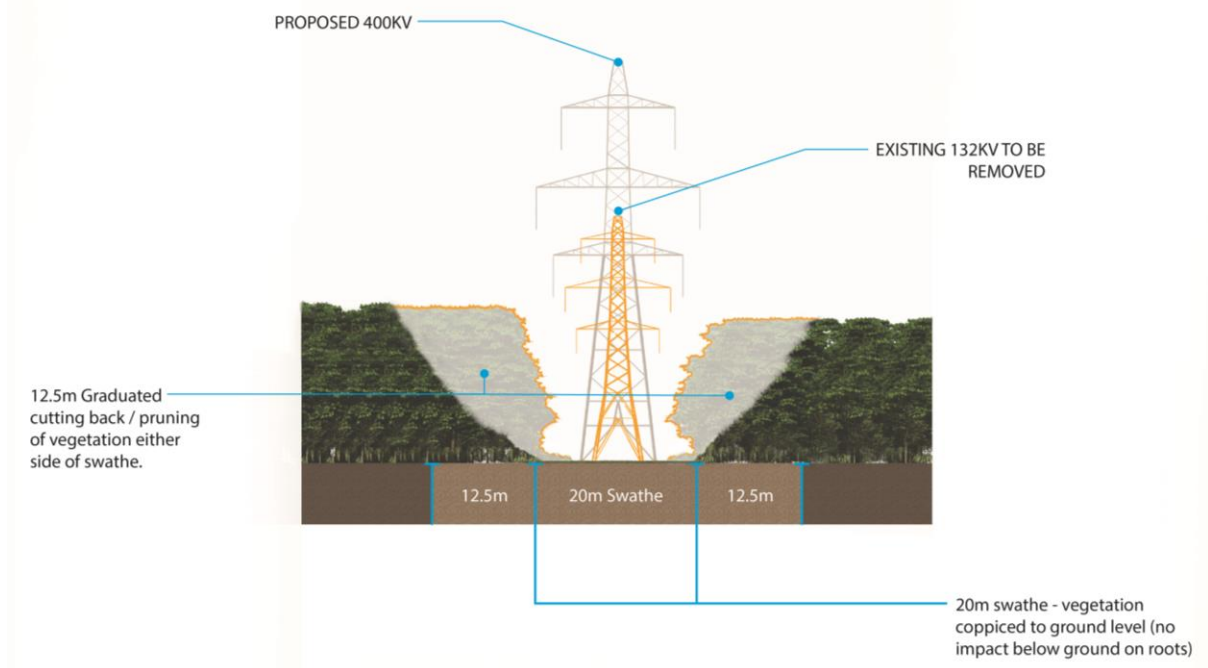
conflict with construction works and construction traffic. Where alternative routes are provided these would be signposted at strategic points on the PRow network to allow the user to follow the diversion and barriers would be erected to prevent continued use of the formal PRow for the period of the works. Following discussions with the PRow officers it may be considered that given the short-term nature of the closures and the low usage of a particular PRow a diversion either onto nearby routes or within the working width is not required. However, this would be decided on a case-by-case basis.

- 4.4.29 National Grid will endeavour to reduce impacts on PRow including reducing the duration of any closure, as far as practicable.
- 4.4.30 It is not currently envisaged that there would be a requirement to permanently stop up (extinguish) a PRow; however, should this need arise during the design evolution or changes to the design following feedback at statutory consultation, National Grid would seek powers to create a new permanent diversion.
- 4.4.31 The PEI Report assumes that Hadleigh Railway Walk would remain open during the works. Scaffolding or tunnelling would be provided to provide safety for users. It assumes that PRow within overhead line sections could be disrupted for a number of weeks and that PRow within the underground cables sections could be disrupted for up to three years.

Overhead Line (Including Removal of the 400kV and 132kV Overhead Line Woodland

- 4.4.32 For the purposes of the PEI Report, it has been generally assumed (unless otherwise stated) that woodland areas within the new 400kV overhead line sections would have a 20m swathe felled 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 construction activities and conductor swing. This is shown in Illustration 4.1. The pulling of conductors would be undertaken using a tractor.

Illustration 4.1: Sketch of 400kV Overhead Line Construction Within Woodland



- 4.4.33 For the removal of the 132kV overhead line, it is anticipated that there would be limited woodland lost and this would lie within the existing easement underneath the current overhead line. As this is within the existing easement, the area is currently regularly maintained to trim the height of the trees. Where the existing 132KV overhead line would not be replaced with the 400kV overhead line, opportunities would be sought to replant woodland areas with native species.
- 4.4.34 For the removal of the 400kV overhead line, it has been assumed that a 20m working area would be required where trees would be cut to ground level (no below ground works). As this is within the existing easement, the area is currently regularly maintained to trim the height of the trees. Once construction is complete, the woodland area would either be replanted with native species or left to regenerate naturally.

Hedgerows

- 4.4.35 For the removal of the 132kV overhead line, it is anticipated that there would be limited hedgerow lost underneath the current overhead line and this would be replaced following construction on an equivalent basis.
- 4.4.36 Where the new 400kV overhead line would cross a hedgerow, it is assumed that a 20m gap would be created to undertake the works. The hedgerow would be coppiced to ground level (no excavation of the rootzone). Once construction is complete, the hedgerow gap would be replanted.

Watercourses

- 4.4.37 A temporary bailey bridge would be required over the River Brett as part of the temporary construction haul route. This would involve excavating the banks to install the bridge. The bridge would be in place for approximately 12 months. Following construction, the bridge would be removed, and the banks would be reinstated. The proposed design and construction methodology will be discussed with the Environment Agency.
- 4.4.38 Other watercourses within the overhead line sections, including the Belstead Brook, would be crossed by the haul route using temporary culverts. Bank excavation may be necessary at these locations and, where this is required, bank reinstatement would take place following construction. A typical design and construction methodology will be discussed with the Environment Agency (for the Belstead Brook) and the LLFAs (for non-main rivers).

Roads

- 4.4.39 Where the new overhead line is to be installed across a road or where the existing 132kV overhead line is to be removed across a road, scaffolding would be used to protect the road during construction. During site set up scaffolding would be placed on either side of the road. Each scaffold would be designed for the individual crossing that it would protect. 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.
- 4.4.40 Stop and go boards would be used to manage traffic under road crossings while A-roads may require police presence. Outside of the set up and removal of the scaffold and netting, it is currently assumed that all roads within the overhead line section would remain open during the works.

Underground Cables

Woodland

- 4.4.41 For the purposes of the PEI Report, it has been assumed that woodland areas within the new underground cable sections would have an 80m swathe felled and the roots excavated to allow construction of the haul route and cable trenches. It is currently assumed that following construction, the swathe would be left to regenerate naturally and would be routinely maintained by National Grid to keep this as scrub to avoid tree roots interfering with the cables.

Hedgerows

- 4.4.42 Where the proposed cables would cross a hedgerow, it is assumed that the working area would be 80m to undertake the works. Further design work will be undertaken to consider if this could be reduced to 50m in particularly sensitive locations. Construction would include removal of the hedgerow and the roots to allow excavation of the cable trenches and haul route. Once construction is complete, the hedgerow gap would be replanted with shallow rooting hedgerow species.

Watercourses

- 4.4.43 A temporary bailey bridge would be installed across the Rivers Box and Stour as part of the temporary construction haul route along the underground sections. The River Box would involve excavating the banks to install the bridge and it would be in place for approximately three years. The bailey bridge for the River Stour would be set back 9m away from the river edge and would be of a sufficient size and design to allow existing navigation of the river by non-motorised vessels to continue during construction. The bailey bridge across the River Stour would be in place for up to two years. Following construction, both temporary bridges would be removed and the area reinstated. The proposed design and construction methodology for both river crossings will be agreed with the Environment Agency.
- 4.4.44 Smaller watercourses within the underground cable sections would use a culvert crossing for the temporary construction haul route, where water flow can continue to flow. Temporary culverts would be in place for approximately three years to allow testing to be completed. Once testing has been completed, the culvert would be removed and the channel would be reinstated to at least its pre-works condition. A typical design and construction methodology will be agreed with the LLFAs (responsible for non-main rivers).
- 4.4.45 With regards to installing the underground cable at watercourses, the River Stour (the only watercourse within the underground cable sections used for navigation) would be crossed using a trenchless method (see Section 4.6 for details). All other watercourses crossed by the underground cables would be dammed and over-pumped to create a dry working area during installation. The over-pumping would typically last a few weeks in duration, but this would depend on the size of the watercourse and the complexity of the works in any given location. A trench would be cut into the dry channel and the cables would be installed to be at least 1m below bed level. The cable swathe would be up to 80m, although works are not expected to take place along the whole length of the swathe at a single time. Once installation is complete, the banks would be reinstated and the temporary dam removed.

Roads

- 4.4.46 Traffic management would be provided at locations where the temporary construction haul route crosses the local road network, for example at Henny Road. The haul route

crossing points would be manned for the duration of the underground cable installation (up to three years). Smaller roads may be closed and diversions provided.

- 4.4.47 Where the underground cables cross a B-road, it is expected that they would be installed by excavating a trench in one lane, while the other lane remains open to traffic using 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. Given their narrow width, smaller roads are likely to require road closures with diversion routes. Installation of the cables at each road crossing (B-roads and smaller roads) is expected to last for approximately two weeks.
- 4.4.48 National Grid will discuss any traffic management, road closures and diversions with the relevant Highways Authority and the emergency services. Further details, including any proposed road closures and diversions will be set out within the Transport Assessment submitted with the application for development consent.

4.5 Good Design Principles

Introduction

- 4.5.1 This section describes the good design principles that have and will be taken regarding the design process including reducing use of raw materials and waste generation. It also sets out how the project has been designed to be resilient to climate change.
- 4.5.2 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project, including NPS EN-1 and NPS EN-5. Paragraph 4.5.1 of NPS EN-1 states:

‘The visual appearance of a building is something considered to be the most important factor in good design. But high quality and inclusive design goes far beyond aesthetic considerations. The functionality of an object — be it a building or other type of infrastructure — including fitness for purpose and sustainability, is equally important. Applying “good design” to energy projects should produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible.’
- 4.5.3 The National Grid options appraisal allows good design to be considered as part of the design process. This includes locating project features away from sensitive receptors where practicable, and considering measures that can be embedded into the design regarding the final features. Good design incorporated into the designs to date includes the lattice pylon design which is the same style as the existing 400kV overhead line and includes triple ‘Araucaria’ conductors which are regarded as practically quiet during all weather conditions (see Table 4.1).
- 4.5.4 The project will be designed, constructed and operated in accordance with applicable health and safety legislation. The project will also need to comply with design safety standards including the 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.

- 4.5.5 The project will also be designed to comply with existing National Grid standards and relevant external guidance and processes, such as the ICNIRP guidelines (1998) for reducing effects in relation to EMFs. These measures will mean that the designs will meet the functions required.

Approach to Materials and Waste

Materials During Construction

- 4.5.6 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) and the underground cables. Water would also be required for the River Stour trenchless crossing. It is currently assumed that this would be brought to site in tankers.
- 4.5.7 Sulphur hexafluoride (SF6) would also be required in the circuit breakers at the GSP substation, as is commonly used at many substations across the country. National Grid is undertaking research and development to find a suitable alternative to SF6, however, there is no suitable alternative at the present time. SF6 is a particularly potent greenhouse gas and would therefore need to be considered as part of the good design principles within the ES.
- 4.5.8 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 is 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.
- 4.5.9 Temporary materials, such as hardcore for the temporary construction haul route and site compounds, are assumed to use recycled aggregates sourced from other construction, where practicable and land restrictions allow. Work cabins and security fencing would be reused from other projects. It is assumed the hardcore, works cabins and security fencing would be reused at other construction projects after completion of construction of the project.
- 4.5.10 The main works contractor would be required to produce a Materials and Waste Management Plan (MWMP) prior to construction (see commitment GG21 in the Outline CoCP). This would document what materials are required for construction of the project and how consideration has been given to sourcing materials from secondary sources. The Outline MWMP will be submitted as part of the application for development consent.

Waste During Construction

- 4.5.11 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.
- 4.5.12 In addition to its certified Environmental Management Systems, National Grid also maintains Sustainability and Environment policies which define how projects will seek ways to use resources more efficiently through good design, use of sustainable materials, responsibly refurbishing existing assets, and reducing and recycling waste.
- 4.5.13 As noted in paragraph 4.5.9, the main works contractor would be required to produce a MWMP prior to construction. This would set out the measures proposed to reduce the generation of waste by applying the waste hierarchy:

- prevention: by designing out the need for raw materials, only ordering materials required and storing materials in a way to reduce damage;
- reuse: by reusing materials where suitable, such as reusing the stone from haul roads or reusing temporary fencing and signs;
- recycling: by segregating materials for recycling;
- other recovery: including energy recovery and composting of green waste; and
- disposal: landfill and incineration.

4.5.14 The MWMP would also identify appropriate waste facilities to dispose of materials.

4.5.15 Two of the main sources of waste would be the steel lattice pylons and aluminium conductors as a result of the removal of the existing 132kV overhead line. These would be recycled.

4.5.16 It is currently assumed that no soil would need to be removed and that any surplus soil gained from excavation of the cable trenches or foundations would be reused within the site. The exception would be if the soil were found to be contaminated, in which case, the soils would be managed in an appropriate manner, as set out in the good practice measures within the Outline CoCP.

4.5.17 Other wastes would include green waste (associated with vegetation clearance), drilling mud (associated with the trenchless crossing) and municipal waste (associated with the office and welfare facilities). These would be disposed of in accordance with the waste hierarchy noted above. Details would be provided within the MWMP, an outline version of which will be submitted as part of the application for development consent.

Materials and Waste During Operation

4.5.18 The project would require limited materials during operation, other than at the end of the design life of project components, when these would be replaced. Similarly, limited waste would be generated 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.

4.5.19 Further information regarding materials and waste will be provided within the project description within the ES.

Approach to Energy Consumption

4.5.20 During construction, the project would consume energy both in the form of power for plant and tools and fuel for construction vehicles. The project will consider measures to reduce energy consumption during construction, through using energy efficient plant and tools. The project will also consider using electricity as a form of power, over diesel, where available and practicable.

4.5.21 The CTMP will set out measures to reduce journeys, such as car sharing and using public transport where practicable. It will also set out commitments regarding using electric vehicles (subject to available charging points) or vehicles conforming with emission standards ratings (see commitment GG12 in the Outline CoCP).

4.5.22 The measures outlined above would reduce the energy consumption of the project during construction in line with the good design principles.

4.5.23 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.

Design Resilience to Climate Change

4.5.24 During construction, the project would comply with the good practice measures outlined within the Outline CoCP to reduce the risk of flooding or other extreme weather conditions associated with climate change, including commitments W02, W04, W06 and W08.

4.5.25 During operation, the project has been designed to be resilient to climate change by locating the above ground elements of the project, including the GSP substation and the CSE compounds, outside of Flood Zones 2 and 3. Further details on the resilience to climate change can be found in Chapter 9: Water Environment, along with a commitment to produce an FRA to support the application for development consent. Extreme climatic events are also assessed within Appendix 3.1, as part of the scoping assessment for major accidents and disasters.

4.5.26 Commitment W12 in the Outline CoCP states that where new, permanent areas of impermeable land cover are created, the drainage design will be in accordance with the requirements of the Essex County Council Sustainable Drainage System (SuDS) Design Guide (2020) and the Suffolk County Council SuDs Palette (2021). The drainage design will include allowances for climate change in accordance with current Environment Agency requirements. The drainage infrastructure would provide the storage necessary to achieve discharges at greenfield rates. As noted in Section 4.4, a specialised drainage contractor will review the designs, and provide advice to National Grid and the main works contractor during all relevant construction and reinstatement activities.

4.5.27 With these measures in place, the project is considered to be resilient to climate change over the project design life.

4.6 Temporary Features (During Construction)

Introduction

4.6.1 This section describes how the project would be constructed including the temporary work features, e.g. site compound and haul routes. It is split into practices common to the whole project (overhead lines and underground cables) and then for each component e.g. overhead line (including CSE compounds), underground cables and the GSP substation.

Practices Common to Overhead Line and Underground Cables

Construction Compound and Working Areas

4.6.2 There would be an element of preparatory works in anticipation of construction at all construction sites. This 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. Once secured, the working area in site compounds and along cable sections

would generally be stripped of the upper layers of soil, including separation of topsoil and subsoil to maintain soil quality during storage.

- 4.6.3 Site compounds would be established and may involve levelling of parts of the compound area to provide a flat foundation. There would be a main site compound adjacent to the A134, near Leavenheath. This would be approximately 200m x 200m and would include the site offices, welfare facilities for construction site workers, parking for cars and unloading and storage areas. The proposed main site compound is indicated on the General Arrangement Plans provided as part of the statutory consultation material. There would also be smaller satellite compounds (these would range in size between 55m x 55m to 70m x 100m), which would serve specific working areas and provide local welfare facilities for staff, and provide points for delivery of materials to the working areas. The proposed locations of these satellite compounds will be provided within the ES.

Haul Routes and Access Points

- 4.6.4 Temporary haul routes would be constructed within the working area to provide access for construction vehicles along the working area and to limit construction vehicles using the local road network. It is currently assumed that all temporary haul routes would have the topsoil stripped and hardcore placed on top of the subsoil. The exception would be temporary haul routes to access the areas where the existing 132kV overhead line is to be removed, where it is assumed that trackway would be used. National Grid is currently undertaking ground investigations, which may reduce the areas where a stone haul route is required. The results of this work and any updated assumptions would be presented in the ES.
- 4.6.5 An access point is where the construction vehicles would leave the local road network and access the draft Order Limits and temporary haul routes. Existing access points would be used where available and practicable. The current proposed access points are shown on Figure 12.1. In some locations, there is likely to be a need for new or widened accesses (bellmouths), along with localised modifications of public highways to safely accommodate construction vehicles. Site surveys are being undertaken to identify where such modifications may be required and details will be presented within the ES.

Reinstatement

- 4.6.6 Once the project has been constructed, the working areas would be removed and the site reinstated. Temporary construction haul routes (including temporary bridges and culverts) would be removed. Any widened accesses would be restored to their original condition at the commencement of the works. Temporary features such as site cabins, fencing and scaffolding would be removed and reused at other construction sites where appropriate. Any stripped topsoil would be reinstated and the site would be reinstated to its former use, subject to any planting restrictions.
- 4.6.7 Reinstatement would also include landscaping. This is likely to include reseeding grassland areas, replanting hedgerows and trees and creating any new habitat areas required as a result of BNG requirements. It would also include additional landscape planting in some areas to help screen the new infrastructure from sensitive receptors.

Overhead Line (Including CSE Compounds and Removal of Overhead Lines)

New Overhead Line

- 4.6.8 The working area (assumed to be 80m by 80m) around each new pylon would be cleared of vegetation and fenced appropriately. A temporary stone pad would be required

adjacent to each new pylon location, on which to place plant such as cranes and piling rigs (see GG23 in the Outline CoCP). Materials would be brought to site in lorries and would include the steelwork for the pylons and the conductors wrapped around large drums.

- 4.6.9 The base of the pylons would involve the excavation of the soil. Percussive piling may be required at some pylon locations, subject to the ground conditions. This will be confirmed through a programme of ground investigations which will in turn inform the foundation designs. The preliminary assessment set out in this PEI Report assumes that piling is required at all pylon locations. Further details on the need for piling and specific locations will be set out within the ES.
- 4.6.10 Premixed concrete would be used to encase the steelwork base, with the steelwork protruding from the concrete as stubs, which the pylon legs are then attached to. Temporary discharges may be required relating to dewatering and over-pumping at pylon foundations. It is assumed these would be local discharges to ground and not to watercourses.
- 4.6.11 The steelwork for the pylons would be bolted together on the ground 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. Linesmen help guide the sections into place and bolt the pylon together.
- 4.6.12 The insulators would be fastened to the pylons in preparation for installing the aluminium conductors. The conductors are usually installed in sections between tension pylons, where the line changes direction. A pulling site 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. Pilot wires are used to pull conductors between pylons. 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 wires runs along the top of the pylons and contains optical fibres to allow transmission of data around the system.
- 4.6.13 Once the overhead line is constructed, the temporary access tracks and working areas at the pylon sites would be removed and the ground reinstated to its former condition.

CSE Compounds

- 4.6.14 Four CSE compounds are proposed on the project, one at each interface between the new overhead line and the new underground cable. Construction would begin with the preparation and installation of the permanent access road to the CSE compound, which would also be used as the construction access to the rest of the site where practicable. Following this, the working area would be stripped of soil and a stone pad would be installed for the mobile crane. The terminal pylon would be constructed in a similar way to the overhead line pylon construction noted previously, with a concrete foundation and the pylon being assembled before 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.
- 4.6.15 The CSEs require a clean and controlled environment whilst being installed. Therefore, a weatherproof covered scaffold structure would be erected over the CSEs during installation. Temporary overhead lines may be required to facilitate the construction of

the CSE compounds. Once constructed, the cables would be tested using a high voltage cable testing lorry from the CSE compound.

- 4.6.16 Percussive piling may be required the CSE compounds. This will be confirmed through a programme of ground investigations which will in turn inform the foundation designs. The preliminary assessment set out in this PEI Report assumes that piling is required at all CSE compounds. Further details on the need for piling and specific locations will be set out within the ES.

Removal of Overhead Lines

- 4.6.17 The existing 132kV overhead line would be removed between the angle pylon southeast of Burstall Bridge (approximately 2.5km south of Bramford Substation) and the 132kV diamond crossing south of the existing 400kV overhead line to the south of Twinstead, a distance of approximately 25km. In addition, four spans and four 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 2.5km.
- 4.6.18 Construction activities for the removal of the overhead lines would begin with the preparation and installation of temporary access tracks to each existing pylon site. The working area around each pylon would be cleared and, where appropriate, fenced to keep the public and any livestock away from the construction work.
- 4.6.19 Fittings, such as dampers and spacers, would be removed and the conductors would be winched onto drums in a reverse of the process described for the construction of pylons. The fittings would be removed from the pylons and lowered to the ground.
- 4.6.20 Where practicable, the legs of the pylons would be cut and the pylon pulled to the ground using a tractor. If there is limited space, the pylons may be dismantled by crane, with sections cut and lowered to the ground for further dismantling or removed from site. Unless there is a compelling need for removal of the foundations in a particular area, these would be removed to approximately 1.5m below ground level, and subsoil and topsoil reinstated as has been undertaken on similar National Grid projects, such as Richborough Connection. Once the overhead line is removed, the temporary access tracks and working areas would be removed and the site reinstated to its former use.

Underground Cables

Underground Cables Standard Installation

- 4.6.21 The draft Order Limits are likely to generally be 100m wide within the underground cable sections. Within this, the working area would be approximately 80m wide with 20m to provide flexibility for site constraints during detailed design and construction. Wherever there is a particular sensitive feature or features, efforts would be made to locally reduce this width, however, the draft Order Limits widths may need to be wider in other areas to accommodate the additional soil storage. The cables would generally be buried at a depth of approximately 0.9m below ground level.
- 4.6.22 The working area would be appropriately fenced to secure the site from trespass and livestock, and the working area would be cleared of vegetation. The topsoil would be stripped and stored for reuse after installation. A temporary haul route would be installed along the length of each cable section to provide access for construction vehicles to the working area. It is assumed that the temporary haul route would generally lie within the centre of the working area to provide access to both sides of the working area.

- 4.6.23 The underground cables would be installed by open cutting a trench, within which the ducts would be laid, with the 18 cables laid in six groups made up of three cables per group plus two fibre cables. The trench surrounding the ducts would be filled with cement-based sand and a polymeric cable protection would cover the width of the trench. Topsoil and subsoil would be replaced over the top of the polymeric cable protection.
- 4.6.24 A ducted system would result in a faster construction programme, enable quicker reinstatement and reduce potential construction traffic effects when compared to an open cut method, where the trench would remain open for the duration of the works. There may be locations where ducting is not the best solution, such as where topography limits installation techniques or where ground conditions could increase risk of damaging cable sheath. In such cases, standard open cut methods would be employed. For the PEI Report is assumed that ducting would be undertaken throughout the underground sections.
- 4.6.25 The underground cables would be delivered to the working area using specialist low-loading articulated lorries. The cable would be wrapped around cable drums and a crane would 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. Depending on the cable manufacturer, joint bays would be required every 500m–1km. These would be constructed on-site and the finished joints would be protected by a glass fibre box filled with resin or bitumen.
- 4.6.26 Once the cables have been installed, the temporary works including any temporary haul routes and compound areas would be removed. The land would be reinstated to its previous condition and use, subject to any planting restrictions, for example, trees cannot be planted over the top or within 10m of underground cables.

Underground Cables (Trenchless Method)

- 4.6.27 A trenchless crossing is proposed for crossing the River Stour to reduce potential impacts on the habitats and water-based recreation. The underground cable would be installed using a drilling or boring method to pass beneath the river, with limited disturbance to the watercourse. There are different trenchless methods that could be used and each method would have a different construction footprint required for the drill launching/receiving sites or drill pits. Depending on the technique, the drill may need to undertake a number of passes to make the hole wide enough to allow the ducts (pipes) to be pulled through. The cables would be pulled through the ducts using a cable pulling rig.
- 4.6.28 Drilling is an expensive option, often one of the noisiest activities during construction, can be technically challenging in areas of unsuitable geology and requires large quantities of water. For the PEI Report, it is assumed that the water required for the River Stour trenchless crossing would be imported to the site using tankers.
- 4.6.29 National Grid is currently undertaking discussions with Network Rail to determine the best methods for crossing the Sudbury Branch Railway Line. This may involve a trenchless crossing method. For the PEI Report it is assumed that the railway would remain open during these works.
- 4.6.30 Temporary discharges may be required relating to dewatering and over-pumping in the cable sections, particularly where deeper working is required such as at the trenchless crossing. It is anticipated these would be local discharges to ground and not to watercourses.

GSP Substation

- 4.6.31 Construction activity would begin with site preparation including setting up the temporary accommodation, parking and laydown area. The permanent perimeter fencing would be completed early in the construction programme to secure the construction area. The permanent access road would be installed to connect the proposed GSP substation to the A131.
- 4.6.32 The initial preparatory works would comprise the temporary removal of the top layer of ground and laying a temporary stone capping 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 low level screening and details of this would be confirmed when earthworks quantities are known. 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.
- 4.6.33 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, shallow concrete pad foundations and steel supports would be installed for the electrical equipment. The majority of electrical equipment would be mounted on steel posts fixed to concrete foundations.
- 4.6.34 Reinforced concrete bunds would be installed for each super grid transformer (SGT) and would comprise a perimeter concrete wall, a base slab continuous with the wall and a central plinth for supporting the SGT. The bunds act as a secondary oil containment measure. The two SGT would be transported to site as AIL and installed within the bunds. 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.
- 4.6.35 Once 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.
- 4.6.36 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:
- The arcing horns need to be replaced on existing pylons on the existing 400kV overhead line 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 would be undertaken using ropes, with new arcing horns winched up and fixed into place by the rope access team and vehicular access would use existing access tracks;
 - An existing 400kV pylon to the southwest of the proposed GSP substation is to be removed and replaced by a new 400kV pylon to the west of the existing pylon. These works would require a temporary diversion to be installed on the 400kV overhead line 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. Once the work is completed, the temporary works would be removed. The duration of the temporary diversion is likely to be dictated by when outages can be taken on the overhead lines;

- An existing 132kV pylon needs to be replaced with a new pylon in the same location. This would be constructed similar to the 400kV pylon above, with a temporary diversion in place during the works;
- Two new 132kV underground cables are required to connect the proposed GSP substation with the existing 132kV overhead line and a new 400kV underground cable would connect the CSE platform with the proposed GSP substation. The cables would be laid in trenches, approximately 1.5m deep and 0.55m wide. The 132kV cables are required to 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. The extent and method of these temporary works has not yet been confirmed.

4.7 Permanent Features (During Operation)

Introduction

- 4.7.1 This section describes the permanent features of the project that would be in place during operation. It is split into the three main components; overhead lines (including CSE compounds), underground cables and the GSP substation.

Overhead Line (Including CSE Compounds and Removal of Overhead Lines)

New Overhead Line

- 4.7.2 The current design assumes standard steel lattice pylons, which would be approximately 50m in height and similar to the existing 400kV overhead line. The pylon base footprint would typically be 10m by 10m and the pylons would typically be at a 360m spacing, subject to site constraints. Indicative pylon locations have been assumed for the assessment, as per the location shown on the General Arrangement Plans, however, National Grid will be seeking consent for horizontal and vertical LoD within which the final alignment would lie, and will not be seeking approval for a specific alignment (including pylon locations).
- 4.7.3 The project would involve approximately 19km of overhead line comprising up to 55 steel lattice pylons (similar to the design of pylons used on the existing 400kV overhead line) and triple Araucaria conductors. There would be three types of pylon, which are also present on the existing 400kV overhead line:
- suspension steel pylons: which support the overhead line in a straight line;
 - tension (also called angle) pylons: which support the overhead line where the line changes direction; and
 - terminal pylons: which support the overhead line where it connects to underground cables at a CSE compound or substation.
- 4.7.4 The standard height for a tension, terminal or suspension pylon would be approximately 50m from ground level (compared to approximately 30m for the existing 132kV pylons). The extra height means there can be a larger spacing between pylons (fewer overall) compared to the existing 132kV overhead line. Pylon extensions (up to an additional 9m) would be required in some locations to allow extra height to clear existing features, such as areas of woodland. The pylon base would consist of concrete foundations and potentially sheet piling depending on ground conditions.

- 4.7.5 The permanent easement corridor (associated with statutory safety clearances) is assumed to be 10m from the outer edge of the pylons or the conductors (total 30m width). Vegetation within this corridor would be maintained to a three-year growth to avoid branches interfering with the conductors.

CSE Compounds

- 4.7.6 The CSE compound would contain cable terminations, electrical equipment, support structures and a small control building. An overhead line terminal pylon would be located outside the compound with down-leads connecting to a gantry within the compound that then connects the other electrical equipment.
- 4.7.7 The CSE compound would be set within a relatively flat area, typically 85m x 50m, surrounded by security fencing. There would be a single-track permanent access road with passing places to connect the CSE compound to the local road network, to provide access for operation and maintenance. Standard vegetation planting would be provided around each CSE to help screen the site.
- 4.7.8 The CSE compounds would be without power and a temporary generator would be taken to site for any planned maintenance work or inspections requiring temporary lighting. The CSE compounds would have porous surfacing to allow surface water to naturally infiltrate without the need for formal drainage. No permanent discharges are anticipated.

Underground Cables

- 4.7.9 The project includes two sections of 400kV underground cables (Section E: Dedham Vale AONB and Section G: Stour Valley) approximately 10km in length. The underground cables would comprise 18 transmission cables, each approximately 150mm diameter, made of a copper core, cross-linked polyethylene insulation, seamless corrugated aluminium sheath and PVC outer sheath. There would also be two fibre-optic cables alongside the electricity cables. One would be used to act as the earth-wire shield for the overhead line section, and it would also provide a communication path for the transmission lines' protection and control. The second fibre-optic cable would be used for the distributed temperature sensing that would enable above ground monitoring of the cable performance.
- 4.7.10 The cables would generally be buried at a depth of approximately 0.9m below ground level. The cables would be surrounded by an additional layer of cement-bound sand and would have a polymeric cable protection over top and 'Danger Electric' signs on the upper surface to protect them from future excavation works.
- 4.7.11 The cables would be buried deeper and would need to be located further apart at the trenchless crossing compared to standard cable sections. This is because the heat from the underground cables would need to traverse through a greater amount of earth to be dissipated. Therefore, the LoD would be wider at the trenchless crossing location.
- 4.7.12 Depending on the cable manufacturer, joint bays would be required every 500m–1km. The finished joints would be protected by a glass fibre box filled with resin or bitumen. Link pillars will be required at each joint bay and are used to monitor and test the underground cables and to offer protection from electric shock. The link pillars are small above ground structures, which measure 1m by 0.4m and are approximately 1m in height. 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 and would be fenced off with

stock-proof fencing. No permanent access tracks are required to the link pillars or link pits but a gate would be required for access.

GSP Substation

- 4.7.13 The GSP substation would include a compound area approximately 270m x 50m in size between Butler's Wood and Waldegrave Wood. The proposed GSP substation would 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 UK Power Networks.
- 4.7.14 The GSP substation would include two SGT within reinforced concrete bunds, comprising a perimeter concrete wall, a base slab continuous with the wall and a central plinth for supporting the SGT. There would also be a noise enclosure around the SGT 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.
- 4.7.15 The majority of electrical equipment is 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 downloads off the pylon to the southeast; this would be approximately 15m high.
- 4.7.16 A permanent bellmouth junction would be constructed on the A131 to local highway authority standards. This will connect to a surfaced track and would provide access for the periodic maintenance activities at the GSP substation. The GSP substation would also require low lux level light-emitting diode (LED) type luminaires with directable light output to reduce light spill. There will also be individual passive infrared sensor (PIR) motion activated lighting at the access gates to facilitate safe entry at night. Closed-circuit television would not be required at this site.
- 4.7.17 The GSP substation would include permanent surface and foul drainage systems. 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.
- 4.7.18 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 amenities buildings.
- 4.7.19 The GSP substation would include a 400kV single circuit CSE 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 track linking it to the main GSP substation compound. The single circuit CSE 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 downloads 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.

- 4.7.20 The proposed GSP substation would be connected to the existing 400kV overhead line via an existing pylon to the southeast of the site and a new replacement pylon to the southwest of the site, which would connect into the single circuit CSE 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 tower, replacing the existing pylon on the 132kV overhead line.
- 4.7.21 As part of the proposed GSP substation, standard mitigation planting is proposed around the GSP substation and further planting would be undertaken to improve the hedgerow along the A131 to help screen the site. The planting would comprise a mixture of native trees and scrub.

4.8 Operation and Maintenance

Introduction

- 4.8.1 This section describes the activities that are anticipated during the operation stage including site inspections and routine maintenance. It is split into overhead line (including CSE compounds), underground cables and the GSP substation.

Overhead Line (Including CSE Compounds)

- 4.8.2 The typical lifespan of an overhead line and the CSE compounds would be at least 40 years, depending on use and location. Over this time, the overhead line and CSE compounds would be subject to annual inspection from the ground (using a small van) or by helicopter to check for visible faults or signs of wear. The inspections would confirm when refurbishment is required and indicate if plant/tree growth or development were at risk of affecting safety clearances.
- 4.8.3 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.
- 4.8.4 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. During refurbishment there would be activity along the overhead line, especially at tension pylons (where the line changes direction) 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 done 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.

- 4.8.5 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.
- 4.8.6 The refurbishment works would require temporary access tracks, 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 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). Similarly, the refurbishment of the CSE compound would be similar to those described during construction.

Underground Cables

- 4.8.7 Underground cables have a typical life expectancy of at least 40 years. Over this time, the cables 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.
- 4.8.8 When a repair is needed, the area where the fault is located would be accessed using a temporary access track 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 joints) would need to be removed and new joints constructed.

GSP Substation

- 4.8.9 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. The routine maintenance would be undertaken on a three-year 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. 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.

4.9 Decommissioning

Introduction

- 4.9.1 This section describes what would happen once the project reaches the end of its design life and/or was no longer required. It is split into overhead line (including CSE compounds), underground cables and the GSP substation. It also summarises the preliminary assessment of the environmental effects associated with decommissioning.
- 4.9.2 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). Section 4.8 explains how operation of each part of the project could be extended with regular maintenance and refurbishment of components.

- 4.9.3 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. At such a time National Grid determines that it will 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.
- 4.9.4 As part of any decommissioning strategy, there would need to be engagement with UK Power Networks as the Distribution Network Operator of the 132kV overhead line, 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.
- 4.9.5 In the event that the project, or any part of it, is to be decommissioned, a written scheme of decommissioning would be submitted for approval by the relevant planning authorities at least six months prior to any decommissioning works. 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.

Overhead Line (Including CSE Compounds)

- 4.9.6 Decommissioning sections of the overhead line would follow the same methods set out in paragraphs 4.6.17 to 4.6.20 which describe the removal of existing sections of the existing 132kV and 400kV overhead lines during construction of the project.
- 4.9.7 The above ground features of the CSE compounds would be removed by dismantling the pylons and conductors and removing any other above ground features. The foundations of the CSE compounds would be excavated to approximately 1.5m below ground level, and subsoil and topsoil reinstated. Any temporary access tracks and working areas required would be removed and the site reinstated to its former use.

Underground Cables

- 4.9.8 Decommissioned underground cables are likely to be left in the ground with any above ground structures, such as link pillars removed. These works would 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 tracks and working areas required would be removed and the site reinstated to its former use.

GSP Substation

- 4.9.9 As noted above, in the event that the GSP substation is to be decommissioned, discussions would be held with UK Power Network to agree alternative requirements for providing power to local communities and businesses.

4.9.10 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 temporary access tracks and working areas required would be removed and the site reinstated to its former use.

Environmental Effects of Decommissioning

4.9.11 As there are no current plans to decommission the project. An assessment of effects associated with decommissioning is not presented in Chapters 6–15 of the PEI Report, however Table 4.3 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. Table 4.3 assumes that standard good practice measures, such as those set out within the Outline CoCP would be implemented during decommissioning activities, as these would be typical measures employed on large National Grid contracts.

4.9.12 Table 4.3 does not take into account changes to the baseline environment, outside of those noted within the future baseline section of Chapters 6–15, as there could be a number of scenarios that could occur. However, it is noted that the baseline environment could change and would be assessed at the time of decommissioning.

Table 4.3: Summary of Decommissioning Assessment

Topic	Summary Assessment
Landscape	<p>The removal of the overhead line would be the same as outlined within Section 4.6 (Removal of Overhead Lines) with some exceptions. There would be no direct effects on Dedham Vale AONB and most of the Stour Valley as the underground cable would remain in situ. There would be construction vehicles present within the landscape and views but these would be temporary and transient throughout the project area.</p> <p>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.</p>
Biodiversity	<p>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.</p> <p>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 (e.g. for Hintlesham Woods SSSI) or EPS licences required at the time. Therefore, there are unlikely to be any significant effects to biodiversity during decommissioning.</p>
Historic Environment	<p>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.</p> <p>Removal of the above ground features including the overhead lines, CSE compound and GSP substation could have beneficial effects on heritage assets through the</p>

Topic	Summary Assessment
	<p>removal of modern development within their setting. However, these are unlikely to be significant.</p> <p>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. However, this is unlikely to be significant.</p>
Water Environment	<p>The removal of the overhead line would be the same as outlined within Section 4.6 (Removal of Overhead Lines). 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.</p>
Geology and Hydrogeology	<p>The removal of the overhead line would be the same as outlined within Section 4.6 (Removal of Overhead Lines). 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 to the geology and hydrogeology during decommissioning.</p>
Agriculture and Soils	<p>The removal of the overhead line would be the same as outlined within Section 4.6 (Removal of Overhead Lines). The footprint of any remaining decommissioning works such as 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 to agriculture and soils during decommissioning.</p>
Traffic and Transport	<p>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 would remain in situ). Therefore, there are unlikely to be any significant effects to traffic and transport during decommissioning.</p>
Air Quality	<p>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.</p>
Noise and Vibration	<p>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 (BPM) would be employed, including noise barriers and mufflers to reduce effects. Therefore, there are unlikely to be significant effects on noise and vibration during decommissioning.</p>

Topic	Summary Assessment
Cumulative Effects	<p>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.</p> <p>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.</p>

5. ENVIRONMENTAL IMPACT ASSESSMENT APPROACH AND METHOD

5.1 Introduction

5.1.1 Environmental Impact Assessment (EIA) is a process that is used to identify the likely significant effects that could occur as a result of a project. The information gathered is taken into account by the decision-making body when determining consent. Three main EIA documents are produced as part the NSIP pre-application process:

- **Scoping Report:** The Scoping Report sets out the likely significant effects from a project (scope). It also presents the data collected and the proposed assessment methodology and approach that would be used during the EIA. The Scoping Report for the project was issued to the Planning Inspectorate in May 2021 (National Grid, 2021b) and the Scoping Opinion was received in June 2021 (Planning Inspectorate, 2021a). Chapter 3: Scoping Opinion and Consultation contains details on the aspects that have been scoped out of the EIA;
- **Preliminary Environmental Information (PEI) Report** (this is the current stage of the project): The PEI Report sets out the information that *'is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development'* (Planning Inspectorate, 2020). The PEI Report is used by consultees to inform their consultation responses during the Statutory Consultation. The PEI Report is produced at a time when there may not be a full understanding of all environmental effects, and the detailed assessment may not have been undertaken. The PEI Report sets out the level of work undertaken to reach the conclusion as to whether there are likely to be significant effects for each scoped in aspect. It also outlines any further work that would be presented in the ES to validate these conclusions;
- **Environmental Statement (ES):** The ES presents the results of the EIA undertaken for the project. It identifies the likely significant effects that would result if the project is implemented, and any proposed mitigation to avoid or reduce those significant effects to a non-significant level. The ES is submitted as part of the application for development consent and is taken into account during the decision-making process.

5.1.2 In addition to the documents above, there will be additional documents produced as part of the application for development consent, which will form the securing mechanisms for the environmental measures and mitigation identified within the EIA. These are expected to include the following documents:

- **Outline CoCP:** The Outline CoCP is presented in Appendix 4.1 and sets out the good practice measures that would be implemented on the project. These are generally generic good practice measures that would be applied across the whole project;
- **Outline CEMP:** The Outline CEMP will provide further details on how environmental impacts and risks would be managed during construction. The Outline CEMP will provide further details on measures to reduce effects to water and soil, and effects resulting from waste and dust;
- **Outline MWMP:** The Outline MWMP will provide further details on the measures taken to reduce consumption of raw materials and increase use of secondary or recycled materials. It will also set out how the project intends to implement the waste hierarchy and to reduce waste being sent offsite to landfill;

- Outline CTMP: The Outline CTMP will provide details on construction routes and any required road diversions or closures. It will also include details on the management of PRow during construction; and
 - Outline Landscape and Ecological Management Plan (LEMP): The Outline LEMP will provide details on how vegetation will be retained and protected during construction. It will also provide details on reinstatement planting and aftercare.
- 5.1.3 National Grid intends to submit an updated version of the CoCP with the application for development consent, with the intention that the CoCP would be finalised during Examination and that this document, and the commitments within it, would be secured through a requirement within the DCO. As a minimum, National Grid will prepare an Outline CEMP, an Outline MWMP, an Outline CTMP and an Outline LEMP which will be submitted with the application for development consent. Final detailed versions of the management plans will be prepared prior to construction. The final management plans would be in accordance with the outline management plans prepared as part of the application.
- 5.1.4 The need for additional mitigation has been identified within this PEI Report (see the summary provided in Chapter 16: Conclusion). These mitigation measures are designed to avoid or reduce the potential for significant effects to a residual non-significant level. This mitigation will be set out in a schedule of EIA commitments, the implementation of which would be secured through a requirement in the DCO.

5.2 General Approach

- 5.2.1 This chapter describes the methodology which will be used to assess the potential effects on the natural, human and built environment as a result of the project. In accordance with the EIA Regulations 2017, the assessments undertaken will evaluate and identify the likely significant environmental effects arising from the proposed construction, operation and decommissioning phases of the project.
- 5.2.2 The scope of the assessment is based on that presented within the Scoping Report (National Grid, 2021b). It has also been updated based on the responses given in the Scoping Opinion (Planning Inspectorate, 2021a). Where the Planning Inspectorate has requested that aspects should be scoped back into the assessment, these have been included within the assessment presented in this PEI Report and will be included within the ES, unless further information (also documented in the ES) is provided to justify scoping out.
- 5.2.3 As noted in Section 1.6, all conclusions and assessments presented within this PEI Report are by their nature preliminary and are based on the proposed project design and assumptions described within this PEI Report. All assessment work has and continues to apply a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed. The final assessment will be presented within the ES submitted with the application.
- 5.2.4 Each assessment chapter within this PEI Report includes a description of the proposed methodology for determining the significance of effects. The EIA will also be supported by supporting statements prepared by the technical specialist authors to justify the final judgements on significance.
- 5.2.5 In general, the EIA will follow a receptor-based assessment approach. Receptors are those aspects of the environment which may be sensitive to change as a result of a

project. When deciding on which receptors to include within the EIA, consideration was given to Regulation 5(2) and Schedule 4 paragraph 4 of the EIA Regulations 2017.

5.3 Geographical and Temporal Scope

Geographical Scope

- 5.3.1 The PEI Report identifies the draft Order Limits for the project. These encompass the land anticipated to be required permanently and temporarily to build and operate the project. The draft Order Limits include the working areas to install the overhead line and underground cables, including the construction compounds, storage areas, road access points, land required for permanent above and below ground features and land required to implement landscape and visual and ecological mitigation and enhancement. See Chapter 4: Project Description for further details.
- 5.3.2 The draft Order Limits include the LoD, within which the project would be constructed and operated. The assessment is based on the assumption that the 400kV line (including pylon locations) could lie anywhere within the LoD. The exception would be where there is a project commitment, for example an embedded measure.
- 5.3.3 For the purposes of the preliminary assessment, the PEI Report has used the indicative locations of the pylons shown on the General Arrangement Plans in Figure 3.2 of the statutory consultation material. There is then a sensitivity test (generally presented in Section 7 of each assessment chapter) to identify whether a deviation in project components within the LoD would result in new or different likely significant effects using a reasonable worst-case approach when undertaking the assessment. Details of this are provided in the relevant assessment chapters. This allows for deviations in the siting of pylons and alignment of the 400kV line within the LoD during detailed design, construction and operation, without triggering the need to revise the EIA.
- 5.3.4 When considering the geographical scope of the assessment, consideration has been given to the distance over which an effect is likely to occur. The study area is defined in each of the assessment chapters and varies between topics and also the phase of the project, depending on the nature of the effects. For example, direct physical impacts would only occur within the construction footprint; impacts on water quality at crossings could extend further downstream than upstream; and the visual impact of the project may occur over a long distance.

Temporal Scope

- 5.3.5 As set out in Chapter 4: Project Description, National Grid is still considering a number of different scenarios in terms of the construction phasing of the project. One scenario under consideration involves the project seeking separate planning consent for the proposed GSP substation, such that it would be completed prior to commencement of works under the DCO. National Grid will confirm the construction phasing prior to submitting the application for development consent.
- 5.3.6 The EIA will predict the changes (effects) to the current and future baseline during the construction, operation and decommissioning phases of the project. The general approach is summarised below and any variations from this are discussed in the relevant technical chapters:
- **Baseline year:** the baseline is the existing environmental conditions in absence of the project, against which the potential environmental effects of the project are assessed.

The baseline year for the project is 2021, when the majority of baseline surveys will have taken place. For certain topics the baseline environment is expected to change over time, and for these topics this change has been predicted to enable robust identification of the effects of the project against a future baseline;

- Construction phase: these are effects that are likely to occur during the construction phase of the project, including effects resulting from the activities associated with installation of the overhead line, underground cables, CSE compound, GSP substation and the removal of 132kV and 400kV overhead lines. It also includes effects associated with the temporary works such as temporary overhead lines, access tracks, haul roads, construction compound areas and work activities such as piling. The construction programme and proposed phasing is outlined in Chapter 4: Project Description, which explains why different start and end dates may apply depending on the consenting approach taken. For the purposes of the PEI Report, the construction phase is assumed to be up to six years in duration. Each assessment chapter includes a sensitivity analysis based on potential alternative start dates and durations, which could affect the timing of the project alongside other proposed developments (e.g. the traffic and transport and cumulative effects assessments);
- Operation phase: these are effects that are likely to occur as a result of the presence, operation and maintenance of the project; and
- Decommissioning phase: these are effects that are likely to occur as a result of decommissioning the project. Further details on decommissioning and the likely significant effects associated with this are set out in Section 4.9 of Chapter 4: Project Description.

5.3.7 The environmental assessment uses defined temporal scales to characterise the duration of potential effects. For the purposes of assessment, the following definitions are applied unless otherwise defined in the specific assessment chapter:

- Short term: This is assumed to be up to 2033, which covers construction and the commencement of operation and the establishment of mitigation and enhancements;
- Medium term: This is assumed to be 2033 to 2048, which is based on up to 15 years post construction; and
- Long term: This is assumed to be 2048 onwards and is used to describe effects with a duration that extends longer than 15 years post construction or which are irreversible.

5.3.8 The temporal nature of effects could be different to the phase in which the effects occur. For example, effects as a result of vegetation clearance during construction may be felt for a number of years after construction has been completed, before any replanted habitats have matured. For the purposes of the EIA, the effects are described under the phase within which the impact arises (i.e. in the above example, vegetation loss assessed for the construction phase).

5.4 Embedded and Good Practice Measures

5.4.1 National Grid has adopted a number of embedded measures to avoid or reduce significant effects that may otherwise be experienced during construction and operation of the project. Embedded measures are those that are intrinsic to and built into the design of the project. The current embedded measures are described in Table 4.1 in Chapter 4: Project Description.

- 5.4.2 In addition, National Grid has identified a number of good practice measures, which are set out within Appendix 4.1: Outline CoCP. These are considered to be required regardless of the EIA because they are generally either imposed through legislative requirements or represent standard sector good practices. These include measures to reduce nuisance from construction activities and commitments regarding reinstatement. The Outline CoCP will continue to be updated in parallel with the EIA process. A final version will be included as part of the application for development consent and would be secured through a requirement within the DCO.
- 5.4.3 Embedded and good practice measures are assumed to be in place prior to undertaking the assessment of likely significant effects, in accordance with guidance from the IEMA (2015). The PEI Report refers to embedded and good practice ‘measures’ to differentiate them from additional mitigation identified during the EIA process to avoid or reduce a likely significant effect.

5.5 Assessment of Effects and Determination of Significance

- 5.5.1 Regulation 5(2) of the EIA Regulations 2017 states that ‘*the EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors– (a) population and human health, (b) biodiversity... (c) land, soil, water, air and climate; (d) material assets, cultural heritage and the landscape; e) the interaction between the factors referred to in sub-paragraphs (a) to (d).*’
- 5.5.2 Schedule 4 paragraph 5 of the EIA Regulations 2017 requires a description of the likely significant effects of the project on the environment.
- 5.5.3 The assessment of the significance of effects for the majority of topics is based on a three-step process, as set out in the following paragraphs. Any departure from this methodology is described within the individual assessment chapters.
- 5.5.4 The first step assigns sensitivity or inherent value to a receptor. Sensitivity is how easily the receptor is affected by change, and value is a measure of its inherent worth. Table 5.1 provides broad definitions of sensitivity or value. This is based on the Table 3.2N in the DMRB LA 104 Environmental Assessment and Monitoring (Highways England *et al.*, 2020b). Appendix 5.1 outlines the sensitivity and value tables that are used in the assessment.

Table 5.1: Value and Sensitivity Criteria (based on Highways England *et al.*, 2020b)

Value/Sensitivity	General Criteria
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

- 5.5.5 The second step of the assessment is to determine the magnitude of potential impact. This is the scale of the change caused to the baseline conditions. The influence of impact duration (including reversibility) will also be considered as part of the determination of magnitude. The assessment of magnitude takes into consideration all embedded measures (as described in Table 4.1 of Chapter 4: Project Description) and the good practice measures contained within Appendix 4.1: Outline CoCP.
- 5.5.6 Table 5.2 presents the generalised magnitude criteria based on DMRB LA 104 (Highways England *et al.*, 2020b). Appendix 5.1 outlines the magnitude tables that are used in the assessment.

Table 5.2: Magnitude Criteria (based on Highways England *et al.*, 2020b)

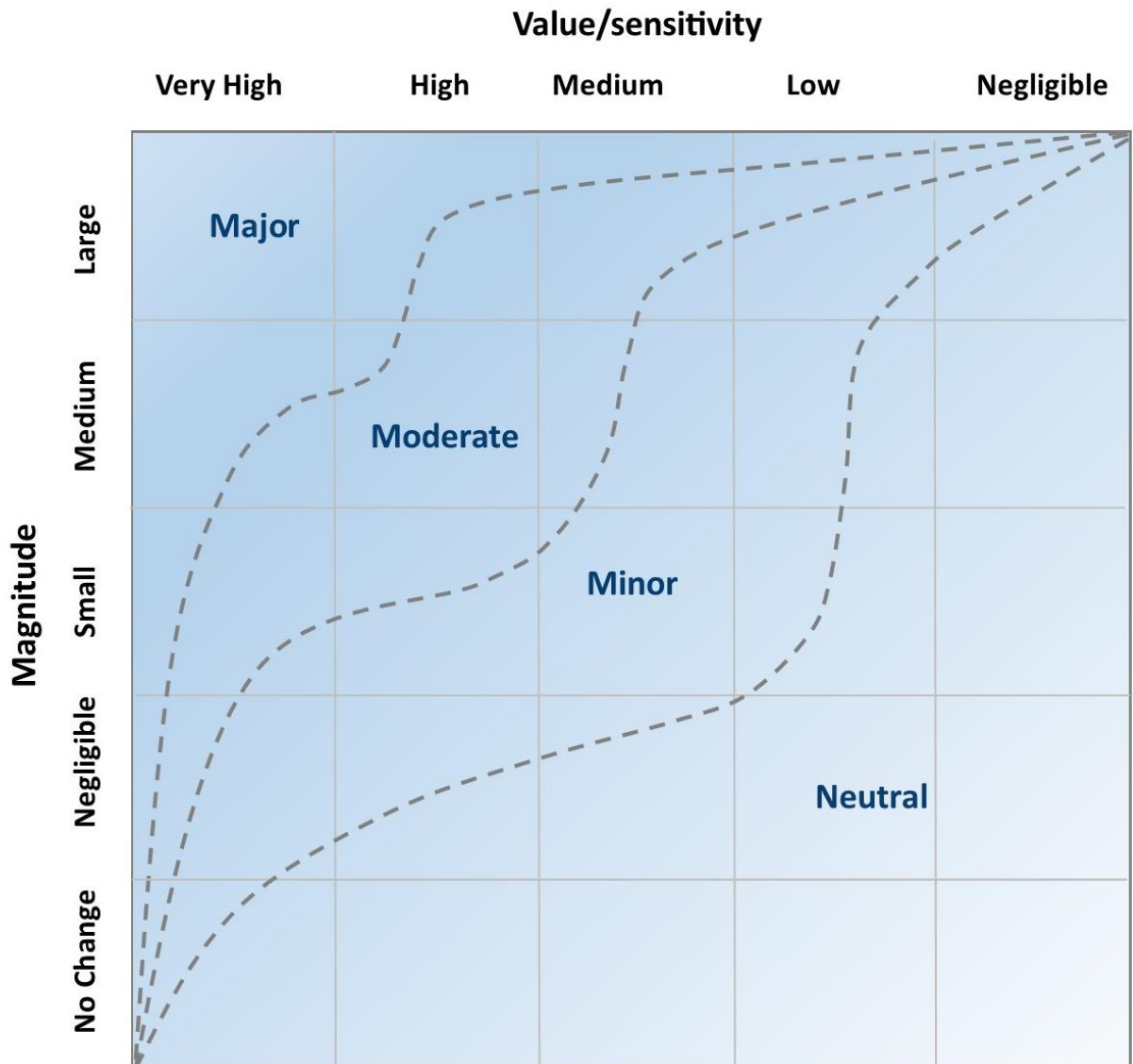
Magnitude	General Criteria
Large	Adverse: Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Beneficial: Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Medium	Adverse: Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Small	Adverse: Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements. Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.
No change	Adverse or beneficial: No loss or alteration of characteristics, features or elements; no observable impact in either direction.

- 5.5.7 As the third step in the process, the likely significance of effect is considered as a function of the sensitivity or value of the receptor, and the magnitude of the potential impact on it. To aid transparency in the assessment process, the matrix shown in Illustration 5.1 has been used as the basis for assigning potential significance to an effect. As an illustration, a high sensitivity receptor subject to a large magnitude of change would experience a major or moderate significance effect, and a low sensitivity receptor subject to a small magnitude of change would experience a minor or neutral significance effect. Professional judgement will be used to determine whether the higher or lower level of significance is applicable in each case, along with explanation as to why this was chosen.
- 5.5.8 Professional judgement will be used when assigning significance. This is of particular relevance where the assessment is based on a qualitative approach and the significance of effect is a matter of judgement rather than a quantified outcome. Explanatory text will

be provided to explain how professional judgement, where used, has determined the significance assigned.

5.5.9 Under the EIA Regulations 2017, the likely significant effects of the project on the environment must be reported in the ES. A significant effect in the context of the EIA Regulations 2017 is typically taken to be a moderate or greater adverse or beneficial significance. Effects of neutral, minor or negligible significance are not considered to be significant effects on the environment but reflect that there may be some differences from the baseline conditions. The ES will only report the likely significant effects resulting from the project, i.e. those that are moderate or above.

Illustration 5.1: Matrix of Significance



5.5.10 As presented in Section 4.4 of Chapter 4: Project Description, the Statutory Consultation is consulting on two options at Hintlesham Woods. The preliminary assessment has considered the potential significant effects of both options and identified that the likely significant effects only differ between the options for landscape and visual, biodiversity and historic environment. Therefore, these three chapters (Chapters 6, 7 and 8 respectively) contain details summarising the different effects between the two options at

the end of the overhead line assessment in Section 6 and where applicable, Sections 7, 8 and 9 to allow the reader to compare the options.

5.6 Mitigation

5.6.1 After initial consideration of the effects of the project and their potential significance, consideration will be given to how those significant effects could be avoided, reduced or offset. This is referred to as mitigation. Each assessment chapter of the PEI Report, where relevant, has identified potential mitigation measures that are likely to be required to avoid or reduce the potential significant adverse effects of the project.

5.7 Residual Effects

5.7.1 Residual effects are those that are predicted to remain after the proposed mitigation measures have been implemented. These are described at the end of each assessment chapter within this PEI Report.

5.7.2 At this stage in the project, the PEI Report identifies which effects may be potentially significant, both before and after the proposed mitigation identified to date has been defined to reduce the predicted environmental effect to a non-significant level. These potential effects will be taken forward as part of the EIA and additional mitigation may be identified as the design develops further. Therefore, potential likely significant effects captured at this preliminary stage, may be found to be not significant following completion of the mitigation strategy when reported in the ES.

5.8 Cumulative Effects

5.8.1 The project could result in cumulative effects, categorised as either intra-project or inter-project effects:

- intra-project cumulative effects: when a receptor is affected by more than one type of environmental impact from the same development. For example, a residential property may be subject to air quality, noise and visual impacts; and
- inter-project cumulative effects: when a receptor is affected by the project and at least one other proposed development. For example, the project and another proposed development within the same sensitive landscape leading to more significant landscape and visual effects than if the developments were considered in isolation.

5.8.2 The likely significant cumulative effects are presented in Chapter 15: Cumulative Effects.

5.9 Monitoring

5.9.1 The EIA Regulations 2017 introduced a requirement on the Secretary of State to consider whether it would be appropriate to impose monitoring of any significant adverse effects on the environment from a project. The ES will identify the need for any monitoring, along with clear and proportionate objectives for the monitoring, a timescale for implementation, identification of the party who would be responsible for the monitoring, together with an outline of the remedial actions to be undertaken should results be adverse.

6. LANDSCAPE AND VISUAL

6.1 Introduction

- 6.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on landscape and visual receptors. Landscape receptors include landscape designations and the landscape character of the area. Visual receptors include people who could experience different views and level of amenity, through the removal and/or introduction of man-made and natural features.
- 6.1.2 During the construction phase, there will be construction vehicles and machinery on site, and the addition of man-made features within the landscape. Vegetation would also be removed during construction, which could change the landscape character and open up views. During operation, the above ground features such as pylons, the CSE compounds and the GSP substation would become features within the landscape and may be visible to people visiting or living within the surrounds.
- 6.1.3 This chapter has links with other chapters, in particular, Chapter 7: Biodiversity, which considers the impact of the project on vegetation in terms of habitats, and also Chapter 8: Historic Environment, which considers the impact of the project on the setting of historic assets.
- 6.1.4 This chapter is supported by the following appendices and figures:
- Appendix 6.1: Landscape and Visual Baseline;
 - Figure 6.1: LVIA Study Area and Landscape Designations;
 - Figure 6.2: Landform and Drainage;
 - Figure 6.3: Tree Cover;
 - Figure 6.4: Settlements and Infrastructure;
 - Figure 6.5: Landscape Character;
 - Figure 6.6: Visual Receptors and Viewpoints;
 - Figure 6.7: Comparative Zones of Theoretical Visibility (ZTV) of Pylons to be Removed and Proposed Pylons;
 - Figure 6.8: ZTV of Proposed 400kV Overhead Line (by Project Section);
 - Figure 6.9: ZTV of Dedham Vale East CSE Compound;
 - Figure 6.10: ZTV of Dedham Vale West CSE Compound;
 - Figure 6.11: ZTV of Stour Valley East CSE Compound;
 - Figure 6.12: ZTV of Stour Valley West CSE Compound; and
 - Figure 6.13: ZTV of Proposed GSP Substation.

6.2 Regulatory and Planning Policy Context

National Policy Statement

- 6.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS

EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse landscape and visual effects which has been considered within this chapter.

6.2.2 Paragraphs 2.8.2 and 2.8.3 of NPS EN-5 state:

'Government does not believe that development of overhead lines is generally incompatible in principle with developers' statutory duty under section 9 of the Electricity Act to have regard to amenity and to mitigate impacts ... In practice new above ground electricity lines, whether supported by lattice steel towers/pylons or wooden poles, can give rise to adverse landscape and visual impacts, dependent upon their scale, siting, degree of screening and the nature of the landscape and local environment through which they are routed. For the most part these impacts can be mitigated, however at particularly sensitive locations the potential adverse landscape and visual impacts of an overhead line proposal may make it unacceptable in planning terms, taking account of the specific local environment and context. New substations, sealing end compounds and other above ground installations that form connection, switching and voltage transformation points on the electricity networks can also give rise to landscape and visual impacts. Cumulative landscape and visual impacts can arise where new overhead lines are required along with other related developments such as substations, wind farms and/or other new sources of power generation.' (paragraph 2.8.2)

'Sometimes positive landscape and visual benefits can arise through the reconfiguration or rationalisation of existing electricity network infrastructure.' (paragraph 2.8.3)

Other Relevant Policy

6.2.3 Appendix 2.1: Local Planning Policy lists the local policy potentially relevant to the LVIA. Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP17 and LP19 state that developments should seek to protect and enhance the character of the landscape, and where significant landscape or visual effects are likely, ways of avoiding, reducing and mitigating any adverse effects should be identified along with opportunities for enhancement.

6.2.4 Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP20 specifically refers to the AONB and states that development should conserve and enhance the landscape and scenic beauty of the AONB and its setting. It should be sensitive to the landscape and visual impacts (including on dark skies and on tranquil areas) and have regard for siting, design, lighting, use of materials and colour, along with associated mitigation measures.

6.2.5 Braintree District Council Local Plan (2017) Policy LLP 69 seeks to protect prominent trees which contribute to the character of the local landscape and trees that make a significant positive contribution to the character and appearance of their surroundings. Policy LLP 71 relates to landscape character and features, and states that proposals for new development should be informed by, and be sympathetic to, the character of the landscape as identified in the District Council's Landscape Character Assessments.

6.3 Scoping Opinion

6.3.1 The scope of the assessment for landscape and visual has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021a) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.

6.3.2 Table 6.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 6.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction and Operation			
Designated landscapes – Special Landscape Areas (SLA)	SLA that would not be physically impacted (construction and operation)	Scoped out	(ID 4.1.1) The Inspectorate does not consider that sufficient information is yet available on the design and location of the project to conclude that there would not be significant effects to the setting of these SLAs from addition of new infrastructure elements; where significant effects in this respect are likely, these should be scoped in to the ES.
Designated landscapes, landscape character and views	Night-time effects on designated landscapes, landscape character and views (construction and operation)	Scoped out	(ID 4.1.2) On the basis that lighting used during construction would be managed in line with the good practice measures in the Outline CoCP and that operational lighting at the GSP substation would only be switched on when needed, the Inspectorate agrees that night-time effects can be scoped out of the ES (see Table 6.2 for further details).
Landscape Character Areas (LCA)	Effects on district-scale LCA which are not directly physically impacted by the project	Scoped out	(ID 4.1.3) The Planning Inspectorate considers that there is insufficient information to scope out of the assessment those LCA that are not physically impacted by the project given that there may be significant effects on their setting (scoped in). For clarity, the ES should confirm those LCA within the study area that would not be physically affected.
Landscape elements as individual receptors	Effects on landscape elements and how these may affect landscape character at construction and operation.	Scoped in as part of their contribution towards wider landscape character	(ID 4.1.4) The Planning Inspectorate agrees that individual landscape elements such as tree cover, field boundaries, landform and watercourses will not be assessed as separate landscape receptors, but their contribution to the baseline landscape character and value, and the impacts of changes to features, would be considered as part of the assessment of impact to district-scale LCA. On that basis, the Inspectorate agrees that landscape elements can be scoped out as individual receptors.

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
National Character Areas (NCA)	Effects on NCA at construction and operation	Scoped out	(ID 4.1.5) To avoid duplication in the assessment with the district scale LCA, the Planning Inspectorate agrees that the NCAs can be scoped out of the ES.
County Scale LCA	Effects on County Scale LCA at construction and operation	Scoped out	(ID 4.1.5) The Inspectorate considers that given the linear route, length and geographical coverage of the project, and therefore expected impacts to landscape character over a large geographical area, that a landscape character assessment at a wider level than district level is required as part of the ES in order to understand the potential likely significant effects to landscape character. On that basis, the county scale LCA should be scoped in to the ES.
Zone of Theoretical Visibility (ZTV)	Effects on views outside of the ZTV	Scoped out	(ID 4.1.6) The Applicant proposes to scope out effects on visual receptors that are wholly outside of the ZTV during construction and operation as there would be no likelihood of visual effects on receptors. The Planning Inspectorate agrees that this matter can be scoped out of the ES.
Residential receptors	Effects on private views	Scoped out	(ID 4.1.7) On the basis that the project has been designed to avoid residential properties and that effects to visual receptors in terms of local residents would be considered as part of the assessment of community-level views, the Planning Inspectorate agrees that this matter can be scoped out of the ES.
Views – road users	Visual effects on people travelling by car through the area (road receptors).	Scoped out	(ID 4.1.8) On the basis that the impacts to promoted scenic drives or tourist routes, quiet lanes and other road users will be considered within the community assessment, the Inspectorate agrees that this matter can therefore be scoped out of the ES.
Views – rail users	Visual effects on people travelling on the Sudbury Railway Branch Line (rail receptors).	Scoped out	(ID 4.1.9) Due to the speed of travel and that underground cables are proposed at this location, together with the fact that there would be control measures in place to manage construction lighting to avoid impacts to drivers and rail users, the Inspectorate agrees that this matter can be scoped out of the ES.

6.3.3 Table 6.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 6.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
<p>(ID 4.1.2) The ES should clarify whether operational lighting is required at the CSE compounds. If lighting is required for these elements, then the ES should include further information about the location, type and hours of use of lighting and where significant effects are likely, these should be considered in the ES.</p>	<p>Chapter 4: Project Description states that the operational CSE compounds would be without power and a temporary generator would be taken to site for any planned maintenance work or inspections requiring temporary lighting. Therefore, this remains scoped out of the ES.</p>
<p>(ID 4.1.10) The Inspectorate considers that the ES should also refer to the Landscape Institute Technical Guidance Note: Landscape Character Assessment (Technical Information Note 08/15). The Inspectorate also draws the Applicant’s attention to the release of further technical guidance by the Landscape Institute, TGN 02-21 Assessing landscape value outside national designations, in May 2021. This includes incorporation of cultural associations into consideration of landscape value, which should be considered as part of the assessment in the ES.</p>	<p>These technical guidance and information notes have been considered in this preliminary assessment (see Section 6.4) and will be used to support the assessment presented within the ES.</p>
<p>(ID 4.1.11) The Scoping Report states that the draft ZTV presented in Figure 6.3 (Volume 3) excludes the area around the proposed GSP substation and CSE compounds. The final ZTV in the ES should ensure it encompasses all of the project.</p>	<p>The ZTV is presented in Figures 6.9–6.13 which encompass the ZTVs for each of the four CSE compounds (6.9 to 6.12) and the proposed GSP Substation (6.13). The ES will present the final ZTV for all elements.</p>
<p>(ID 4.1.12) The Inspectorate notes that the baseline conditions are described by reference to the Landscape Character of Braintree District (2006). The landscape has evolved since the preparation of this document and the Inspectorate considers that the description of the baseline in the ES for Section G: Stour Valley and the GSP substation should be supplemented with further information from the Applicant’s own study and the findings of the Essex Landscape Character Assessment and the Stour Valley Project Area Valued Landscape Assessment to ensure that it is up to date. The Suffolk Landscape Character Assessment should also inform the description of the baseline conditions.</p>	<p>Baseline conditions have been established and informed by a site survey and also by the sources of information set out in ID 4.1.12. The updated baseline is presented in Section 6.5 and in Appendix 6.1: Landscape and Visual Baseline. The baseline will be further updated in the ES, following further site surveys.</p>
<p>(ID 4.1.13) The Applicant proposes to scope in an assessment of effects on the Stour Valley SLA. The part of this SLA affected by the project is within an area under consideration as part of the Dedham Vale AONB boundary review by Natural England; the proposal for boundary variation was registered in March 2021 and as</p>	<p>It is not known which parts of the Stour Valley, if any, may become part of the Dedham Vale AONB in the future. The identification of an extension area would be the responsibility of Natural England.</p>

Matter Raised in the Scoping Opinion	Project Response
<p>yet there is no confirmed timetable for consideration and decision. It is noted that the Parliamentary Under Secretary with responsibility for AONBs stated in May 2021 that an extension has not been ruled out and Natural England would communicate with the local proposers in due course.</p> <p>The Applicant proposes that as this area is not currently designated as part of the AONB, it will be assessed under landscape character in the ES. However, the Inspectorate considers that the extension area has already been identified as having a particular value and an important role in the setting of the Dedham Vale AONB that is distinct from its SLA status. As such, the ES should include sensitivity testing assuming a worst case where the AONB has been extended.</p> <p>Depending on the status of the extension application at the time of any DCO application, the ES plans may need to illustrate any extension to the Dedham Vale AONB.</p>	<p>National Grid will continue to review the position and back-check and review the assessment and project in light of any such change.</p> <p>It is the intention that the approach to setting effects will be discussed and agreed with Natural England prior to undertaking the LVIA presented in the ES.</p> <p>If there is no change to the AONB boundary, the Stour Valley (or parts of it) will be considered as forming part of the setting of the AONB as agreed with Natural England. Figure 6.1 illustrates the extent of the SLAs and the AONB. Section 6.5 and Appendix 6.1: Landscape and Visual Baseline discuss the AONB and the SLA.</p>
<p>(ID 4.1.14) The Applicant's Scoping Report refers to the River Box SLA. This site is not shown on the corresponding Figure 6.1 (Volume 3) of the Scoping Report, but the figure does show a site called 'Box Valley SLA'. The ES should use consistent terms for sites and ensure that this consistency is also applied to both figures and the text.</p>	<p>The 'Box Valley SLA' has been considered in Section 6.5 of this PEI chapter and in Appendix 6.1: Landscape and Visual Baseline, which now use consistent terms as Figure 6.1 where the extent of the Box Valley SLA is shown.</p>
<p>(ID 4.1.15) The Inspectorate notes that the assessment of effects to visual receptors will be focused on a 3km study area around the project, and further rationale for the selection of this study area is presented in the Scoping Report. The draft ZTV in Scoping Report Figure 6.3 indicates that the project would be visible beyond this study area. The ES should assess impacts to visual receptors beyond the 3km study area where these are likely to give rise to significant effects, rather than applying an arbitrary cut off.</p>	<p>The study area for the preliminary assessment is discussed in Section 6.4 and is illustrated in Figure 6.1. ZTV Figures 6.7 to 6.13 illustrate the ZTV of the project within the study area, extending to a distance of 5km from the draft Order Limits.</p>
<p>(ID 4.1.16) The scope and methodology used to determine the baseline, including the selection of viewpoints, should be discussed and agreed with relevant consultation bodies, including the local planning authorities. In addition to representative viewpoints and receptor groups, the viewpoints selected should include relevant vistas/vantage points. The scope of any baseline data collection should also cross reference to any requirements for the historic environment assessment.</p>	<p>The selection of viewpoints is being undertaken in consultation with relevant consultation bodies, including the local planning authorities. Viewpoint locations will be refined as the project progresses and the design develops. A selection of viewpoints is discussed in Sections 6.4 and 6.5 and is illustrated in Figure 6.6. Chapter 8: Historic Environment uses the same viewpoints to support the historic environment assessment.</p>

Matter Raised in the Scoping Opinion	Project Response
<p>(ID 4.1.17) The Applicant proposes to assess visual effects on communities by dividing the study area into community areas. The Inspectorate notes that the visual assessment will also be supported by selection and assessment of representative viewpoints and is therefore satisfied with this approach. The ES should however ensure that any areas defined for the assessment are clearly described and reasons given for their selection. Receptors within the community areas should be identified and agreed with relevant consultation bodies.</p>	<p>Community areas in this preliminary assessment relate to areas in proximity to nearby settlements and are described as such in the assessment of likely significant effects presented in Section 6.7.</p> <p>Establishment of defined areas will be further addressed in the ES.</p> <p>National Grid has presented the approach for defining community areas at the landscape thematic meeting and will be seeking to agree community areas in the relevant Statement of Common Ground.</p>

Project Engagement

- 6.3.4 National Grid has held a number of meetings with relevant consultees including Suffolk County Council, Essex County Council, Babergh and Mid-Suffolk District Councils, Braintree District Council and Dedham Vale AONB and Stour Valley Partnership as summarised in Chapter 3: Scoping Opinion and Consultation.
- 6.3.5 These meetings have included a discussion with Babergh and Mid Suffolk District Councils about whether the SLA would be taken forward in the Joint Local Plan, as Braintree District Council has already removed the SLA from their current policy. Babergh and Mid Suffolk District Councils confirmed that there will be no need to consider SLA in the LVIA once the Joint Local plan is adopted. The SLA will be considered in the LVIA (and the preliminary assessment is presented in the PEI Report) until the point when the Joint Local Plan is adopted.
- 6.3.6 The proposed viewpoints were issued to the Dedham Vale AONB and Stour Valley Partnership and the local planning authorities for comment following a meeting on 26 May 2021. A joint response was received from the local planning authorities with suggestions for a small number of additional viewpoints. The suggested additional viewpoints will be included in the LVIA.

6.4 Approach and Methods

- 6.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on landscape and views. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what will be undertaken as part of the ES.

Desk Study

- 6.4.2 The baseline assessment has been informed by a desk-top study which has drawn on the following key information sources:
- work undertaken by National Grid and their appointed consultants before project paused in 2013;
 - published landscape character assessments;
 - 1:25,000 and 1:50,000 Ordnance Survey (OS) maps (2021c);

- aerial photography, Google Earth and Google Maps Street View;
- terrain data;
- open source Geographical Information System (GIS) data; and
- other advice and information provided by consultees and referenced within the chapter including the Dedham Vale AONB and Stour Valley Management Plan.

Site Survey

- 6.4.3 The findings of the desk-top study have been supplemented by site surveys undertaken between winter 2021 and summer 2021.
- 6.4.4 An initial site visit was undertaken on 18 February 2021 to gain a high-level overview of the general landscape character and visual resource in proximity to the project. This was followed by site visits undertaken between 20 and 29 April 2021 to gain a more in-depth understanding of the study area and with a focus on identifying viewpoints used to support the assessment. These visits involved visiting proposed viewpoint locations, capturing baseline photography and identifying potential visual receptors, preliminary judgements on potential impacts and initial consideration of options for mitigation.
- 6.4.5 In addition to the preliminary site visits undertaken, a further visit was made on 27–28 July 2021 to capture baseline photography to be used for photomontage production for selected viewpoints that will be presented in the ES. Other surveys are ongoing and are expected to continue throughout the autumn and winter of 2021 and during 2022. These surveys will continue to inform the assessment and will be undertaken during both summer and winter months to fully understand the visual baseline and inform the LVIA for the ES.

Study Area

- 6.4.6 The Scoping Report (National Grid, 2021b) proposed a study area 5km distance from the draft Order Limits (the ‘wider landscape’). The Planning Inspectorate stated in the Scoping Opinion (2021b), the importance of consideration of visual receptors beyond 3km, therefore the 5km study area has been retained and used for this preliminary LVIA, as it is considered to more than adequately cover receptors which could experience significant effects. Although the study area is based on a 5km buffer of the draft Order Limits, the emphasis of this preliminary assessment is, however, based on receptors lying within 3km where significant landscape and visual effects are most likely to occur. Visual receptors that fall outside the ZTV are excluded from the assessment.
- 6.4.7 The justification for the study area and focus of the assessment is based on the following considerations:
- Professional experience of assessments of 400kV overhead lines (the tallest element of the project) (National Grid, 2014) and field assessment have shown that there are circumstances when a steel lattice 400kV pylon approximately 50m high can be discerned at distances up to 10km. However, in most instances it is likely to be barely perceptible beyond 5km and therefore unlikely to give rise to significant effects. This is because at 5km distance, when viewed at arm’s length, a 50m tall pylon will appear to be approximately 6mm high in the landscape. This is known as the apparent height of the pylon. If a pair of pylons are seen close together at this distance, perceptibility may increase slightly but this is still unlikely to trigger significant effects;

- Field assessment has determined that where visible at distances between 1km and 3km, a steel lattice 400kV overhead line approximately 50m high, can typically be seen in only a small proportion of views as it is often screened by trees, landform and vegetation. Where visible within 1km it is typically seen in a greater proportion of the view depending on filtering, screening or backgrounding which may reduce the extent visible;
- The draft ZTV illustrated in Figure 6.7: Comparative ZTV of Pylons to be Removed and Proposed Pylons, demonstrates that the difference in extent of theoretical visibility (worst-case scenario) between the proposed 400kV overhead line, the existing 400kV overhead line to be removed and the existing 132kV overhead line to be removed, is relatively small in terms of geographical coverage. Although the comparative ZTV does demonstrate the difference between the extent of theoretical visibility between the proposed 400kV overhead line and the existing 400kV and 132kV overhead lines to be removed, it is a high level ZTV and only provides an illustration as it is based on indicative top heights of pylons only, and does not take into consideration screening effects of existing vegetation. Additional ZTVs have therefore been produced (Figures 6.8 to 6.13) to further analyse potential visibility and to focus the assessment. These are discussed later in this section;
- Site visits undertaken in April 2021 verified that the landscape within which the project is proposed is generally well treed and, with the exception of some elevated views, visibility is often foreshortened by woodland blocks, field and hedgerow trees and hedgerows.

6.4.8 The ZTVs have been used to identify visual receptors and to inform the preliminary assessment of visual impacts.

6.4.9 The study area will continue to be reviewed, both in the light of ongoing site surveys, and following the production of updated ZTVs as the project develops. This is to assist in capturing all potentially significant visual effects in the assessment.

Assessment Methodology

General Methodology

6.4.10 The assessment is based on the Guidelines for LVIA, Third Edition (GLVIA3) (Landscape Institute and IEMA, 2013), which promotes LVIA that should be proportional to the scale and nature of the proposals and the likely landscape and visual effects. Relevant guidance from the Landscape Institute has been considered, including the Landscape Institute's (February 2016) Technical Information Note: Landscape Character Assessment (08/15), and Landscape Institute's (May 2021) Technical Guidance Note 02-21 'Assessing landscape value outside national designations'. (TGN 02-21 includes incorporation of cultural associations into consideration of landscape value, which should be considered as part of the assessment in the ES.)

6.4.11 The approach set out in GLVIA3 establishes good practice guidelines for LVIA but also complies with the requirements of NPS EN-1 and NPS EN-5. Further relevant guidance documents were referenced in Appendix 2.1 of the Scoping Report (National Grid, 2021b).

6.4.12 The general approach to assessing potential impacts of the project on landscape and visual receptors is as follows:

- The existing landscape and views form the basis for the identification and description of the landscape and visual changes that may result from the project. The baseline includes the existing 400kV overhead line and the existing 132kV overhead line;
- An assessment of the potential impacts of the project on landscape receptors has been undertaken including a review of potential impacts on the fabric of the landscape (such as the addition, removal or alteration of structures, woodlands, trees or hedgerows), which may alter the character and perceived quality of the area, or more general impacts on landscape character and designated areas of landscape arising from the removal or introduction of man-made features. In landscapes designated or valued for their scenic or landscape quality such as Dedham Vale AONB, such changes can affect the purpose of the designation or perceived value of the landscape;
- An assessment of the potential impacts of the project on visual receptors has been undertaken. This relates to specific changes in the composition of views and the effects of those changes on visual receptors and wider visual amenity. In accordance with industry guidance, the assessment is focused on public views experienced by those groups of people who are likely to be most sensitive to the construction and operation of the project. This comprises local communities where views contribute to the landscape setting enjoyed by residents in the area and people using recreational routes, features and attractions.

6.4.13 The categories of landscape and visual receptors that are considered are:

- Landscape designations at a national and local level. These include the nationally designated Dedham Vale AONB and locally designated SLA. The method for assessing setting impacts is currently being formulated with the intention of agreeing the approach with Natural England prior to undertaking the LVIA;
- Landscape character (combinations of elements and aesthetic and perceptual aspects that make an area distinctive) at a county level but taking cognisance of other relevant published landscape character assessments and site based findings;
- Views experienced by people living and moving around the area (communities) and people taking part in outdoor recreational activities/pursuits within the area (recreational receptors).

6.4.14 Significance has been derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which, where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the EIA Regulations 2017, are effects of moderate or greater significance.

6.4.15 The preliminary assessment presented in this chapter makes an assessment of whether or not a potential effect is likely to be significant without categorising into defined thresholds (i.e. moderate or major). The work involved to provide this additional level of detail is still ongoing and will be provided in the ES.

Zone of Theoretical Visibility (ZTV)

6.4.16 A series of ZTV maps has been produced to inform the preliminary assessment (Figures 6.7–6.13). These illustrate theoretical visibility of the project during the operational phase and have been modelled based on indicative pylon and gantry locations and heights

provided at this stage. Further details regarding the flexibility of the design and the application of the LoD can be found in Chapter 4: Project Description.

- 6.4.17 The ZTVs have been generated in GIS using a combination of OS Terrain 5 and Terrain 50 Digital Terrain Model. The ZTVs will be refined and updated as the assessment progresses and a new set of ZTVs will be produced for the ES to capture any changes.
- 6.4.18 The ZTV presented in Figure 6.7 is based on the theoretical visibility of the proposed overhead line and takes no account of the screening effects of buildings and vegetation, which may in reality preclude visibility from certain areas. This is referred to as a 'bare earth' ZTV and provides the 'worst-case' scenario (largest geographical area) from which the project may be visible.
- 6.4.19 Additional ZTVs have been produced (Figures 6.8–6.13) to assist the assessment further. These maps present the extent of theoretical visibility of the proposed 400kV overhead line within each section of the project and also the CSE compounds and GSP substation. They are not based on bare-earth alone but take into consideration existing woodland. Woodland blocks have been defined by desk-top study using the National Forest Inventory mapping dataset and have been assigned a 15m height. This is considered a conservative approach to represent the likely screening/filtering effects of mature woodland. The ZTVs do not take into account the additional screening and filtering effects of hedgerow and field trees, small copses or more recently planted trees, woodland and hedgerows which are found in many places throughout the study area.
- 6.4.20 Each of the maps illustrate the ZTV as follows:
- the areas from which pylons or gantries (within a CSE compound or GSP substation) may theoretically be visible, from the ground level to the top;
 - the areas from which the top half of pylons or gantries (within a CSE compound or GSP substation) may theoretically be visible, but the bottom half would not be; and
 - the areas from which the very top of pylons or gantries (within a CSE compound or GSP substation) may theoretically be visible, but the rest would not be (this is based on the top 2.5m of pylons being visible or the very tip of the gantries).
- 6.4.21 As the ZTVs are theoretical, fieldwork has been and will continue to be undertaken to take into account local screening elements within the landscape to inform the LVIA. The results of the fieldwork undertaken to date has informed this preliminary assessment.

Viewpoint Analysis

- 6.4.22 Preliminary high level viewpoint analysis has been conducted from a series of publicly accessible viewpoints in fine weather conditions as part of the site survey work undertaken in April 2021. The viewpoints (illustrated on Figure 6.6) have been selected to represent the different receptors in the study area and their likely views. This includes people living and moving around the area (referred to as 'Community Receptors') and people taking part in outdoor recreational activities/pursuits within the area (referred to as 'Recreational Receptors'). Potential changes in views have been considered to determine whether a potentially significant effect may be likely to arise.
- 6.4.23 The selection of these viewpoints has been informed by previous work undertaken prior to project pause, ZTV analysis, site visits, desk-based research on access and recreation including footpaths, bridleways and public land, by tourism including popular vantage points, and by the distribution of the different groups of visual receptor.

6.4.24 The viewpoints have been issued to relevant consultees for consideration. The local planning authorities have provided joint feedback on the proposed viewpoints and these suggestions will be taken on board as the project progresses.

Preliminary Assessment Key Parameters and Assumptions

6.4.25 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.

6.4.26 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.

6.4.27 A number of assumptions and limitations are made in relation to the information presented in this chapter. These reflect the evolving nature and preliminary stage of the project:

- The vegetation loss and retention matches the assumptions in Chapter 4: Project Description, namely:
 - no tree or hedgerow loss would be required for the removal of the existing 132kV overhead line (directly under the overhead line);
 - limited vegetation loss required for the removal of the 400kV overhead line in Section G: Stour Valley (under the overhead line) as the 20m swathe required for removal is already managed as part of the existing maintenance corridor;
 - woodland and tree gaps could be replanted where either the 132kV or 400kV overhead lines would be removed and no overhead line constructed in the vicinity; and
 - tree and vegetation loss required to construct the 400kV overhead line would be restricted to a 20m swathe with an additional 12.5m of graduated cutting back of vegetation either side from ground up to canopy height.
- The survey and assessment work is ongoing. The preliminary assessment focuses on landscape and visual receptors which would potentially experience significant effects;
- At the time of undertaking this preliminary assessment, a potential Dedham Vale AONB extension has been submitted but not yet approved or rejected. As such the landscape designation baseline and assessment considers the current AONB boundary. If the AONB is extended prior to the application for development consent then this will be re-considered accordingly in the ES;
- The preliminary assessment is based on high level assumptions of potential construction working area and potential vegetation loss set out in Chapter 4: Project Description. These assumptions are considered to be a worst-case scenario. It also assumes that vegetation removed during construction would be reinstated, except where there are planting restrictions associated with the legal land right (easement or wayleave).

Further Assessment Within the ES

- 6.4.28 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point, the assumptions and assessment will subsequently be developed and presented in the ES.
- 6.4.29 As noted above, the preliminary assessment presented in this chapter considers whether or not a potential effect is likely to be significant without categorising into defined thresholds. The LVIA in the ES will provide the additional level of detail.
- 6.4.30 In line with the standard approach to LVIA, residual effects will be considered in year 15 when reinstatement planting would be established. This approach is adopted to acknowledge that measures to reduce landscape and visual effects caused by vegetation loss cannot be completely effective until replacement planting is fully established, which can take approximately 15 years.
- 6.4.31 The viewpoint assessment is ongoing. Further site visits will be undertaken and a detailed analysis of viewpoint assessments will be presented at ES stage. This work will involve visiting and viewing wireframes prepared for each viewpoint location and will consider seasonal effects of vegetation. It is envisaged that by arranging the viewpoints in order of distance, it will be possible to define a threshold or outer limit beyond which there would be no significant effects; this will be considered in the ES.

6.5 Existing Baseline

- 6.5.1 The following text provides an overview of the landscape designations, landscape character and views within the 5km study area, as a summary for the overall study area. Appendix 6.1: Landscape and Visual Baseline provides a detailed breakdown of the landscape and visual baseline for each of the project sections.
- 6.5.2 The existing 400kV overhead line and the existing 132kV overhead line are considered as forming part of the baseline.

Landscape Designations

- 6.5.3 The project is located near to and crosses a number of landscape designations, as shown on Figure 6.1:
- Dedham Vale AONB (national designation);
 - Gipping Valley SLA (local designation);
 - Brett Valley SLA (local designation);
 - Stour Valley SLA (local designation); and
 - Box Valley SLA (local designation).
- 6.5.4 These designations and their relationship to the project are described in more detail in Appendix 6.1: Landscape and Visual Baseline.
- 6.5.5 Although not a designation, the Stour Valley Project Area is also shown on the same figure for context, as this area has similar picturesque landscape qualities to Dedham Vale AONB, being valued for its similar gently undulating river valley topography, medieval settlement pattern and rural characteristics.
- 6.5.6 The project also runs close to areas of ancient woodland including at Hintlesham Woods. It passes numerous listed buildings and Historic Environment Records (HER). These are

discussed further in Chapter 7: Biodiversity and Chapter 8: Historic Environment respectively.

Landscape Character

- 6.5.7 The project crosses a landscape which comprises a low-lying topography of flat to gently undulating landform, and wide, flat river valleys. Topography becomes more rolling to the west of the River Stour, around Twinstead. Major watercourses within the study area typically flow north to south, including the River Brett, River Box, and River Stour, with topography gently rising between these river corridors.
- 6.5.8 At a national level, the project (and entirety of the study area) falls within the Natural England NCA 86: South Suffolk and North Essex Clayland (Natural England, 2014c). Relevant characteristics of this NCA are listed in Appendix 6.1: Landscape and Visual Baseline.
- 6.5.9 At a regional level, the project is covered by the East of England Landscape Typology (Landscape East Partnership, 2011) and falls within the landscape typologies of Wooded Plateau Farmlands, Valley Settled Farmlands, Wooded Plateau Claylands, and Valley Meadowlands.
- 6.5.10 At a county level, the project is covered by the Suffolk Landscape Character Assessment (Suffolk County Council, 2010), Essex Landscape Character Assessment (Chris Blandford Associates, 2003), and also the Suffolk and Essex Historic Landscape Characterisation (Suffolk County Council, 2012). These county scale landscape character types and areas are described in more detail in Appendix 6.1: Landscape and Visual Baseline.
- 6.5.11 At a district level, the eastern and central sections of the project are covered by the Joint Babergh and Mid Suffolk District Council Landscape Guidance (Dyson-Bruce and Bennet, 2013a). This is based on Suffolk Landscape Character Assessment (Suffolk County Council, 2010), with further information and detail provided in order that each area clearly relates to the Babergh and Mid Suffolk District. The western sections of the project are covered by the Landscape Character of Braintree District (Braintree District Council, 2006). These district scale LCAs are described in more detail in Appendix 6.1: Landscape and Visual Baseline.
- 6.5.12 The county level assessments have been used for the purposes of this chapter and are considered in further detail in the baseline condition description under each section of the project and are shown on Figure 6.2.
- 6.5.13 Appendix 6.1: Landscape and Visual Baseline sets out in detail how the project interacts with these LCAs in each of the seven project sections. Below is a summary of the LCAs identified within each project section.

Section AB Bramford Substation/Hintlesham

- 6.5.14 The majority of Section AB: Bramford Substation/Hintlesham lies within landscape characterised as Ancient Plateau Claylands, with Ancient Estate Claylands to the south, and Rolling Valley Farmlands to the west of Section AB and along the Belstead Brook valley. This characterisation is at a county level in the Suffolk Landscape Character Assessment (2010).
- 6.5.15 The Dedham Vale AONB boundary lies approximately 2km from the west end of Section AB. The Belstead Brook valley is designated as the Gipping Valley SLA in the Babergh District Local Plan (2006). The Gipping Valley SLA extends northeast from the valley up

to the local authority boundary, which is to the southwest of Bramford Substation. A small part of the Brett Valley SLA extends into the eastern part of Section AB: Bramford Substation/Hintlesham.

Section C Brett Valley

- 6.5.16 Section C: Brett Valley lies in landscape characterised as Rolling Valley Farmlands, and Valley Meadowlands at a county level in the Suffolk Landscape Character Assessment (2010). Dedham Vale AONB lies approximately 2km to the south of Section C. The Brett Valley is designated as an SLA (Babergh District Council, 2006) and covers the whole of Section C: Brett Valley.

Section D Polstead

- 6.5.17 Section D: Polstead lies in landscape which in the main is characterised as Ancient Rolling Farmlands at a county level in the Suffolk Landscape Character Assessment (2010). The eastern end of Section D lies within Rolling Valley Farmlands. Dedham Vale AONB abuts the western end of Section D and lies between 0.2km and 2km to the south of Section D: Polstead. The Brett Valley is designated as an SLA (Babergh District Council, 2006) and covers the eastern half of Section D: Polstead.

Section E Dedham Vale AONB

- 6.5.18 Section E: Dedham Vale AONB lies in landscape characterised as Ancient Rolling Farmlands, Rolling Valley Farmlands, and Valley Meadowlands at a county level in the Suffolk Landscape Character Assessment (2010). The key characteristics of these landscape character types are listed in Appendix 6.1: Landscape and Visual Baseline.
- 6.5.19 The majority of Section E runs directly through Dedham Vale AONB. The River Box is designated as an SLA (Babergh District Council, 2006) and the southern extent of this designation lies approximately 0.5km to 1.4km to the north of Section E: Dedham Vale AONB.

Section F Leavenheath/Assington

- 6.5.20 Section F: Leavenheath/Assington lies in landscape which is characterised as Ancient Rolling Farmlands at a county level in the Suffolk Landscape Character Assessment (2010). The Dedham Vale AONB abuts the eastern end of Section F and some areas of the AONB come within approximately 0.5km to the south of Section F.
- 6.5.21 The Stour Valley Project Area, subject to a number of ecological and access enhancement schemes, abuts the western end of Section F and some of the Stour Valley Project Area is covered by the SLA designation over the eastern extent of the Stour Valley (Babergh District Council, 2006).

Section G Stour Valley

- 6.5.22 Section G: Stour Valley lies in landscape which is characterised by the Suffolk Landscape Character Assessment (2010). The eastern and western parts of Section G lie within Ancient Rolling Farmlands and the central area lies within Rolling Valley Farmlands and Valley Meadowlands. The western part of Section G is also characterised within the Essex Landscape Character Assessment (2003) as C8: Stour Valley and B3: Blackwater and Stour Farmlands.
- 6.5.23 The whole of Section G lies within the Stour Valley Project Area, which, while not a designated landscape in itself, has been described as having '*similar picturesque landscape qualities to Dedham Vale*' (Land Use Consultants, 2018) and is therefore considered to be part of the setting of the AONB.

Section H GSP Substation

6.5.24 Section H lies in landscape which is characterised as Ancient Rolling Farmlands and Rolling Valley Farmlands at a county level in Suffolk Landscape Character Assessment (2010). This landscape is also characterised as B3: Blackwater and Stour Farmlands in the Essex Landscape Character Assessment (2003). The Dedham Vale AONB lies approximately 7.5km to the east of the proposed GSP substation.

Views

Visibility Overview

6.5.25 A description of existing views is presented in Section 6 of Appendix 6.1: Landscape and Visual Baseline, with reference to each of the seven sections of the project (shown on Figure 6.6: Visual Receptors), as follows:

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

6.5.26 The baseline text in Appendix 6.1 takes into account site observations in addition to information gathered during desk-top studies and during consultation with relevant consultation bodies.

Future Baseline

6.5.27 The future baseline is related to landscape and visual changes which are considered certain or likely to happen, including consented proposals which are not yet present in the landscape but are expected to be constructed. There are applications for development within the study area, which may affect the landscape character or result in changes to visual amenity and people's views. These are considered within Chapter 15: Cumulative Effects.

6.5.28 Ash (*Fraxinus excelsior*) trees within the study area may be affected by ash dieback. This is a disease of ash trees caused by a fungus of Asian origin. The disease causes leaf loss and crown dieback in affected trees and is usually fatal. Mapping by the Department for Environment, Food and Rural Affairs (Defra) and the Forestry Commission confirms the presence of ash dieback in Essex and Suffolk and it has been identified in site surveys undertaken for the project. The future baseline therefore assumes that there would be loss of ash trees in the long term across the study area, but that other tree species would occupy gaps created in the short term, and overall levels of vegetation would remain similar to existing. The arboricultural survey is recording incidents of ash dieback and the results of this will be included within the ES.

6.5.29 In contrast to expected loss of ash trees, some beneficial landscape changes are also anticipated. These relate to agri-environment and woodland planting schemes which will continue to enhance the landscape. Within the areas of the study area being managed in accordance with the Dedham Vale AONB and Stour Valley Management Plan (Dedham Vale AONB and Stour Valley Project, 2016b), new areas of woodland and hedgerows

have been planted to restore the landscape fabric and it is anticipated this area will continue to be enhanced.

- 6.5.30 As previously stated, it is recognised that no landscape is static and that the landscape across the study area is under different pressures and continually changing; albeit over relatively long timeframes. Further to a review of the above, in terms of landscape character, it is considered that the character of the baseline landscape would not significantly change in the future during construction and operation.

6.6 Likely Significant Effects (Without Mitigation)

- 6.6.1 This section sets out the likely significant effects of the project on landscape and visual receptors, based on a preliminary assessment. It assumes that the relevant embedded measures and good practice measures outlined within Appendix 4.1: Outline CoCP are in place before assessing the potential effects.
- 6.6.2 It is likely that the greatest landscape effects would occur during construction. This is most notable because of the impacts of vegetation clearance in construction working areas. These effects are likely to occur along the full length of the project, with effects varying according to the landscape in each section, and therefore have been reported individually for each project section.
- 6.6.3 During operation, landscape effects are likely to be more similar across the project because overhead lines are already a feature in the baseline landscape. Operation effects are therefore reported as a summary, rather than by section, to avoid repetition. Landscape effects are also likely to be greater in magnitude at year 1 of operation, because of the impacts of vegetation clearance. Impacts are expected to reduce over time as proposed replacement planting establishes (assumed to be up to 15 years after completion).
- 6.6.4 Whilst there will be impacts on views during construction, operation and decommissioning, the greatest visual effects are likely to occur during operation since the effects would more likely be long term and (in the absence of decommissioning) permanent. Visual effects during operation have therefore been reported individually for project sections, whilst during construction they are reported as a summary to avoid repetition.

Embedded and Good Practice Measures

- 6.6.5 The project includes the following embedded measures relevant to the assessment of the landscape and visual effects:
- Underground cables are proposed through Dedham Vale AONB and the Stour Valley Project Area. This along with removal of the existing 132KV overhead line would reduce the overhead lines in these areas;
 - Using the route of the existing 132kV overhead line, where practicable, for the proposed 400kV overhead line;
 - Use of full tension gantries at three of the CSE compounds;
 - Embedded landscape planting around each of the four CSE compounds and the GSP substation. The draft Order Limits include adequate room for planting and potentially mounding for additional screening.

- 6.6.6 In addition, the LVIA will continue to identify embedded measures through the location of any proposed mounding and/or planting to help with screening of equipment and, where practicable, influencing the proposed materials and colour finishes of equipment, security fencing and surfacing.
- 6.6.7 During the ongoing design process, it is envisaged there may be further opportunities for embedding measures into the design in terms of further detailed consideration of the design and siting of temporary and permanent access routes and construction working areas and micro-siting of underground cable routes.
- 6.6.8 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to landscape and visual matters, including proposals for replacement planting.

Construction

Overhead Line (including CSE Compounds and Removal of Overhead Lines)

- 6.6.9 The potential sources of landscape and visual effect of the overhead line works during construction include the following (these are all anticipated to be adverse):
- site clearance, tree felling and hedgerow removal;
 - topsoil stripping and earthworks, particularly associated with construction compounds and site accesses;
 - movement of construction related traffic including delivery and removal of material to and from site, off-site road traffic including workers travelling to and from site;
 - construction and removal of temporary site accesses and haul routes, including bellmouths;
 - general construction activities and facilities including the movement of large-scale construction equipment, construction compounds and temporary buildings required for construction, parking on site and materials stockpiles;
 - temporary bailey bridges and culverts;
 - temporary scaffolding;
 - temporary hoardings and/or security fencing or signage;
 - temporary pylon and overhead line required for construction; and
 - construction site lighting particularly during the winter months.
- 6.6.10 Construction would require machinery including cranes for erection and removal of pylons. This machinery and these activities would be different to those typically noted in the landscape as part of regular farming practice. The grouping of operations around working areas and concentrations of machinery would introduce increased levels of activity across the landscape. This would be similar across the landscapes of all of the project Sections.
- 6.6.11 Construction activities that would give rise to landscape and visual effects would include working areas, access tracks and operations including at-height working to construct the 400kV pylons. The majority of the works associated with the removal of the existing 132kV pylons is likely to be at ground level for dismantling with some at-height working to remove conductors and fittings from pylons.

- 6.6.12 In Section AB: Bramford Substation/Hintlesham there would be a temporary pylon used to divert existing overhead lines whilst construction work is undertaken near Hintlesham Woods for Option 1.
- 6.6.13 Erection of scaffolding over rural roads, PRow and lower voltage overhead lines may give rise to temporary, short-term, landscape and visual impacts. In some instances there may be a need to remove vegetation to accommodate scaffolding.
- 6.6.14 There would also be removal of trees, scrub and hedgerows within the draft Order Limits to allow for the construction of the proposed 400kV overhead line and removal of the existing 132kV overhead line. Generally, routeing has sought to avoid tree loss where practicable but there will be requirements for trees to be removed or lopped.
- 6.6.15 Construction activities would also involve the creation of new access tracks. For the purposes of this preliminary assessment an assumption has been made based on the worst-case scenario of stone surfaced access tracks, with trackway used for the removal of the existing 132kV overhead line. The final surfacing of the access tracks may vary depending on ground conditions.
- 6.6.16 Whilst it is anticipated that where practicable, new access tracks would be along existing tracks, they would introduce new elements into the landscape particularly where they may need to cross the centres of fields to access existing or proposed pylon positions. In these instances, they may result in a localised disruption to the field pattern of the landscape.
- 6.6.17 Construction of CSE compounds would involve concentrated construction activities in specific locations. There would be work compounds established to receive deliveries of equipment and material and to store machinery and equipment during works.

Landscape Designations

- 6.6.18 The construction activities associated with the removal of the existing 132kV overhead line could directly and negatively affect the special qualities and setting of nationally valued Dedham Vale AONB temporarily during construction; both within Section E (the northern extent of the AONB in the Box Valley) and within Section G (the Stour Valley is considered to form part of the setting of the AONB). The effects would likely be **not significant** due to the short-term and relatively unobtrusive nature of the work required to dismantle the 132kV conductors and pylons, which would require very little if any vegetation removal. Landscape impacts in Section G: Stour Valley, would also arise due to the work required for the removal of several spans of existing 400kV overhead line from Twinstead Tee southwards. In these areas there would be a requirement to cut back vegetation within a 20m swathe along the alignment of the existing 400kV overhead line to facilitate removal.
- 6.6.19 The construction of the CSE compounds and proposed 400kV overhead line would not directly affect the landscape of Dedham Vale AONB. Preliminary assessment has identified that the construction of these components of the project may however affect the setting of the AONB, particularly in the Stour Valley in Section G. The preliminary assessment undertaken suggests that effects would likely be **not significant** due to intervening vegetation and/or distance between the AONB and the project. As the project progresses, further analysis and assessment work will be undertaken to verify this.
- 6.6.20 There is potential for the construction of the proposed 400kV overhead line to directly impact the current locally designated, and regionally valued Gipping Valley SLA (Section AB: Bramford Substation/Hintlesham). This includes effects at Belstead Brook, where part of a linear strip of woodland would be cut back to enable the oversailing of conductors

across the valley. Overall construction landscape effects on the Gipping Valley SLA would likely be **not significant** due to the nature of the majority of impacts being short term and temporary.

- 6.6.21 There is potential for the construction of the proposed 400kV overhead line and removal of the existing 132kV overhead line to directly impact the Brett Valley SLA (Sections AB, C and D) and the Stour Valley SLA (Sections F and G). Although the majority of construction works would be temporary and reversible there may be locations where removal of vegetation in smaller valleys would have a longer-term effect and alter parts of the valued characteristics of the SLA such as to the south of Kate's Hill Farm (Section AB: Bramford Substation/Hintlesham), near Rands Road (Section D: Polstead) and to the south and southwest of Assington (Section F). The cutting back of woodland in these small valleys combined with the introduction of construction activities would result in a localised disruption to the more enclosed and sometimes tranquil character of localised parts of the landscape. Overall construction landscape effects on the Brett Valley SLA and Stour Valley would likely be **not significant** due to the majority of impacts being short term and temporary.
- 6.6.22 It is unlikely that the construction of the project would have significant effects on the River Box SLA which would not be directly impacted by the project. Preliminary assessment suggests that should any effects be identified these would likely be **not significant**.

Landscape Character

- 6.6.23 The potential main sources of effects on landscape character during construction include:
- the loss and/or changes to landscape elements and features such as woodland, trees, scrub, hedgerows within the draft Order Limits;
 - the temporary loss of an area of farmland within the draft Order Limits; and
 - the loss of perceived sense of remoteness and tranquillity due to the introduction of construction vehicles, equipment and accesses.

Section AB Bramford Substation/Hintlesham

- 6.6.24 Construction effects along this section of the project would include working areas, access tracks and operations including at-height working to construct the 400kV pylons. Removal of the existing 132kV pylons is likely to be on ground dismantling with small amounts of at-height working. The creation of new access tracks would result in localised disruption to the field pattern of the landscape.
- 6.6.25 The potential works associated with the two options at Hintlesham Woods are described in Table 6.3. South of Hintlesham Woods, around Bushey Coopers Farm and Primrose Farm, there would be a clustering of works to alter the alignment of the existing 400kV overhead line, construct the new proposed 400kV overhead line and remove the existing 132kV overhead line.
- 6.6.26 In addition to vegetation removal identified in Gipping Valley SLA and Brett Valley SLA there would likely be tree and hedgerow removal, including sections of tree lined hedges along tracks.
- 6.6.27 Along the route of the existing 132kV overhead line, the effect from construction activities would be largely associated with on the ground dismantling of pylons. Localised effects would be experienced as a result of access tracks across fields to pylons and scaffolding across roads. The effects on the landscape would be localised and perceptibility would quickly diminish within a few fields from the site of works.

6.6.28 Overall, the effects of construction operations on landscape character of Section AB would be **not significant**, due to the majority of impacts being short term and temporary.

Section C Brett Valley

6.6.29 This section of the project crosses the Brett Valley and would comprise the construction of the proposed 400kV overhead line and the removal of the existing 132kV overhead line.

6.6.30 The project generally passes through open farmland with low hedgerow boundaries. This would limit the amount of vegetation clearance required and associated construction effects on landscape character. The most notable tree removal would be along a short section of Hadleigh Railway Walk which is enclosed by tall hedgerows and scrub; it is anticipated that this would be thinned and reduced in height in order to achieve clearance for conductors oversailing the Hadleigh Railway Walk. This would result in a localised change to this wooded corridor. There are however already some existing breaks in the woodland along the Hadleigh Railway Walk, and less dense tree cover around the area where the existing overhead lines cross; the change would be consistent with this character. Other notable woodland removal would be at the western end of the section to the north of Overbury Hall.

6.6.31 Construction effects would generally be similar to those reported for Section AB including access tracks along the valley sides and valley bottom. This is a relatively open landscape and the effect of these access tracks would be a localised disruption to the open arable character of the river valley.

6.6.32 Operations to both construct the proposed 400kV overhead line and remove the existing 132kV overhead line would be in close proximity, and working areas including a clustering of machinery, materials storage and security fencing would all increase activity within the landscape. Any effects on the plateaus beyond the valley sides would largely result from at-height working as the pylons are constructed. Ground level working would not exert an influence on the wider landscape.

6.6.33 South of Lower Layham, the river valley character would remain intact and construction operations would exert little influence on landscape character. There would be very little if any landscape effects on the Dedham Vale AONB section of the Brett Valley where construction operations would be too distant to exert an influence on the rural tranquil character of this nationally designated part of the river valley.

6.6.34 Overall, the effects of construction operations on landscape character of Section C: Brett Valley would be **not significant** due to the majority of impacts being short term and temporary.

Section D Polstead

6.6.35 This section of the project is across an interfluvium between the Brett and Box valleys. Construction activities would involve the erection of 400kV pylons and removal of the existing 132kV overhead pylons in close proximity.

6.6.36 The project generally passes through open farmland with low hedgerow boundaries. This would limit the amount of vegetation clearance required and associated construction effects on landscape character. The majority of vegetation work would relate to the removal of 20m long sections of hedgerows to enable clearance for overhead lines and also for the installation of scaffolds across the roads. The main area of vegetation clearance would be across Rands Road, east of Valley Farm. These works would result in a localised opening up of the valley and construction activities would alter the tranquil

wooded character of the valley whilst works are being carried out. There may be temporary effects where scaffolding is required across the road. Woodland clearance around Overbury Hall would largely be along the existing clearance route for the existing 132kV overhead line. The clearance would be slightly more extensive than the existing route but, as the clearance route exists already, the effects on landscape character would be reduced.

- 6.6.37 Access tracks would temporarily influence local landscape character.
- 6.6.38 The greatest change to landscape character, albeit temporary during construction, would be from the work associated with the construction of the Dedham Vale East CSE compound between the disjointed parts of Millfield Wood. This would introduce activity which is out of character with a predominantly rural farmed landscape. Work would involve activity by machinery to construct the compound and associated gantries within an arable field. This may result in effects on the local landscape; however, these would be short term and temporary.
- 6.6.39 Overall, the effects of construction activities on landscape character of Section D: Polstead would be **not significant** due to the majority of impacts being short term and temporary.

Section E Dedham Vale AONB

- 6.6.40 The effects of construction operations on the landscape of Section E are considered under landscape designations as the majority of this Section falls within the Dedham Vale AONB.

Section F Leavenheath/Assington

- 6.6.41 Section F of the project crosses an interfluvium between the Box and Stour valleys. Construction operations would involve the erection of the proposed 400kV overhead line and removal of the existing 132kV overhead line in close proximity. In addition, the Dedham Vale West CSE compound would be constructed west of Boxford Fruit Farm at the eastern end of the section.
- 6.6.42 The project generally passes through open farmland with low hedgerow boundaries. This would limit the amount of vegetation clearance required and associated construction effects on landscape character. The majority of vegetation works relate to the removal of 20m long sections of hedgerows to enable clearance for overhead lines and also for the installation of scaffolds across the roads. Where this would occur, it would be typically along roads that are characterised by a mixture of tall and short hedgerows; this characteristic element would be detrimentally affected to some degree during construction.
- 6.6.43 Woodland north of Mill Farm and at Ash Grove would require some cutting back to enable the construction of the proposed 400kV overhead line. This would have localised effects of breaking up the linear woodland which is sometimes on the horizon within this part of the landscape. However, there are already clearances in these woodland areas where the existing 400kV and 132kV overhead lines cross and this would reduce the effects of a new clearance associated with the proposed 400kV overhead line. The woodland has developed softer scrub edges making the existing clearances less notable whereas the newly cut back woodland would appear as a more prominent break in the trees in the short term.
- 6.6.44 Access tracks would temporarily influence local landscape character.

- 6.6.45 The greatest change to landscape character, albeit short term and temporary, would arise from the work associated with the construction of the Dedham Vale West CSE compound west of Hill Farm. This would introduce activity which is different and out of character with a predominantly rural farmed landscape; however, landscape sensitivity is reduced in this area through the presence of the pressing plant which is a large commercial structure.
- 6.6.46 Overall, the effects of construction operations on landscape character of Section F: Leavenheath/Assington would likely be **not significant** due to the majority of impacts being short term and temporary.

Section G Stour Valley

- 6.6.47 Section G of the project crosses the Stour Valley. Construction operations would involve the erection of several spans of the proposed 400kV overhead line to the east of the section and the construction of the Stour Valley East CSE compound and Stour Valley West CSE compound.
- 6.6.48 The project would also involve the removal of existing infrastructure including the existing 132kV overhead line from the majority of the section (extending from the eastern boundary all the way up to and including the Twinstead Tee diamond configuration) and the removal of a number of spans of existing 400kV overhead line (from the Twinstead Tee to the south where the Stour Valley West CSE compound would be constructed on the western side of the valley; west of Alphamstone). There would be locations where removal of vegetation required for the dismantling of part of the 400kV overhead line would have a slightly longer-term effect on landscape character, albeit vegetation is already managed within the existing easement and would be replanted following removal of the overhead line.
- 6.6.49 Short-term, temporary effects would arise from access tracks required to access the existing 132kV pylons and existing 400kV pylons to enable their removal. This would have localised effects on landscape character close to the overhead lines where additional machinery and working areas would introduce activity into a rural landscape.
- 6.6.50 The greatest change to landscape character would arise from the work associated with the construction of the CSE compounds south of Sawyers Farm and west of Alphamstone. This would introduce activity which is different and out of character with a predominantly rural farmed landscape. Mature boundaries and woodland around the CSE compound south of Sawyers Farm would help to limit the effect on character but work related to the construction of both CSE compounds would introduce elements of activity which is inconsistent with the surrounding rural, farmed landscape. Work would involve activity by machinery including earthworks to construct the compounds, associated gantries and permanent access roads within arable fields.
- 6.6.51 Overall, the effects of construction operations on landscape character of Section G: Stour Valley would be **not significant** due to the majority of impacts being short term and temporary.

Views

- 6.6.52 There would be temporary localised visual effects around each of the proposed 400kV pylon locations and each of the existing 132kV pylon removal locations and where vegetation would be required to be removed to facilitate construction, dismantling and access. Based on the assessment to date, it is considered likely that there would be some short-term, temporary visual effects on community and recreation receptors close to

construction due to the presence of construction activities, access tracks, traffic, equipment and storage of materials.

- 6.6.53 There would be temporary localised visual effects around the proposed 400kV overhead line local construction compounds. Based on the assessment to date, it is considered that these small compounds are likely to give rise to some short-term, temporary visual effects during construction due to the presence of traffic, equipment and storage of materials.
- 6.6.54 There would be temporary localised visual effects around each of the four proposed CSE compound sites. The CSE compounds are Dedham Vale East CSE Compound (located in Section D, south of Polstead Heath), Dedham Vale West CSE Compound (located in Section F, north of Leavenheath), Stour Valley East CSE Compound (located in Section G, south of Workhouse Green) and Stour Valley West CSE Compound (located in Section G, west of Alphamstone). Based on the assessment to date, it is considered likely that there would be some short-term, temporary visual effects on community and recreation receptors close to the project due to the presence of access tracks, traffic, equipment and storage of materials. This would likely include communities near Polstead Heath (Viewpoint D-03/04), near Leavenheath (Viewpoint F-01/01) and near Alphamstone (Viewpoint G-07/22) where views would look towards the project. Viewpoint locations are illustrated in Figure 6.6: Visual Receptors.
- 6.6.55 It is likely that the effects resulting from changes to views in and around the project would be **not significant** on the visual amenity of recreational and community receptors. This would be due to their short-term and largely temporary nature.

Hintlesham Woods Option

- 6.6.56 As noted in Chapter 5: EIA Approach and Method, the preliminary assessment has considered the likely significant environmental effects for the two options at Hintlesham Woods. These are presented in tabular format for ease of comparison (Table 6.3).
- 6.6.57 The overall summary for the preliminary assessment has shown that there are unlikely to be significant effects associated with either option during construction; albeit Option 1 is slightly less favourable overall in landscape and visual terms as it would likely have a larger construction footprint and works around the woodland would be more visible from surrounding receptors.

Table 6.3: Comparison of the Two Options at Hintlesham Woods (Construction)

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
Landscape designations (Gipping Valley SLA)	Overall construction landscape effects on the Gipping Valley SLA would likely be not significant due to the nature of the majority of impacts being short term and temporary.	Same as Option 1.
Landscape character	It is anticipated that the construction effects of Option 1 (the northern alignment) would be slightly greater than Option 2. This is due to the assumption that more pylons would be required and the overall construction footprint would be bigger. Overall construction effects on landscape character would likely be not significant due	The existing 400kV overhead line would remain as the baseline. Overall construction effects on landscape character would likely be not significant due to the nature of the majority of impacts being short term and temporary.

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
	to the nature of the majority of impacts being short term and temporary.	
Views	<p>Within this option, there would be views of a temporary pylon used to divert existing overhead lines whilst construction work is undertaken near Hintlesham Woods.</p> <p>It is likely that the effects resulting from changes to views experienced by recreational and community receptors in and around the project would be not significant during construction. This would be due to their short-term and largely temporary nature.</p>	<p>It is likely that the effects resulting from changes to views experienced by recreational and community receptors in and around the project would be not significant during construction. This would be due to their short-term and largely temporary nature.</p>

Underground Cables

6.6.58 The main sources of potential adverse landscape effects of the underground cables during construction include:

- site clearance, tree felling and hedgerow removal – the loss of landscape elements and features such as woodland, trees, scrub and hedgerows within the draft Order Limits;
- topsoil stripping, earthworks and excavation, including those associated with construction compounds and site accesses;
- movement of construction related traffic including delivery and removal of material to and from site, off-site road traffic including workers travelling to and from site;
- construction and removal of temporary site accesses and haul routes;
- general construction activities and facilities including the movement of large-scale construction equipment, construction compounds and temporary buildings required for construction, parking on site and materials stockpiles;
- construction and removal of temporary bailey bridges and culverts;
- construction and removal of temporary scaffold bridges;
- construction and removal of temporary hoardings and/or security fencing or signage; and
- construction site lighting particularly during the winter months.

Landscape Designations

6.6.59 The construction of the underground cables could affect the special qualities and setting of nationally designated Dedham Vale AONB during construction. It is anticipated that the construction of underground cables in the Box Valley (Section E), within the AONB, would directly affect the following special qualities as noted in the Dedham Vale AONB and Stour Valley Management Plan 2016–2021 (Dedham Vale AONB and Stour Valley Project, 2016b):

- *‘valley bottom grazing marshes with associated drainage ditches and wildlife;*
- *traditional field boundaries intact and well managed; and*

- *sense of relative tranquillity.*

6.6.60 There is potential for likely short-term **significant** adverse effects on the AONB in the Box Valley due to the intrusive nature of the construction works associated with undergrounding, in particular relating to the potential disturbance to tranquillity and loss of landcover and vegetation. The construction of underground cables would also affect the landscape considered to form the setting of the AONB in Section G: Stour Valley. The preliminary assessment undertaken suggests that there may be short to medium-term **significant** construction effects on the landscape character of the Stour Valley. As the project progresses, further analysis and assessment work will be undertaken to verify this.

6.6.61 There is potential for the construction of the underground cables to directly impact the western edge of the Stour Valley SLA (Section G). Some effects may arise in relation to the need to remove vegetation for clearance, to the south of Workhouse Green. Overall construction landscape effects are likely to be **not significant**.

Landscape Character

6.6.62 The installation of underground cables would give rise to the adverse effects on landscape character of Sections D, E, F and G during construction (some of which are considered as part of effects on landscape designations).

6.6.63 The combined working width incorporating haul roads, working areas and materials storage would be 80m wide. Vegetation would be removed initially to establish the working area and there would then be presence of work compounds, working areas, access roads and haul roads, temporary bridges, excavations and a concentration of construction equipment and activity during the installation of the underground cables. Land use would change during the construction phase from the existing to a construction site with materials storage, including stripped soils, access, fencing, excavation, delivery of cables, installation of cables, and eventual reinstatement (with the exception of trees and scrub which could not be replanted over the cables). There is potential for short term **significant** landscape effects in Sections D, E, F and G during construction as the works would be perceived as a notable feature within the rural landscape. Construction methods will be verified to inform the assessment forming part of the ES.

Views

6.6.64 The installation of underground cables would give rise to the effects on visual amenity of Sections D, E, F and G during construction.

6.6.65 **Community Receptors** – People living and moving within and around local communities whose views are most likely to be affected during the construction of the underground cables are those that are closer to the site and have open, unfiltered views of the project.

6.6.66 In Section D: Polstead, the underground cable is present within the far western edge of the section, and therefore views are likely from in and around Polstead Heath (Viewpoint D-03), which is located north of the project. Views south of the Polstead Heath (Viewpoints D-03 and D-05) are likely to have filtered views of the construction of the 400kV underground cable. The effect on the views would be greater at closer ranges and reduce with distance. The effect on views during construction would be short-term **significant** for receptors at locations closer to the project near Polstead Heath.

6.6.67 Whitestreet Green is located slightly north of the project at the edge of the Dedham Vale AONB. Views from the southern edge of the settlement (Viewpoint E-02) are likely to have open views of the construction of the 400kV cable within Section E, whilst views which

are further away (Viewpoints E-07 and E2.11) would be more filtered. The effect on the views would be greater at closer ranges and reduce with distance. The effect on views during construction would be short-term **significant** for receptors at locations closer to the project.

- 6.6.68 Polstead is located south of the project within the Dedham Vale AONB and views from the northern fringes of the settlement would likely be filtered by intervening vegetation (Viewpoint E-01). Views from the west edge of the settlement (Viewpoint E-08) would have open views of the construction within Section E and would therefore be more likely to experience short-term **significant** effects on views from these locations.
- 6.6.69 Stoke-by-Nayland is located to the south of the project within the Dedham Vale AONB. Views from the northern edge of the settlement (Viewpoint E2.5 and E2.10) would be limited by intervening vegetation and views of the construction of the underground cables would likely comprise occasional glimpses of construction traffic. The effect on views during construction are likely to be **not significant**.
- 6.6.70 Boxford is located to the north of the project and views of the underground cable construction from the edges of the settlement and surrounding rights of way (Viewpoint F2.1, F2.2 and F2.8) would be very limited by landform and intervening vegetation. The effect on views during construction are likely to be **not significant**.
- 6.6.71 In Section F, the underground cables would be constructed within the far eastern edge of the section. Views are likely from the north of Leavenheath near the B1068 Harrow Road (Viewpoint F-01), which is located just south of the project. Views are likely to have filtered and open views of the construction of the 400kV underground cable. The effect on the views would be greater at closer ranges and reduce with distance. The effect on views during construction would be short-term **significant** for receptors at locations closer to the project from the north of Leavenheath near the B1068 Harrow Road.
- 6.6.72 People living and moving within and around local communities whose views are most likely to be affected by the construction of underground cables in Section G are those that are closer to the project and have open, unfiltered views of the project such as Lamarsh and potentially also parts of Alphamstone. Communities which may be affected to a lesser degree include Twinstead.
- 6.6.73 Lamarsh is a village located to the south of the project (Viewpoints G-03, G-04 and G2.5) and due to the landform in the area the community may experience adverse visual effects associated with the construction of the cable. The effect on views is likely to be short-term **significant**.
- 6.6.74 Parts of the community of Alphamstone (Viewpoints G-05 and G-23) would have views of the working area and construction activities. There is potential for short-term **significant** effects during construction.
- 6.6.75 **Recreational Receptors** – People engaged in outdoor recreation close to the project, who are likely to have views of the project during construction of the cables may experience short-term **significant** effects. This includes:
- people walking on the local PRoW network in the vicinity of Polstead and Polstead Heath (Viewpoints D-04 and D-05);
 - people walking along the local PRoW network within the AONB (Viewpoints E-03, E-04, E-06, E-07 and E-10);
 - people walking on the local PRoW network near Leavenheath (Viewpoint F-02).

- people walking along St Edmund Way and Stour Valley Path (Viewpoint G-04, S2.5, G-16 and G-28);
- people walking elsewhere along the local PRow network within the Stour Valley (Viewpoint F-13 and G2.5); and
- people using NCR 13 (Viewpoint G2.5, G-04, G-03 and G2.13).

6.6.76 Views from recreational receptors often tend to be glimpsed as people travel along recreational routes, or filtered by vegetation, for example along sections of the St Edmund Way where there are frequent mature trees and woodlands. People engaged in recreation, such as walking along PRow and promoted routes whose views are most likely to be affected during the construction of the underground cables are those that are closer to the working areas and have open, unfiltered views of the project.

GSP Substation

6.6.77 The potential sources of landscape and visual impacts of the proposed GSP substation and associated works during construction would be the same as those outlined for the construction of the underground cables (these are anticipated to be adverse) but would not include the construction and removal of temporary bailey bridges and culverts.

Landscape Designations

6.6.78 Effects on landscape designations as a result of the construction of the proposed GSP substation and associated works would be **not significant**.

Landscape Character

6.6.79 During construction the grouping of operations around working areas and concentrations of machinery would introduce increased levels of activity across the landscape. Construction would require machinery and in places cranes; these would be different to those typically notable in the landscape as part of regular farming practice.

6.6.80 Construction operations are considered to be temporary effects and activity would generally be focused on one part of the landscape to enable construction, removal or modification of pylons and these areas would then be reinstated.

6.6.81 The proposed 132kV underground cable route to the west of Waldegrave Wood would be through arable and pastoral fields. During construction, short-term impacts on these landscape features are anticipated. Following completion of construction works, features will re-establish quickly and return primarily to the character of the existing landscape. The greatest change to landscape character would be from the construction activity and work associated with the construction of the proposed GSP substation and the single circuit CSE compound (to the west of Waldegrave Wood), and associated works on arable land between Butler's Wood and Waldegrave Wood. The proposed GSP substation also lies between the two areas of mature woodland and close to an existing overhead line. It is assumed that it would not be necessary to remove any woodland to accommodate the substation.

6.6.82 The proposals associated with the GSP substation would have temporary effects on the character of the arable landscape due to the construction associated with the 132kV cable installation in open fields. However, vegetation removal is likely to be limited to sections of hedgerow on field boundaries or roadsides. Gaps in the existing vegetation will be utilised wherever possible to avoid unnecessary effects on landscape features.

6.6.83 The 132kV CSE platform pylon will replace an existing 132kV pylon and works will involve the construction of the CSE platform pylon and the removal of the existing pylon with a

temporary diversion. Construction effects would be temporary and localised. Overall, during construction, landscape effects would be **not significant**.

Views

- 6.6.84 **Community Receptors** – People living and moving within and around local communities whose views are most likely to be affected during the construction of the proposed GSP substation and associated works are those that are located closer to the project. Due to the positioning of the proposed GSP substation between Butler’s Wood and Waldegrave Wood, views of the construction of the proposed GSP substation and adjacent single circuit CSE compound and replacement pylon are likely to be screened or filtered to some extent from the majority of the local community including people living and moving around Wickham St Paul (Viewpoints G-08, G-18, G-21 and S2.23) and Twinstead Green (Viewpoint G-10).
- 6.6.85 People living and moving around the communities of Wickham St Paul (Viewpoints G-08, G-18, G-21 and S2.23), Twinstead Green (Viewpoint G-10), Twinstead (Viewpoint S2.10) and Audley End (Viewpoint S2.26) would have some close-up, short-term and temporary views of works being undertaken to the existing 132kV and 400kV overhead lines. Visual effects on these community receptors are anticipated to be **not significant**.
- 6.6.86 People living and moving within and around Little Henny to the northeast of the proposed GSP substation (Viewpoint G2.20) may have partially filtered, distant views towards the project. Due to distance and intervening vegetation the visual impact would not likely be significant. The construction of the proposed GSP substation would be much less visible due to intervening vegetation and distance. Visual effects on these community receptors are anticipated to be **not significant**.
- 6.6.87 **Recreational Receptors** – People engaged in outdoor recreation who are likely to have views of the construction of the proposed GSP substation and associated works include people walking along PRow in the area (Viewpoint G-09, G-10, G-11, G-18, G-20, G-21, G2.20, S2.10 and S2.26).
- 6.6.88 Based on the assessment to date, it is considered likely that there would be visual effects on recreational receptors close to the project due to the presence of access tracks, construction traffic, equipment and storage of materials and construction activities including earthworks. However, these would be **not significant** as they would be short term and temporary in nature.

Operation

Overhead Line (including CSE Compounds and Removal of Overhead Lines)

- 6.6.89 The potential sources of landscape and visual effects during operation of the overhead sections of the project (including the proposed CSE compounds) include the following, which are anticipated to be adverse unless stated as being beneficial:
- the loss of the existing 132kV overhead line and section of existing 400kV overhead line from the landscape (beneficial);
 - the introduction of the overhead/above ground components of the project into the landscape (proposed 400kV overhead line and CSE compounds);
 - the introduction of new permanent access roads to the CSE compounds;
 - maintenance of trees and vegetation in the existing easement/safety clearance areas; and,

- effects of embedded measures and Outline CoCP good practice measures, particularly replacement planting (beneficial).

6.6.90 The operational effects are considered in this part of the chapter at the date of commissioning (year 1), assuming that all construction works have ended, and machinery, materials and equipment related to construction have been removed and land reinstated. It is assumed that replanting has taken place (for example of hedges and, where relevant, trees) but that there has not been full re-establishment or further growth of planting.

Landscape Designations

6.6.91 The removal of the existing 132kV overhead line would directly and beneficially affect the special qualities and setting of nationally valued Dedham Vale AONB during operation; both within Section E (the northern extent of the AONB in the Box Valley) and within Section G (Stour Valley Project Area). Beneficial landscape effects in Section G (Stour Valley Project Area) would also arise due to the removal of several spans of the existing 400kV overhead line from Twinstead Tee southwards.

6.6.92 The CSE compounds and the proposed 400kV overhead line would not directly affect the landscape of Dedham Vale AONB during operation. Preliminary assessment has identified that the operation of these components of the project may however affect parts of the landscape which form the setting of the AONB, including within the Stour Valley in Section G. The CSE compounds are likely to cause some **significant** effects within the Stour Valley at the date of commissioning (year 1). It is however likely that these effects would reduce in the long term (year 15) as embedded planting matures and reduces their perceptibility.

6.6.93 The preliminary assessment undertaken suggests that landscape effects would be overall **not significant** on the AONB or its setting. This landscape is already influenced by overhead lines and other vertical infrastructure, and although some new infrastructure would be added, the landscape would also benefit from the removal of infrastructure. As the project progresses, further analysis and assessment work will be undertaken to verify this.

6.6.94 The proposed 400kV overhead line would directly affect the current locally designated, and regionally valued Gipping Valley SLA (Section AB) during operation. Landscape effects would likely be **not significant** due to the fact that this landscape is already influenced by overhead lines and there would be beneficial, but not significant, effects on the SLA due to the loss of the existing 132kV overhead line.

6.6.95 The removal of the existing 132kV overhead line and introduction of the proposed, 400kV overhead line would directly affect the current locally designated, and regionally valued Brett Valley SLA (Sections AB, C and D) and Stour Valley SLA (to the west of Section F and east of Section G) during operation. Landscape effects would likely be **not significant** due to the fact that these landscapes are already influenced by overhead lines; albeit the proposed 400kV overhead line would be larger than the 132kV overhead line.

6.6.96 It is unlikely that the operation of the project would have significant effects on the River Box SLA as it would not be directly affected by the project. Preliminary assessment suggests that effects would likely be **not significant**.

Landscape Character

6.6.97 The main sources of potential landscape effects during the operational phase include:

- the introduction of the overhead components of the project (the proposed 400kV overhead line and CSE compounds) into the landscape;
- the removal of the existing 132kV overhead line from the landscape (beneficial);
- the removal of a section of existing 400kV overhead line from the landscape (beneficial); and
- effects of mitigation measures, particularly new planting (beneficial).

6.6.98 In areas where the project would run closely parallel with the existing 400kV overhead line (mostly in Sections C, D, F and the east of Section G), it is likely that effects on landscape character during operation would be **not significant** as it would be perceived as a replacement of the 132kV overhead line, albeit larger pylons. The project would intensify the effects of overhead infrastructure within the landscape but would not fundamentally change the character of the landscape which is already influenced by overhead lines.

6.6.99 In Section AB the convergence of other overhead line infrastructure at Bramford Substation locally reduces landscape sensitivity. The proposed 400kV overhead line would slightly diverge from the existing overhead line near Bramford Substation. However, due to the relatively short distance between the existing and proposed overhead lines landscape, effects are likely to be **not significant**.

6.6.100 In some areas where the existing 132kV overhead line would be removed, such as within the southern part of Section AB: Hintlesham, the western part of Section D: Polstead, all of Section E: Dedham Vale AONB and the majority of Section G: Stour Valley, the character of the landscape would benefit from a reduction of modern vertical infrastructure. Furthermore, in Section G the character of the landscape will also benefit from the removal of several spans of existing 400kV overhead line from Twinstead Tee down to the proposed Stour Valley West CSE compound. This may give rise to some **significant (beneficial)** landscape effects.

6.6.101 The CSE compounds would exert localised effects on the character of the landscape within Sections D, F and G. Proposed planting around the CSE compounds would include hedgerows, scrub, woodland and trees. This would help to limit the effects of the proposed CSE compounds in the longer term. The potential to incorporate earthworks such as false cuttings and/or mounding will be explored as the design progresses to help screen and integrate these compounds in the landscape. The CSE compounds are likely to cause some **significant** landscape effects at the date of commissioning (year 1). It is however likely that these effects would reduce in the long term (year 15) as embedded planting matures and reduces their perceptibility.

Views (CSE Compounds)

6.6.102 For ease of reference, effects on visual amenity resulting from the four CSE compounds are presented below separately to the overhead line since these are in discrete locations and differ in nature to the overhead line. There are likely to be some significant effects on community and recreation receptors close to the CSE compounds. Relevant viewpoint references are given for each CSE compound, which can be referenced in Figure 6.6: Visual Receptors. Likely visual effects for each CSE compound are discussed below:

- Dedham Vale East CSE compound: Short-term **significant** visual effects are likely in views from areas south and east of Polstead Heath (Viewpoint D-04) and close to the CSE compound near Millfield Wood. Effects on other receptors, e.g. to the north

of Polstead Heath (Viewpoint D-02) and north of Polstead (Viewpoint E-10), are likely to be **not significant** due to existing vegetation and intervening distance.

- Dedham Vale West CSE compound: Short-term **significant** visual effects are likely in views from northern extents of Leavenheath (Viewpoint F-01). Effects on other receptors, e.g. the more southerly extents of Leavenheath (Viewpoint F-04), to the northwest near Dillack's Farm (Viewpoint F-05) and further north of the project near Hagmore Green (Viewpoint F-20), are likely to be **not significant** due to the existing vegetation and intervening distance.
- Stour Valley East CSE compound: Short-term **significant** visual effects are likely in views from isolated locations along PRow close to the proposed site. The Stour Valley East CSE compound may also be seen from the western side of the Stour River Valley (Viewpoint G2.5) near Lamarsh. From these viewpoints, the top of the CSE compound may be visible, although effects are likely to be **not significant** due to partial screening from existing vegetation and intervening distance.
- Stour Valley West CSE compound: Short-term **significant** visual effects are likely in views from areas to the west of Alphamstone (Viewpoints G-07, G-15 and G-22) close to the CSE compound. Effects on other receptors, e.g. more distant receptors, receptors within Alphamstone and to the east, are likely to be **not significant** due to the layering effect of existing vegetation on field boundaries, which would likely help to screen views of the site.

6.6.103 Effects of the CSE compounds on views from Dedham Vale AONB have been considered. Analysis of the ZTVs suggests that there may be some views of the Dedham Vale East CSE compound and Dedham Vale West CSE compound from the AONB. However, taking into consideration the findings of preliminary site surveys (Viewpoints D2.5, C2.7 and E-07), visual effects are likely to be **not significant** due to either intervening vegetation and/or distance and also the fact that the existing 400kV and 132kV overhead lines are components in baseline views.

Views (Overhead Line)

6.6.104 Based on the ZTV and site survey work undertaken to date, the main sensitive receptors and locations from where people are most likely to experience effects from the proposed 400kV overhead line element (including removal of the 132kV overhead line) of the project are described by Section below.

Section A/B: Bramford Substation/Hintlesham (Community Receptors)

6.6.105 People living and moving within and around the eastern edge of the town of Hadleigh (Viewpoints AB-12, AB-17 and AB2.35), to the west and north of the project, are likely to have some views of the proposed 400kV overhead line. People may also experience views of the removal of the existing 132kV overhead line further away. The degree of change as a result of the existing 132kV overhead line being removed and the proposed 400kV overhead line being introduced along a similar route would be greater in close range views (such as Viewpoint AB-11 and AB-14) and reduce with distance. Scattered dwellings and properties along Pond Hall Road are close to the project. The effects on views from scattered local communities to the southeast of Hadleigh within a closer distance to the project are likely to be **significant**.

6.6.106 Community views from the north include views from Flowton (Viewpoints AB2.17 and AB-19) and Elmsett (AB2.29). People on the southern edges of these villages are likely to have some open and filtered views of the project which would lie approximately 1.3km to

the south. The existing 132kV overhead line is approximately 1.5km beyond the proposed 400kV overhead line so people are unlikely to experience views of the removal of the existing 132kV overhead line. The presence of a 400kV overhead line in a closer position than the existing 132kV overhead line would result in a small degree of change in views from Flowton; these would likely be **not significant** due to distance and the fact that views already comprise existing overhead lines.

- 6.6.107 The village of Burstall (Viewpoint AB-01, AB-02 and AB-03) is situated to the south of the existing 400kV overhead line and north of the existing 132kV overhead line to be removed. People living on the northern edge of Burstall and moving between Burstall and Burstall Hill to the north are likely to have views of the proposed 400kV overhead line. People located on the southern edge of Burstall are more likely to have views of the removal of the existing 132kV overhead line. The addition of the proposed 400kV overhead line would be likely to slightly intensify the effects in relation to the baseline, and people on the northern edge of Burstall in close proximity may experience a **significant** effect on views. Receptors on the southern edge of Burstall may experience a slight beneficial but **not significant** effect on views due to the distance from the proposed 400kV overhead line and removal of the existing 132kV overhead line to the south.
- 6.6.108 Hintlesham village (Viewpoint AB-22 and AB-05) is similarly located between the removal of the existing 132kV overhead line and proposed 400kV overhead line. The A1071 links the settlement to Hadleigh. The proposed 400kV overhead line is located slightly closer to and broadly parallel with the existing 400kV overhead line, slightly intensifying the effect of overhead lines to the north of the settlement (particularly from more dispersed community receptors such as at Viewpoint AB-04), but views from the settlement are often filtered by vegetation within the golf club. Views south from Hintlesham will benefit from the existing 132kV overhead line removal although views are also filtered by vegetation. The effect on views from Hintlesham is likely to be overall **not significant**, but there may be some **significant** effects on isolated parts of the community close to the proposed 400kV overhead line.
- 6.6.109 Community views from the southeast of the project include the settlements of Washbrook and Copdock (Viewpoints AB2.5 and AB2.6) which would have long distance, filtered views towards the proposed 400kV overhead line and some open views of the existing 132kV overhead line which is to be removed. The proposed 400kV overhead line is located slightly closer to and broadly parallel with the existing 400kV overhead line, slightly intensifying the effect of overhead lines in views. However, due to the removal of the existing 132kV overhead line, the overall effect on these communities at Washbrook and Copdock would be **negligible** and **not significant**.
- 6.6.110 From the south of the project, community views include Chattisham (Viewpoints AB-06 and AB-16). Views of the proposed 400kV overhead line would be long distance and filtered by intervening vegetation to the northwest, such as Hintlesham Great Wood, and other settlements including Hintlesham. The existing 132kV overhead line being removed is closer to the settlement than the proposed 400kV overhead line, so the effect on views is likely to be beneficial for people in and around Chattisham, and may be **significant (beneficial)** in areas near Chattisham (Viewpoint AB-07) that are close to the project.

Section A/B: Bramford Substation/Hintlesham (Recreational Receptors)

- 6.6.111 People engaged in outdoor recreation who are likely to have views of the proposed 400kV overhead line or removal of the existing 132kV overhead line within Section AB include:

- National Cycle Route (NCR) 1 (Viewpoints AB-13, AB-09, AB-07 and AB-16);
- people visiting and playing golf at Hintlesham Hall and using the surrounding PRoW (Viewpoints AB-04, AB-20, AB-21, AB-22);
- people visiting Wolves Wood Nature Reserve and the PRoW in the surrounding area (Viewpoints AB-08, AB-10, AB2.26, AB2.30 and AB2.35);
- people walking on other areas along the local PRoW network (Viewpoints AB2.4 and AB2.11); and
- people walking along the Hadleigh Railway Walk/Local Nature Reserve (LNR) (Viewpoint AB-13).

6.6.112 Views from recreational receptors would often be glimpsed as people travel along recreational routes, or filtered by vegetation, for example within Hintlesham Golf Club and along the Hadleigh Railway Walk, which contains a high proportion of mature trees. Although some routes pass directly under the proposed 400kV overhead line, effects on views tend to be localised. Effects on recreational receptors in Section A/B: Bramford Substation/Hintlesham are likely to be **significant** close to the project.

Section C: Brett Valley (Community Receptors)

6.6.113 People living and moving within and around the southwestern edge of Hadleigh (Viewpoint C2.16), to the north of the project, may have filtered views of the removal of the existing 132kV overhead line and introduction of the proposed 400kV overhead line. The degree of change as a result of the existing 132KV overhead line being removed and the proposed 400kV overhead line introduced at a similar location would be greater in close range views and reduce with distance. The effect on closer distance views such as on the southern edge of Hadleigh (e.g. Viewpoint C-01) are likely to be **significant**.

6.6.114 From the south, community views include Lower Layham and Upper Layham (Viewpoints C-04 and C-02). In close proximity to removal of the existing 132kV overhead line and the proposed 400kV overhead line views from Lower Layham and Upper Layham would likely be filtered by intervening vegetation and built form. Scattered parts of the community to the west of Lower Layham (Viewpoint C-03) lie closer to the project. The proposed 400kV overhead line broadly follows the same route as the existing 132kV overhead line being removed. There would therefore be a degree of change on views from parts of these communities, with those at a closer range being more affected. Visual effects may be **significant** in areas close to the project.

6.6.115 Further southeast of the project, people living in and around the communities of Raydon and Lower Raydon (Viewpoints C2.4 and C-09), connected to Layham by the B1070, would potentially have heavily filtered views of the proposed 400kV overhead line. Since the proposed 400kV overhead line broadly follows the same route as the existing 132kV overhead line, the degree of change would be minimal at this distance and effects near Raydon and Lower Raydon are likely to be **not significant**.

Section C: Brett Valley (Recreational Receptors)

6.6.116 People engaged in outdoor recreation who are likely to have views of the proposed 400kV overhead line include:

- NCR 1 (closest viewpoint Viewpoint C2.4);
- Broom Hill and Riverside Walk LNR (Viewpoints D2.2 and C-05);
- people visiting Dedham Vale AONB (Viewpoint C-08);

- people using Brett Vale Golf Club (Viewpoint C2.7); and
- people walking on the local PRow network (Viewpoint C-06, C-07, C2.1 and C2.13).

6.6.117 Views from recreational receptors tend to be glimpsed as people travel along recreational routes, or filtered by vegetation, for example within Brett Vale Golf Club which contains a proportion of mature trees. Some routes would pass directly under the proposed 400kV overhead line, and therefore visual effects close to the project in Section C: Brett Valley are likely to be **significant**.

6.6.118 Effects of overhead lines within Section C on views from Dedham Vale AONB have been considered. Although the loss of the existing 132kV overhead line and addition of the proposed 400kV overhead line may be discernible in some views, the effects within Section C on views from Dedham Vale AONB are anticipated to be **not significant** due to either intervening vegetation, landform and/or distance, together with the fact that the existing 400kV and 132kV overhead lines are components in baseline views.

Section D: Polstead (Community Receptors)

6.6.119 People living and moving within and around the local community of Polstead Heath (Viewpoint D-03), north of the project, are likely to have open and close-range views of the removal of the existing 132kV overhead line and introduction of the proposed 400kV overhead line. The existing 400kV overhead line and 132kV overhead line are baseline components in existing views. The effects of overhead line in views would be slightly increased with the addition of the larger proposed 400kV overhead line in place of the existing 132kV overhead line that would be removed. Views would be partially filtered by intervening vegetation and built form for much of the community. The effect on some views in and around Polstead Heath which are closer to the project may however be **significant**.

6.6.120 Hadleigh Heath (Viewpoint D2.11) and surrounding receptors near the A1071 (Viewpoint D2.14 and D2.10) are located further north of the project and would experience partially filtered views of the removal of the existing 132kV overhead line and introduction of the proposed 400kV overhead line. The proposed 400kV overhead line broadly follows the same route as the existing 132kV overhead line which would slightly intensify the visual effects of overhead line on views in the area. Due to the distance to the line being over 1.5km, the effects on views in and around Hadleigh Heath are likely to be **not significant**.

6.6.121 William's Green (Viewpoint D2.15) may have limited and filtered views of the removal of the existing 132kV overhead line and introduction of proposed 400kV overhead line. The addition of the 400kV overhead line would result in a slight increase in amount of visible infrastructure, but due to the distance to the overhead line the effects on views from William's Green are likely to be **not significant**.

Section D: Polstead (Recreational Receptors)

6.6.122 People engaged in outdoor recreation who are likely to have views of the proposed 400kV overhead line include:

- people visiting the PRow near Broom Hill nature reserve (Viewpoints D2.2 and D2.6);
- people visiting the Dedham Vale AONB (Viewpoints D2.5 and C2.12);
- Heath Road linking Polstead and Polstead Heath (Viewpoint D-05); and
- people walking on the local PRow network (Viewpoints D-01, D-02 and D-04).

6.6.123 Views from recreational receptors tend to be glimpsed as people travel along recreational routes, or filtered by vegetation, for example within Broom Hill nature reserve which contains a high proportion of mature trees. Although some routes pass directly under the proposed 400kV overhead line, effects on views tend to be localised and therefore any **significant effects** in Section D are likely to be close to the project.

6.6.124 Effects of overhead lines within Section D on views from Dedham Vale AONB have been considered. Although the loss of the existing 132kV overhead line and addition of the proposed 400kV overhead line may be discernible in some views, the effects within Section D on views from Dedham Vale AONB are anticipated to be **not significant** due to either intervening vegetation and/or distance, together with the fact that the existing 400kV and 132kV overhead lines are components in baseline views.

Section E: Dedham Vale AONB (Community Receptors)

6.6.125 People living and moving within and around local communities of Polstead, Whitestreet Green, Boxford and Stoke-by-Nayland are likely to be most beneficially affected by the removal of the existing 132kV overhead line.

6.6.126 Polstead is located to the south of the project within the Dedham Vale AONB. Receptors on the northern and western edges of the town (Viewpoint E-01 and E-08) are unlikely to have views of the removal of the existing 132KV overhead line in Section E due to a combination of topography and intervening vegetation.

6.6.127 Whitestreet Green is located slightly north of the project at the edge of the Dedham Vale AONB. The fringes of the settlement (Viewpoints E-02, E-07 and E2.11) are likely to have distant views of the removal of the existing 132KV overhead line which is located behind the existing 400kV overhead line. This would reduce the overall overhead line infrastructure visible in views. The effect on the views would be greater at closer ranges and reduce with distance. The effect on views from Whitestreet Green may be beneficial but likely **not significant**.

6.6.128 Boxford is located north of the project next to the A1071, outside the AONB. Views from the edges of the settlement and surrounding PRow (Viewpoints F2.1, F2.2 and F2.8) would have glimpsed and filtered views of the removal of the existing 132kV overhead line. Due to the distance from the project and filtering of intervening vegetation and built form, the effect on views from Boxford would likely be **not significant (beneficial)**.

6.6.129 Stoke-by-Nayland is located within the Dedham Vale AONB to the south of the project. The local community living along and moving around the northern edge (Viewpoints E2.5 and E2.10) and to the south (Viewpoint E2.3) would have long-distance views of the project. Effects on the views from Stoke-by-Nayland would likely be **not significant (beneficial)** due to distance.

Section E: Dedham Vale AONB (Recreational Receptors)

6.6.130 People engaged in outdoor recreation whose views are likely to be most positively affected by the removal of the existing 132kV overhead line within Section E include:

- people walking along the PRow network (Viewpoints E-03, E-04 and E2.15); and
- people within the AONB (Viewpoints E-04, E-06 and E-07).

6.6.131 Effects on views tend to be localised, so **significant (beneficial)** effects in Section E are likely to occur where receptors are close to the project.

Section F: Leavenheath/Assington (Community Receptors)

6.6.132 People living and moving within and around the southern edge of the village of Assington (Viewpoints F-06 and F-09), immediately to the north of the project, are most likely to have open views of the removal of the existing 132kV overhead line and an introduction of the proposed 400kV overhead line. The existing 400kV and 132kV overhead lines form components in baseline views. The degree of change as a result of the existing 132kV overhead line being removed and the proposed 400kV overhead line being introduced along a similar route would be greater in close range views and reduce with distance. The effect on views from Assington within closer proximity are likely to be **significant**.

6.6.133 Community views from the south include filtered views from the northern edges of Leavenheath (Viewpoints F-07 and F-04), both from the main part of the settlement and also the community north of Harrow Street. A small proportion of the community to the north of the B1068 (Viewpoint F-01) would have open or glimpsed and/or filtered views of the project. There would be more distant views of the proposed 400kV overhead line from Wormingford (Viewpoint F-17) and the scattered properties to the south (Viewpoint F-16). These settlements currently have views of the existing 400kV and 132kV overhead lines. The removal of the existing 132kV overhead line and presence of the proposed 400kV overhead line broadly in its place would be likely to slightly intensify the effects in relation to the baseline. However, due to the distances involved, the resulting visual effects in and around much of Leavenheath and Wormingford are likely to be **not significant**.

Section F: Leavenheath/Assington (Recreational Receptors)

6.6.134 People engaged in outdoor recreation who are likely to have views of the proposed 400kV overhead line and removal of the existing 132kV overhead line include:

- people walking along St Edmund Way (Viewpoints F-15 and F-21);
- people walking along the local PRoW network (Viewpoints F-02, F-11, F-13, F2.7, F2.8 and F2.18);
- people visiting Arger Fen and Spouse's Vale LNR (Viewpoints F2.16, F-18 and F-19); and
- people playing golf at Stoke by Nayland Golf Club (Viewpoint E-03).

6.6.135 Views from recreational receptors tend to be glimpsed as people travel along recreational routes, or filtered by vegetation, for example within Stoke by Nayland Golf Club and along the St Edmund Way where there are mature trees and woodlands. Although some routes pass directly under the proposed 400kV overhead line, effects on views in Section F: Leavenheath/Assington tend to be localised, and therefore **significant** effects would be likely in closer proximity to the project.

6.6.136 Effects of overhead lines within Section F on views from Dedham Vale AONB have been considered. Although the loss of the existing 132kV overhead line and addition of the proposed 400kV overhead line may be visible from some areas, the overall effects within Section F on views from Dedham Vale AONB are likely to be **not significant** due to either intervening vegetation, landform and/or distance together with the fact that the existing 400kV and 132kV overhead lines are components in baseline views.

Section G: Stour Valley (Community Receptors)

6.6.137 People living and moving within and around the small hamlet of Workhouse Green (Viewpoint G02) just north of the project, including scattered communities (Viewpoints G-

13, G-12 and G-25), would likely have relatively close views of a short section of the proposed 400kV overhead line as it approaches the Stour Valley East CSE Compound. The existing 400kV overhead line and 132kV overhead line form components in baseline views. The degree of change as a result of the existing 132kV overhead line being removed and the proposed 400kV overhead line being introduced along a similar route would be greater in close range views and reduce with distance. **Significant** effects are likely in views close to the project, near Workhouse Green.

6.6.138 Views towards a short section of the proposed 400kV overhead line as it approaches Stour Valley East CSE Compound would be afforded from communities to the west including scattered communities, people living and moving within and around Lamarsh (Viewpoint G-04 and G2.5), and to a lesser extent Alphamstone (Viewpoint G-23), Great Henry (Viewpoint G-16) and Middleton (Viewpoint G2.16), though effects are likely to be **not significant**. The same communities would benefit from the removal of the existing 132kV overhead line within Section G, as would people living and moving around Twinstead (Viewpoint S2.6 and S2.10). In addition to this, the communities of Little Cornard (Viewpoints G2.2 and G2.3), Alphamstone and Twinstead and nearby scattered community would further benefit from the removal of a section of the existing 400kV overhead line between Twinstead Tee and the proposed Stour Valley West CSE Compound, with effects being **not significant (beneficial)**.

Section G: Stour Valley (Recreational Receptors)

6.6.139 People engaged in outdoor recreation who are likely to have views of the proposed 400kV overhead line and removal of the existing 132kV overhead line include:

- people walking along St Edmund Way and Stour Valley Path (Viewpoint G-04, S2.5, G-16 and G-28);
- people walking along the local PRow network (Viewpoint G2.12 and G-22);
- people visiting Loshes Meadows Complex Local Wildlife Site (LWS) (Viewpoint S2.5 and S2.6); and
- people using NCR 13 (Viewpoint G2.5, G-04, G-03 and G2.13).

6.6.140 Views from recreational receptors tend to be glimpsed as people travel along recreational routes, or filtered by vegetation, for example within Loshes Meadows Complex LWS and along St Edmund Way where there are mature trees and woodlands. Although some routes would pass directly under the proposed 400kV overhead line, the most notable effects on views tend to be localised, and therefore any **significant** effects would be close to the project.

6.6.141 Effects of overhead lines within Section G on views from Dedham Vale AONB have been considered. Although the loss of the existing 132kV overhead line, small section of existing 400kV overhead line and addition of several spans of the proposed 400kV overhead line may be discernible in some views, the overall effects are anticipated to be **not significant**. This is due to either intervening vegetation, landform and/or distance together with the fact that the existing 400kV and 132kV overhead lines are components in baseline views.

Hintlesham Woods Option

6.6.142 As noted in Chapter 5: EIA Approach and Method, the preliminary assessment has considered the likely significant environmental effects for the two options at Hintlesham Woods. These are presented in tabular format for ease of comparison (Table 6.4).

6.6.143 The preliminary assessment has shown that out of the two options, Option 1 is likely to give rise to a slightly greater visual impact as the two lines would not be parallel, and would be slightly less favourable overall in landscape and visual terms.

Table 6.4: Comparison of the Two Options at Hintlesham Woods (Operation)

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
Landscape designations	Option 1 would affect the Gipping Valley SLA during operation. Overall landscape effects on the Gipping Valley SLA would likely be not significant due to the fact that the designation is already influenced by overhead lines.	Same as Option 1.
Landscape character	<p>Option 1 would introduce a greater magnitude of change than Option 2, as this option deviates more from the existing 400kV overhead line through Hintlesham Woods SSSI and would require additional and larger angle pylons.</p> <p>Option 1 would extend the negative influence of overhead lines on the landscape to the north and west of the woods, however it would not result in any loss of woodland, which is an important component of the local landscape.</p> <p>The diverging overhead line would spread the effects of the infrastructure across a slightly wider geographical area near Hintlesham Woods; however due to the relatively short distance between the existing and proposed overhead lines, overall landscape effects are likely to be not significant.</p>	<p>Option 2 would introduce a lower magnitude of change than Option 1 as the proposed new 400kV overhead line would closely parallel the existing 400kV overhead line through the woodland. This would minimise the extent that the 400kV overhead lines have an influence on the landscape.</p> <p>The fragmentation and loss/reduction of woodland would represent an adverse effect on the fabric of the landscape. However, in landscape terms this would likely be balanced against the advantages of closely paralleling the existing 400kV overhead line.</p> <p>Overall landscape effects are likely to be not significant.</p>
Views	<p>Option 1 would result in a greater change to views than Option 2 as visual receptors would lie closer to the new 400kV overhead line and would have near views. This would include high sensitivity community and visual receptors including people living to the north and west of Ramsey Wood and people using the PRoW network at this location.</p> <p>Overall, Option 1 would result in the greatest change to views. Some significant visual effects are likely with this option, where receptors are in close proximity and particularly where an overhead line would be introduced in views where there is no existing overhead line visible or is at a distance and much less visible.</p>	<p>Option 2 would result in a slightly lower magnitude of change on views compared to Option 1, as the new 400kV overhead line would parallel the existing throughout Hintlesham Woods and would require fewer pylons and angle pylons. The receptors most likely to be affected would be the local community along Pond Hall Road and people using PRoW to the north and south of the woodland.</p> <p>Overall, Option 2 would result in a slightly lower magnitude of change on views compared to Option 1, as the new 400kV overhead line would parallel the existing throughout Hintlesham Woods.</p>

Underground Cables

6.6.144 The potential main sources of landscape and visual effects of the cables during operation include:

- the introduction of above ground link pillar box in the landscape;
- the ongoing maintenance of trees and vegetation in the easement/underground cable clearance areas; and
- effects of embedded measures and Outline CoCP good practice measures, particularly replacement planting.

6.6.145 The underground cables themselves would not give rise to landscape and visual effects during operation. However, landscape and visual effects may arise because trees cannot be planted to replace those removed during construction if the replacement planting is above or close to the underground cables.

Landscape Designations

6.6.146 During operation, effects on both the Dedham Vale AONB and its setting and the Stour Valley SLA, as a result of the underground cables, are anticipated to be **not significant**. This is based on the assumption that hedgerows could be replanted broadly perpendicular across cables in places.

Landscape Character

6.6.147 During operation, effect on landscape character as a result of the underground cables are anticipated to be **not significant**.

Views

6.6.148 During operation, the underground cables, which are located to the far west of Section D: Polstead, within Section E: Dedham Vale AONB, to the far east of Section F: Assington/Leavenheath and within Section G: Stour Valley, would not be visible.

6.6.149 The above ground link pillar box may be visible in views from small parts of the community (community receptors), depending on where it is located, but effects are likely to be **not significant** due to the small size of the equipment.

6.6.150 People engaged in outdoor recreation (recreational receptors) close to the project may also have views of the above ground link pillar box. Effects are again likely to be **not significant** due to the small size of the equipment.

6.6.151 The ongoing maintenance of vegetation within the corridor, above and near to the underground cables, may change some community and recreational views to a small degree, which is considered **not significant**.

GSP Substation

6.6.152 The source of potential landscape effects during the operational phase of the proposed GSP substation and associated works includes:

- the introduction of the overhead components of the project (the GSP substation and adjacent CSE compound) into the landscape and the replacement of one existing 400kV pylon and one existing 132kV pylon);
- the introduction of new permanent access roads to the GSP substation and adjacent CSE compound;
- maintenance of trees and vegetation in safety clearance areas;

- beneficial effects of mitigation measures, particularly new planting; and
- cumulative effects, particularly with respect to other proposed developments of a similar scale.

Landscape Designations

6.6.153 Effects on landscape designations as a result of the operation of the proposed GSP substation and associated works would be **not significant**.

Landscape Character

6.6.154 The proposed GSP substation site is between two areas of mature woodland in Section H and is associated with an existing 400kV overhead line. It would not be necessary to remove any vegetation for these woodlands to accommodate the GSP substation. Associated works fall mostly within Section H: GSP Substation (except small area inside Section G: Stour Valley) and include the following:

- modifications to an existing 400kV pylon;
- the dismantling of another existing pylon and the construction of a new pylon and single circuit CSE compound to the west of the GSP substation;
- the dismantling of an existing 132kV pylon and construction of a new 132kV CSE platform pylon;
- installation of cables between the existing 132kV overhead line and new single circuit CSE compound; and
- small modifications to existing sections of 132kV and 400kV overhead lines including reconductoring.

6.6.155 The various elements of the proposed GSP substation (including the single circuit CSE compound) would be integrated into the landscape through the pattern of existing vegetation including hedgerows with trees and woodland. Landscape proposals include planting to the west and east of the proposed GSP substation site and would assist in integrating the project into the landscape.

6.6.156 The main change to the high-level appearance of the existing 400kV overhead line would be modifications to one pylon to become a terminal pylon with downleads to the gantry in the GSP substation and the nearby replacement of another pylon just outside the woodland gap to the west. These minor changes would not affect landscape character as the 400kV overhead line is already present.

6.6.157 The 132kV CSE platform pylon would be perceived as a replacement of an existing 132kV pylon. The underground cable route across the fields would have no effect on landscape character during operation.

6.6.158 Preliminary appraisal has judged that overall landscape effects during operation would be **not significant**.

Views

6.6.159 With the combination of intervening existing vegetation and a proposed planting scheme forming part of the project around the proposed GSP substation, the operational visual impacts are unlikely to have significant effects on community receptors. In terms of the 132kV underground cables and works to the existing 132kV and 400kV overhead lines, visual effects on communities during operation are likely to be **not significant**.

6.6.160 With the combination of intervening existing vegetation and a proposed planting scheme forming part of the project around the proposed GSP substation, the visual effects on the majority of recreational receptors, in the long term, are likely to be **not significant**. In the short term (year 1), whilst planting establishes, there are likely to be visual effects of significance on recreational receptors close to the project. These relate to people walking along one PRow (Viewpoint G-20) which is close to the proposed GSP substation; albeit these receptors already have close-up views of the existing 400kV overhead line. In terms of the 132kV underground cables and works to the existing 132kV and 400kV overhead lines, visual effects during operation are likely to be **not significant**.

Summary of Construction Effects

6.6.161 Construction activities will take place in a predominantly farmed landscape where mechanical operations are frequently associated with agricultural activities. Construction operations are generally considered to be temporary effects, but they may introduce activities which are not typical of the farmed landscape, including high level construction work, the creation of access roads and the movement of materials. Other construction effects may result from the need for working areas, soil stripping and materials storage. Additional activities which may give rise to temporary effects include the erection of scaffolding over rural roads and the use of a temporary pylon to divert existing lines whilst construction work is undertaken.

6.6.162 It is predicted that the construction activities are likely to result in a greater magnitude of change in the landscape than the operational effects; however, construction effects will generally be temporary and short term. Some short term landscape and visual effects of significance are likely during construction due to the working areas required to construct underground cables; however, these are anticipated to reduce in the medium to long term (year 15) once construction is complete.

6.6.163 A series of good practice measures, which aim to reduce effects, are set out in Appendix 4.1: Outline CoCP. There is however potential for some short term landscape and visual effects of significance within Dedham Vale AONB and its setting and other parts of the landscape due to the construction of underground cables which will involve site clearance and construction work within the landscape. These effects would likely reduce in the medium to long term (year 15). Significant adverse effects on views of the overhead line construction are less likely due to the temporary nature of the construction works; together with the fact that not all of the work would take place at the same time.

Summary of Operational Effects

6.6.164 **Significant** visual effects are likely to occur in operation where community and recreational receptors are moving within and around areas very close to the overhead line elements of the project. Changes to views as a result of the project are likely to diminish (and become **not significant**) with increased distance from the project, and where there is screening from intervening vegetation and/or landform.

6.6.165 Whilst the removal of the existing 132kV overhead line and introduction of the larger-scale proposed 400kV overhead line broadly in its place would be likely to intensify the visual effects in relation to the baseline, effects are unlikely to be significant unless close to the project, since overhead lines are already components in baseline views. Beneficial visual effects are likely to occur where the existing 132kV and 400kV overhead lines are removed, for example within Dedham Vale AONB and the Stour Valley.

- 6.6.166 The proposed CSE compounds, GSP substation, elements relating to the underground cable (including the link pillar, joint bays and ongoing vegetation maintenance in safety clearance areas) and other above ground elements of the project are unlikely to result in long-term significant visual effects during operation (year 15). This is because embedded design and good practice measures will limit their wider visibility. Although some vegetation may be able to be replanted *in situ*, there would be an ongoing need for the maintenance of trees and vegetation associated with legal land rights for the life of the project (beyond year 15).
- 6.6.167 The embedded measures included as part of the design are anticipated to reduce and offset the likelihood of significant landscape and visual effects of the project.
- 6.6.168 As a result, overall landscape effects are likely to be **not significant**.
- 6.6.169 **Significant** visual effects are likely to occur where community and recreational receptors are moving within and around areas close to the overhead line elements of the project. Changes to views as a result of the project are likely to diminish (and become **not significant**) with increased distance from the project, and where there is screening from intervening vegetation and/or landform.
- 6.6.170 Whilst the removal of the existing 132kV overhead line and introduction of the larger-scale proposed 400kV overhead line broadly in its place would be likely to intensify the visual effects in relation to the baseline, effects are unlikely to be significant unless close to the project, since overhead lines are already components in baseline views.
- 6.6.171 The proposed CSE compounds, GSP substation, elements relating to the underground cable (including the link pillar and joint bays and ongoing vegetation maintenance associated with the legal land right) and other above ground elements of the project are likely to result in visual effects that are **not significant** during operation unless close to the project, since embedded design and good practice measures will limit their wider visibility.
- 6.6.172 Beneficial visual effects are likely to occur where the existing 132kV and 400kV overhead lines are removed, for example within Section E: Dedham Vale AONB and part of Section G: Stour Valley.

6.7 Sensitivity Testing

Flexibility in Construction Programme

- 6.7.1 This chapter assumes the base construction programme described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be no new or different likely significant effects to those identified in the baseline scenario assessed in Section 6.6.

Flexibility in Design

- 6.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward.

6.7.3 Alternative locations for pylon positions could change the preliminary assessment for this chapter in relation to visual impacts. Changes to pylon positions would have implications on views and may result in either an increased or decreased level of effect on some visual receptors. At this preliminary stage, it is anticipated that alternative locations for pylon position would have no new or different significant effects on the assessment of landscape character or landscape designations than the base assessment, which has already concluded a number of potential significant effects. This will continue to be reviewed and assessed in the LVIA.

6.8 Proposed Mitigation

6.8.1 This section sets out the proposed mitigation for the likely significant effects outlined in the previous section. These mitigation measures are additional to the relevant embedded measures in Chapter 4: Project Description (including planting around the CSE compounds and GSP substation) and the good practice measures outlined within Appendix 4.1: Outline CoCP.

6.8.2 The proposed mitigation outlined in this section does not include the reinstatement planting of tree and hedgerows, considered part of the standard good practice on the project. This would be undertaken *in situ* wherever practicable, and replanting of trees and hedgerow boundaries that have been removed for temporary site accesses. Where it is not possible to replace trees or hedgerows in their original locations (for example, under the overhead line and/or above underground cables), replacements will be planted in new locations within the draft Order Limits.

6.8.3 NPS EN-5 (DECC, 2011b) provides guidance for mitigation, including in paragraph 2.8.11:

- *'Landscape schemes comprising off-site tree and hedgerow planting are sometimes used for larger new overhead line projects to mitigate potential landscape and visual impacts, softening the effect of a new above ground line whilst providing some screening from important visual receptors. These can only be implemented with the agreement of the relevant landowner(s) and advice from the relevant statutory advisor may also be needed; and*
- *Screening, comprising localised planting in the immediate vicinity of residential properties and principal viewpoints can also help to screen or soften the effect of the line, reducing the visual impact for a particular receptor.'*

6.8.4 Planting proposed will take into account the results of the arboricultural assessment and ecological surveys and appropriate species will be specified. There are some specific issues regarding some native species of trees which may mean that replacement of trees with the same species is not feasible. An example of this is the current ash dieback disease. Ash is currently not available from British nurseries.

6.8.5 Planting will consist of native species of local provenance or other agreed provenance to suit the potentially changing climate, where available, with all trees and hedge plants, seed sources and nursery root management specified in accordance with UK Forestry Standard Guidelines: Forests and Climate Change.

6.8.6 Measures will continue to be developed and landscape and visual mitigation will form part of the Outline LEMP presented as part of the application for development consent. These will help to fulfil objectives set out in NPS EN-5. The following paragraphs discuss

additional mitigation which will be considered to reduce effects on landscape and visual receptors.

Construction

- 6.8.7 The design of the underground cables will continue to be developed to seek to reduce loss of existing characteristic vegetation within Dedham Vale AONB and its setting, which includes the Stour Valley. Where practicable, commitments will be made to reduce the working area through sensitive locations and the design developed to seek to avoid vegetation loss.
- 6.8.8 Replacement planting would be undertaken at the earliest opportunity given the right planting season. Examples may include planting of the existing statutory clearance area that is no longer required due to the removal of the existing 132kV and 400kV overhead line, once the overhead lines are removed, and also other areas identified for planting within the draft Order Limits.

Operation

- 6.8.9 Landscape effects of significance may occur during operation in relation to the CSE compounds in the short term (year 1). However, it is considered that embedded planting will reduce the effects in the long term (year 15). Further assessment work will continue to consider effects and appropriate mitigation. The nature and extent of significant effects determined will inform the most suitable mitigation proposals. It is however recognised that in localised areas there may be some significant residual landscape effects due to the nature of the project.
- 6.8.10 National Grid will consider the proposed materials and colour palette for the CSE compounds including security fencing, equipment and surfacing; including options for surfacing of permanent access roads. Proposed details will be provided in the ES.

6.9 Residual Significant Effects (With Mitigation)

- 6.9.1 Table 6.5 summarises the likely significant effects, proposed mitigation and residual effects for landscape and visual. Residual significant effects are shown in bold. It is unlikely that there will be significant effects as a result of the GSP substation or the operation of the underground cable.

Table 6.5: Summary of Likely Significant Effects

Aspect	Likely Significant Effect (Without Mitigation)	Proposed Mitigation	Residual Significant Effect (With Mitigation)
Construction			
Underground cables: Loss of landscape features in landscape designations.	Short to medium-term significant effects	Reduce amount of vegetation removal within the draft Order Limits through commitment.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Underground cables: Loss of landscape features affecting landscape character.	Short to medium-term significant effects	Reduce amount of vegetation removal within the draft Order Limits through commitment.	Short term significant effects (while vegetation establishes) leading to medium term, not significant

Aspect	Likely Significant Effect (Without Mitigation)	Proposed Mitigation	Residual Significant Effect (With Mitigation)
Underground cables: Loss of vegetation changing views.	Short to medium-term significant effects	Undertake additional mitigation planting.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Operation			
Overhead lines: Effects associated with the CSE compounds on landscape designations.	Short to medium-term significant effects	Undertake additional mitigation planting.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Overhead lines: Effects associated with the CSE compounds on landscape character	Short to medium-term significant effects	Undertake additional mitigation planting.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Overhead line: Effects of overhead line and CSE compounds on views	Long-term significant effects	Undertake additional mitigation planting and explore the potential for additional off-site planting by agreement during the assessment.	Long-term significant effects

6.10 Conclusion

- 6.10.1 There would be residual effects on the landscape and views resulting from the project. In the main these would be not significant although there may be areas where effects remain significant. A project of this scale and nature can be reasonably predicted to have some residual landscape and visual effects, as is acknowledged in NPS EN-1 (DECC, 2011a).
- 6.10.2 National Grid has undertaken consultation and has taken account of feedback including that relating to landscape and views. In response National Grid is committed to producing good design, an aspect of which has been careful routing. Design and mitigation measures will continue to be developed through the EIA process to avoid, reduce or offset impacts further.
- 6.10.3 In terms of construction, activities would take place in a predominantly farmed landscape where mechanical operations are frequently associated with agricultural activities. Some short to medium-term significant adverse landscape and visual effects are likely during construction. However, these are anticipated to reduce in the medium term once construction is complete and vegetation is reinstated.
- 6.10.4 Significant visual effects are likely to occur during operation where community and recreational receptors are moving within and around areas very close to the overhead line elements of the project. Changes to views as a result of the project are likely to diminish (and become not significant) with increased distance from the project, and where there is screening from intervening vegetation and/or landform. Beneficial visual effects are likely to occur where the existing 132kV and 400kV overhead lines are removed, for example within Dedham Vale AONB and the Stour Valley.

7. BIODIVERSITY

7.1 Introduction

- 7.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on biodiversity. The receptors considered within this chapter comprise statutory designated sites, non-statutory designated sites, ancient woodland, priority habitats, and terrestrial and aquatic biodiversity (including protected species such as bats, hazel dormouse (*Muscardinus avellanarius*), and birds).
- 7.1.2 The project could affect biodiversity during construction through direct effects, such as the loss or fragmentation of habitats within the construction footprint, or indirectly through changes to groundwater, pollution of watercourses or deposition of dust. The preliminary environmental assessment has also considered effects to species both in terms of direct injury or mortality and indirectly through disturbance.
- 7.1.3 This chapter considers habitat loss associated within the working footprint as a construction effect, although this could include permanent effects where the habitat cannot be reinstated *in situ*. Operation effects are those associated with inspections and periodic maintenance activities, and are therefore limited in terms of biodiversity.
- 7.1.4 This chapter has links with other chapters, including Chapter 9: Water Environment and Chapter 10: Geology and Hydrogeology, which provides baseline information used to assess the impacts on aquatic habitats and species and groundwater dependent terrestrial ecosystems (GWDTE). It also has links to Chapter 12: Traffic and Transport, Chapter 13: Air Quality, and Chapter 14: Noise and Vibration, which provide baseline information used to assess the impacts of construction traffic and machinery on habitats and species.
- 7.1.5 This chapter is supported by the following appendices and figures:
- Appendix 7.1: Biodiversity Baseline;
 - Appendix 7.2: Final Habitats Regulations Assessment Screening;
 - Figure 7.1: Statutory Designated Sites;
 - Figure 7.2: Non-statutory Designated Sites;
 - Figure 7.3: Priority Habitats and Ancient Woodland;
 - Figure 7.4: Phase 1 Habitat Survey; and
 - Figures 7.5-7.16: Desk-study and field survey results for different species.

7.2 Regulatory and Planning Policy Context

National Policy Statement

- 7.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on biodiversity, which has been considered within this chapter.
- 7.2.2 Paragraph 5.3.3. of NPS EN-1 states, '*Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation*

importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project.'

7.2.3 Paragraph 5.3.14 in NPS EN-1 also states, 'Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated.'

7.2.4 NPS EN-1 is supported by NPS EN-5, in which paragraphs in 2.7.1 and 2.7.2 relate to biodiversity:

'...large birds such as swans and geese may collide with overhead lines associated with power infrastructure, particularly in poor visibility. Large birds in particular may also be electrocuted when landing or taking off by completing an electric circuit between live and ground wires. Even perching birds can be killed as soon as their wings touch energised parts.' (paragraph 2.7.1)

'The applicant will need to consider whether the proposed line will cause such problems at any point along its length and take this into consideration in the preparation of the EIA and ES (see Section 4.2 of EN-1). Particular consideration should be given to feeding and hunting grounds, migration corridors and breeding grounds.' (paragraph 2.7.2)

Other Relevant Policy

7.2.5 Appendix 2.1: Local Planning Policy lists the local policy relevant to biodiversity. The Babergh and Mid Suffolk Joint Local Plan (2020) Policy SP09 and LP18 and Braintree District Council Local Plan (2017) Policy LPP 67, LPP 68 and LPP 70 require projects to maintain and enhance (through at least 10% net gain) habitats (particularly priority habitats). The policies also state that development that has an adverse effect on habitats and protected species will not be supported.

7.3 Scoping Opinion

7.3.1 The scope of the assessment for biodiversity has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021a) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.

7.3.2 Table 7.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 7.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction and Operation			
Invasive species	Invasive and non-native	Scoped out	(ID 4.2.13) The Inspectorate considers that there is insufficient baseline information available to establish the location and extent of INNS. This matter should therefore

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
	species (INNS)		be scoped in to the ES unless baseline surveys provide evidence otherwise.
Priority habitats	Priority habitats	Scoped in	(ID 4.2.14) It is not clear which priority habitats the assessment will consider. For clarity, the ES should list and assess all priority habitats occurring within the study area that are likely to be affected. Where priority habitats are identified, they should be assessed separately where significant effects are likely to occur (scoped in).
Vascular and lower plants	Vascular and lower plants (aside from arable plant assemblages)	Scoped out	(ID 4.2.15) The Inspectorate agrees that these matters can be scoped out of the assessment, with the exception of arable plant assemblages, which are scoped in to the assessment.

Construction

Protected species	Collision of nocturnal species with construction machinery	Scoped out	(ID 4.2.1) The Inspectorate considers that there is insufficient information about the location and nature of night-time working to conclude that significant effects will not occur. Therefore, potential effects of collision of nocturnal species with construction machinery should be scoped in to the ES.
Habitats	Fragmentation to habitat during construction	Scoped out	(ID 4.2.4) The Applicant proposes to scope out the effects of habitat fragmentation as a result of vegetation removal during construction around the overhead line. As LV01 does not require the contractor to reduce vegetation removal to a minimum, only to retain vegetation 'where practicable', the Inspectorate does not agree therefore that effects on habitat fragmentation can be scoped out of the ES for the overhead line sections (scoped in).
Ecological receptors	Artificial lighting during construction	Scoped out	(ID 4.2.6) The Inspectorate considers that although artificial lighting will be limited, there is insufficient information about the location, duration and nature of night-time working to conclude that significant effects will not occur. Therefore, this should be scoped in to the ES.
Designated sites and habitats	Construction generated dust	Scoped out	(ID 4.2.9) The Planning Inspectorate agrees that this matter can be scoped out of the ES based on the commitments within the Outline CoCP and that any further mitigation would be identified in the Dust Risk Assessment appended to the Outline CEMP. In the event that any matters relating to impacts of construction dust to ecological receptors arise once construction logistics are more fully defined, these should be assessed within the ES (scoped in).

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Ecological receptors	Air quality changes arising from construction traffic	Scoped in but could be scoped out with more data	(ID 4.2.10) It is noted that air quality changes to ecological receptors arising from construction traffic is currently scoped in to the ES but could potentially be scoped out following confirmation of traffic numbers and routes.
Designated sites, habitats and aquatic ecology	Construction emissions to surface and groundwater	Scoped in	(ID 4.2.12) Given the stage of the project and as the exact location and design for watercourse crossings is yet to be determined, the Inspectorate does not agree that these matters can be scoped out of the ES (scoped in).
Protected species	Badger	Scoped out	(ID 4.2.17) As badger are valued as negligible and are covered by separate legislation, the Planning Inspectorate agrees that this matter can be scoped out of the ES.
Protected species	Reptiles	Scoped out	(ID 4.2.18) Whilst the Inspectorate agrees that effects on reptiles are unlikely to be significant with the proposed control measures in place, this cannot be confirmed until an up-to-date baseline position is confirmed through the updated Phase 1 habitat survey. This aspect should therefore be scoped in to the ES.
Protected species	Terrestrial invertebrates	Scoped out	(ID 4.2.19) Whilst the Inspectorate agrees that an adverse effect to conservation status from mortality is unlikely, it is not possible to conclude that there would be no likely significant effects until the baseline position is confirmed through the updated Phase 1 habitat survey. This aspect should therefore be scoped in to the ES.
Ecological receptors	Other notable species	Scoped out	(ID 4.2.20) The Inspectorate notes that the Scoping Report identifies an impact pathway to notable species during construction for mortality and injury, and species disturbance, suggesting a potential for likely significant effects to occur beyond habitat loss during construction. Until the baseline position is confirmed through the updated Phase 1 habitat survey. This aspect should therefore be scoped in to the ES
Operation			
Protected species	Bat and bird collisions with pylons during operation	Scoped out	(ID 4.2.2) Given the potential for further changes to the design and that the new pylons and overhead line will be of different heights and will affect new locations from the existing configuration, this should be scoped in to the ES.

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Protected species	Bat and bird collisions within Hintlesham Woods SSSI during operation	Scoped out	(ID 4.2.3) The Scoping Report does not yet provide details on the final design or siting of the overhead line in this location and is based on an indicative alignment. Given the lack of detailed information about the final route, height and design of the overhead line, and as further bat surveys are yet to be completed, the Inspectorate does not agree that this matter can be scoped out of the ES (scoped in)
Habitats	Habitat loss during operation	Scoped out	(ID 4.2.5) The Scoping Report explains that there will be no habitat loss during operation; however, it is unclear whether there would be any permanent habitat loss arising from maintenance and decommissioning activity for the project, including activity that could affect Hintlesham Woods SSSI and other sites of high biodiversity value with impact pathways to the project. This should be clarified within the ES and where significant effects are likely to occur these should be assessed within the ES (scoped in).
Ecological receptors	Operational lighting to ecological receptors	Scoped out	(ID 4.2.7) The Inspectorate notes that operational lighting may also be required at the CSE compounds. Given the limited scale of these works, the Inspectorate agrees that it is unlikely that significant effects would occur; however, there is insufficient information regarding the type, location and hours of lighting at this stage to confirm this conclusion and this should be assessed in the ES (scoped in).
Ecological receptors	Operational noise and vibration to ecological receptors	Scoped out	(ID 4.2.8) Given the stage of the project and as no evidence is provided in the Scoping Report to explain whether the operation of the new GSP substation or the CSE compounds could give rise to significant noise or vibration effects, the Inspectorate does not agree that this matter can be scoped out of the ES (scoped in).
Designated sites and habitats	Operational air quality to ecological receptors	Scoped out	(ID 4.2.11) Due to the very low vehicles numbers anticipated during operation, the Planning Inspectorate agrees that this matter can be scoped out of the ES.
Designated sites, habitats and aquatic ecology	Operational emissions to surface and groundwater	Scoped out	(ID 4.2.12) The Inspectorate agrees that given the nature of the works and confirmation that there will be no discharges, operational effects for the overhead line and CSE compounds can be scoped out of the ES.

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Statutory and non-statutory wildlife sites	Statutory and non-statutory wildlife sites (excluding GWDTE)	Scoped out	(ID 4.2.21) The Inspectorate notes that where there is permanent habitat loss arising from maintenance and decommissioning activity, including activity that could affect Hintlesham Woods SSSI and other sites of high biodiversity value with impact pathways to the project, this should be scoped in to the ES.
Priority habitats	Ancient woodland and veteran trees during operation	Scoped out	(ID 4.2.22) It is considered that where there is permanent habitat loss arising from maintenance and decommissioning activity, including activity that could affect Hintlesham Woods and areas of ancient woodland, this should be scoped in to the ES.
Designated sites	Effects on statutory designated sites	Scoped out	(ID 4.2.25) The Inspectorate considers that there is insufficient evidence at this stage to determine whether there will be significant effects on the River Stour and Orwell Estuaries SPA and Ramsar site during construction. This should be scoped in to the ES.
Ecological receptors	Air quality changes – receptors	Scoped in	(ID 4.2.26) The assessment should include ancient woodland and veteran trees, and priority habitats as receptors where significant effects are likely. This should be scoped in to the ES.

7.3.3 Further surveys, including the Phase 1 habitat survey, are ongoing. This PEI Report assumes a precautionary approach where a baseline survey is outstanding. A full update of the baseline environment will be presented within the ES. Where appropriate, given the survey results, further justification will be given as to why certain aspects are scoped out of the ES.

7.3.4 Table 7.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 7.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.2.3) The Inspectorate considers that the Applicant should ensure that sufficient baseline information is available to establish the location and extent of INNS. This should include consideration of Australian Swamp Stonecrop. The Inspectorate considers that the validation surveys should also account for INNS.	A Phase 1 habitat survey is being undertaken for the draft Order Limits, subject to land access being granted. This includes the identification of INNS. The results of the Phase 1 habitat survey will be presented in the ES as part of the updated baseline.
(ID 4.2.16) Great Crested Newt (GCN): The Inspectorate considers that the Scoping Report does not provide evidence of any agreement	National Grid has agreed with Natural England to apply the District Level Licence approach to GCN on the project. An initial Impact Assessment and Conservation Payment was agreed, and the certificate

Matter Raised in the Scoping Opinion	Project Response
with Natural England regarding the use of a District Level Licence (DLL).	was received on 5 July 2021. As a District Level Licence approach is being taken, no further GCN surveys are proposed on the project. See Appendix 7.1: Biodiversity Baseline for further details.
(ID 4.2.23) The ES should fully describe the final study areas used in the assessment along with an explanation of the reasons for the choice of these study areas. This should include consideration of potential impact pathways to identify where likely significant effects might occur to a receptor, regardless of geographical distance from the DCO boundary. This should be supported by figures where possible.	The PEI Report identifies potential impact pathways between ecological receptors and the draft Order Limits using SSSI Impact Risk Zones and defined and justified Zones of Influence (ZOIs). The ES will provide further assessment based on the final Order Limits.
(ID 4.2.24) The ES should provide details of the source and dates of the aerial photographs used, to ensure that there is sufficient evidence to show that the baseline has been updated.	National Grid has received updated aerial photography images (2021). In addition, as National Grid is now proposing to undertake a full UK Habitat Classification survey (UKHab), the need for aerial photography is limited to areas where access has not been granted. The ES shall publish the source and dates of the aerial photography used.
(ID 4.2.27) The Inspectorate considers that Natural England, local authorities and local groups, for example the Essex and Suffolk Dormouse Group should be consulted regarding the approach taken to surveys. The ES should ensure that the baseline presented is sufficient to assess the likely significant effects of the project. It should therefore describe the geographical coverage of the surveys with reference to the Order Limits. Where there is reliance on 2009–2013 survey data, it should be clear what surveys remain valid and why, with reference to relevant technical guidance on survey validity. The updated survey of hedgerows should include bat activity surveys to identify any passes of Barbastelle bats, which would trigger Important Hedgerow status under the Hedgerows Regulations 1997 (as amended).	There is ongoing consultation with Natural England to agree the approach to ecological survey. Initial discussions have also been held with the local planning authorities and Essex and Suffolk Wildlife Trusts to inform them of the survey methodology. The use of previous survey data is detailed and justified in Appendix 7.1: Biodiversity Baseline. Surveys carried out in 2021 will be reported in ES and associated appendices. The UKHab survey will record information to identify ‘Important’ hedgerows as per the Hedgerows Regulations 1997. A desk study and review of all field surveys will also be undertaken to identify species specifically listed or categorised in Part II of Schedule 1 of the Regulations that are ‘contained’ within hedgerows. In relation to bats, ‘contained’ is considered to mean roosting. Activity survey for bats will not be undertaken. Existing baseline data will be used to create a Habitat Suitability Map based on presence/absence records of bats.
(ID 4.2.28) The Inspectorate considers that the Applicant should consider the implications of the Environment Bill for the project and ensure that the ES adequately addresses them.	The implications of the Environment Act will be considered in the ES (see Section 2.4 for details). This includes the requirement to include 10% biodiversity gain on the project.

7.3.5 In summary, badger and GCN are scoped out of the assessment and are not discussed further in this chapter. Until the updated habitat surveys and subsequent suitability

assessments are completed, a precautionary approach to assessment will be undertaken with respect to reptiles, terrestrial invertebrates and other notable species. Regardless of inclusion in the final assessment, all of these species, with the exception of GCN, will be reviewed in relation to legislation in a Biodiversity Legislation Compliance Report to be submitted as an appendix to the ES.

Project Engagement

- 7.3.6 National Grid has held a number of meetings with relevant organisations including Natural England, RSPB and the local planning authorities. Further details can be found in Chapter 3: Scoping Opinion and Consultation. Discussions have focused on the methodology for habitat and species surveys and the use of Biodiversity Metric 3.0 (Defra, 2021d) for recording habitat loss and the 10% BNG.
- 7.3.7 In response to feedback from Natural England, National Grid has committed to undertaking a full UKHab survey for the project, which will also provide the condition data required for the Biodiversity Metric 3.0 (Defra, 2021d). National Grid has also committed to producing draft European Protected Species (EPS) licences as part of the application for development consent, in order to secure Letters of No Impediment.
- 7.3.8 There are also ongoing discussions with Natural England and the RSPB regarding construction effects and potential mitigation in relation to Hintlesham Woods SSSI. This has included initial discussions on the two options presented within Chapter 4: Project Description.

7.4 Approach and Methods

- 7.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on Biodiversity. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Sources

- 7.4.2 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:
- international and national statutory designated sites, priority habitats and granted EPS licences (up to May 2019) were identified on the Multi-Agency Geographic Information for the Countryside (MAGIC) website (Defra, 2021c);
 - supplementary information on statutory designated site citations has been collated from Natural England (Natural England, 2021a);
 - non-statutory designated sites information has been provided by Suffolk Biodiversity Information Service and Essex Wildlife Trust Biological Records Centre (Feb 2021);
 - Natural England Open Data Geoportal was consulted for designated sites, ancient woodland, priority habitats and freshwater ecology datasets (Jan 2021);
 - Catchment Data Explorer (Environment Agency, 2020);
 - Ecology and Fish Data Explorer (Environment Agency, 2021g);
 - species records were requested in 2021 from Suffolk Biodiversity Information Service, Essex Wildlife Trust Biological Records Centre, North Essex Badger Group, Essex Field Club (who also hold records from Suffolk Bird Recorder and Essex Bird

Watching Society), British Trust for Ornithology, Froglife (Toad Patrol areas) and RSPB; and

- aerial photography (April 2021) and OS maps.

Site Survey

7.4.3 The approach to field survey of biodiversity features is detailed and justified in Appendix 7.1: Biodiversity Baseline. This details the baseline for each of the biodiversity receptors, including data compiled from field survey undertaken 2009–2013, the desk study in 2021 and where available and results from field survey commenced in 2021. The 2021 field surveys comprised:

- UKHab survey (with incidental INNS recording);
- hedgerow survey (UKHab and Important hedgerows);
- ground based bat roost assessment of trees and buildings;
- riparian mammals; and
- incidental recording of badger and notable species, including birds.

Study Area

7.4.4 The study area for biodiversity relates to the main areas of construction activity, including compounds and access tracks, which are defined by the draft Order Limits. The study area comprises the relative areas by which potential pathways to effect on biodiversity receptors could occur. These areas are based on specified published impact risk zones or where potential pathways exist.

- Internationally important statutory designated sites: Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Wetlands of International Importance (Ramsar sites) within 2km of the draft Order Limits, extending to 30km for SACs where bats are the qualifying interest or where European sites are hydrologically connected to the project. The underpinning component SSSI Impact Risk Zones for European sites were also reviewed for electricity infrastructure projects and if there were any direct pathways to effects;
- Nationally important statutory designated sites: SSSIs, National Nature Reserves (NNR) and LNR within 2km of the draft Order Limits, extending to where SSSI Impact Risk Zones overlap the draft Order Limits or where direct pathways to effects were possible beyond 2km, including sites located within 200m of proposed construction routes where significant changes are anticipated due to the project (see Chapter 12: Traffic and Transport for current assumptions);
- Non-statutory sites of local nature conservation importance: CWS, LWS and Roadside Nature Reserves (RNR), ancient woodland, and habitats of principal importance (referred to as 'priority habitats' in this report) where pathways to effects are possible within 1km of the draft Order Limits;
- Desk study records of protected or otherwise notable habitats and species, veteran or ancient trees within 1km of the draft Order Limits.

Assessment Methodology

- 7.4.5 This preliminary environmental information and assessment process, and the proposed assessment EIA methodology, has been undertaken with reference to guidance provided in the Guidelines for Ecological Impact Assessment (Chartered Institute of Ecology and Environmental Management (CIEEM), 2019a) (hereafter referred to as ‘the CIEEM guidelines’). These recommend that the technical scope of the assessment should comprise those biodiversity receptors that, as a minimum, meet the following criteria:
- be of sufficient value that effects on them may be significant; and
 - be potentially vulnerable to significant effects arising from the project.
- 7.4.6 As such, the source-pathway-receptor approach has been followed in this report to understand the mechanisms by which the project could result in potential significant effects on biodiversity receptors. Potential sources of significant effects were identified, the Zone of Influence (ZOI) was defined, and the pathway recorded. For a significant effect to occur, all three elements (source-pathway-receptor) must be in place. The absence or removal of one of the elements means there is no likelihood for any effect to occur.
- 7.4.7 Appendix 5.1: Assessment Criteria contains the value (sensitivity) and magnitude tables that will form the basis of the assessment relevant to this chapter. Significance has been derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement which, where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects in the context of the EIA Regulations 2017 are effects assessed to be of moderate or greater significance.

Preliminary Assessment Key Parameters and Assumptions

- 7.4.8 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. These key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.
- 7.4.9 The assessment undertaken for this PEI Report is based on desk study information and available survey data at the time of writing (September 2021). A precautionary approach to assessment has been taken using the draft Order Limits and the design information available at this time, assuming a worst-case scenario where design information is unconfirmed or subject to change.
- 7.4.10 The preliminary assessment uses worst-case vegetation clearance assumptions detailed in Chapter 4: Project Description. It also assumes that vegetation removed during construction would be reinstated, except where there are planting restrictions associated with the legal land right (easement or wayleave). The areas of each habitat to be impacted as a result of the construction of the project will be presented in the ES when the final design is understood.

Further Assessment Within the ES

- 7.4.11 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point; the assumptions and assessment will subsequently be developed and presented in the ES. In addition, the following additional

information will be included as appendices to the ES and submitted with the application for development consent:

- No Significant Effects Report: This will document the potential likely significant effects to European sites (SPA, SAC and Ramsar sites). Appendix 7.2: Final HRA Screening provides the preliminary assessment on effects to European sites.
- Biodiversity Legislation Compliance Report: This will report on compliance with the legislation relating to the protection or control of species of fauna and flora and would address all relevant legally protected and controlled species, regardless of whether these had been scoped in or out of the ES.
- Draft EPS Licences: These will be provided to Natural England to seek the Letters of No Impediment required to support the application for development consent. Full submission of any necessary protected species licences to Natural England would be required prior to construction, if the DCO is granted.

7.4.12 Mitigation is currently in a preliminary phase, so this chapter sets out the mitigation principles for biodiversity, which will be fully developed for the ES in consultation with consultees. As noted in Section 4.2, National Grid has an internal target to achieve a 10% BNG on its projects and has started to identify potential areas for BNG using Biodiversity Metric 3.0 (Defra, 2021d). Specific locations and proposals will be set out as part of the ES.

7.5 Existing Baseline

Statutory Designated Sites

7.5.1 Statutory designated sites within their respective study area are shown on Figure 7.1: Statutory Designated Sites. Appendix 7.1: Biodiversity Baseline details the location and approximate distance of statutory designated sites from the draft Order Limits and the reason for designation. Pathways to effect were identified for the following statutory designated sites:

- The Stour and Orwell Estuaries SPA/Ramsar site is located approximately 5.75km east of the draft Order Limits but is hydrologically connected to the project by proposed crossings of the River Stour, River Box, River Brett and Belstead Brook by the draft Order Limits. The European site provides habitats for an important assemblage of wetland birds in the non-breeding season and supports internationally important numbers of wintering and passage wildfowl and waders. The value of this site is **very high** as the site is of international importance;
- Hintlesham Woods SSSI is located within the draft Order Limits and is designated for its ancient woodland habitat and breeding bird assemblage and is managed by the RSPB as one of their reserves. Six additional SSSIs outside of the draft Order Limits have potential pathways to effect as identified by the SSSI Impact Risk Zones: Arger Fen SSSI is designated for woodland, fen and acid grassland habitats; Cornard Mere, Little Cornard SSSI designated for fen and wetland areas; Little Blakenham Pit SSSI designated for its chalk grasslands and large bat hibernation roost; and the three underpinning SSSIs of the Stour and Orwell Estuaries SPA/Ramsar – Cattawade Marshes SSSI, Stour Estuary SSSI and Orwell SSSI designated for their grazing marshes, mudflats and saltmarsh that support important wintering bird assemblages. The value of these sites is **high** as the sites are of national importance, other than those that underpin the SPA/Ramsar site, which are valued as **very high**;

- Hadleigh Railway Walk LNR (woodland copse and hedgerows) is located within the draft Order Limits. An additional four LNR are located within 2km of the draft Order Limits: Hadleigh LNR (woodland), Tiger Hill LNR (heathland, fen and woodland with hazel dormouse), Arger Fen LNR (ancient woodland) and Broom Hill LNR (grassland and tall herb communities). The value of these sites is **medium** because the sites are of county importance.

Non-statutory Designated Sites

- 7.5.2 There are 33 Suffolk CWS, 20 Essex LWS, two Suffolk RNR and one Essex and one Suffolk Wildlife Trust Reserve within the study area (see Appendix 7.1: Biodiversity Baseline and Figure 7.2: Non-statutory Designated Sites). The value of these sites is **medium** because the sites are of county importance.
- 7.5.3 The following non-statutory designated sites are located within the draft Order Limits (from west to east):
- Valley Farm Meadow CWS;
 - Hadleigh Railway Walk CWS;
 - Valley Farm Wood CWS;
 - Layham Pit Woodland and Meadow CWS;
 - The Dollops CWS;
 - RNR 195;
 - Loshes Meadow Complex LWS (part EWT Reserve);
 - Moat Farm/Burnt House Marsh LWS;
 - Alphamstone Complex LWS;
 - Ansell's Grove/Ash Ground LWS;
 - Twinstead Marsh LWS; and
 - Waldegrave Wood LWS.
- 7.5.4 The following sites are immediately next to and form a boundary with the draft Order Limits:
- Bullen Wood CWS;
 - Round Wood and Elms Grove CWS;
 - Tom's/Broad oak Wood CWS;
 - Millfield Wood CWS;
 - Bushy Park Wood CWS;
 - Broom Hill Wood CWS;
 - Daws Hall CWS;
 - Pebmarsh House LWS; and
 - Butler's Wood LWS.
- 7.5.5 Sites such as Habitat Network Restorable habitat (Defra, 2021c) and Buglife's B-Lines present within the study area are valued as **negligible**, but their presence and objectives will be considered when identifying biodiversity enhancement and net gain opportunities.

Habitats

- 7.5.6 There are numerous blocks of ancient woodland and veteran trees within 1km of the draft Order Limits, including two within the draft Order Limits; one at Hintlesham Little Wood (Section AB: Bramford Substation/Hintlesham) and one at Waldegrave Wood (Section H: GSP Substation). Based on their designation and the irreplaceable nature of this habitat, these sites are valued as **high**. These Ancient Woodland Inventory (AWI) sites are shown on Figure 7.3 as are additional sites of potential ancient woodland that have been identified through desk study as having features suggesting ancient woodland origin but have not been included in the AWI. This process is further detailed in Appendix 7.1: Biodiversity Baseline.
- 7.5.7 Desk study suggests the presence of the following priority habitats (i.e. habitats of principal importance in England) within the draft Order Limits: lowland broadleaved woodland, wet woodland, lowland meadows, lowland dry acidic grassland, coastal and floodplain grazing marsh, hedgerows, rivers, and ponds. Additional priority habitats including lowland fen and traditional orchards are located within the wider study area (see Figure 7.3). No habitats listed as per Annex I of the Conservation of Habitats and Species Regulations 2017 (as amended) have been identified to date. Priority habitats are valued as **medium** because these habitats are of county importance. A precautionary **high** value is given to lowland fen due to its irreplaceable definition as per the NPPF (MHCLG, 2021).
- 7.5.8 Potential pathways to effect on GWDTEs have been identified at locally designated sites, Alphamstone Complex LWS (wet woodland and swamp) and Moat Farm/Burnt House Marsh LWS (marsh, wet woodland). As the UKHab survey progresses, the presence of GWDTE will be reviewed so that GWDTE outside of designated sites are also assessed. The value of these GWDTEs is **medium** because the habitats are of county importance, whether they are associated with a non-statutory designated site or not.
- 7.5.9 Extended Phase 1 habitat surveys undertaken in 2012 and 2013 identified valuable habitats including semi-natural ancient woodlands, wet woodlands, species-rich hedgerows, river valleys and ponds. A desk-based update to the habitat survey was undertaken in 2021 using aerial photography (dated 2017); see Figure 7.4. The landscape is highly agricultural, dominated by arable and pasture bordered with a range of boundary hedgerow types. Occasional blocks of semi-natural broadleaved woodland and plantations intersperse the study area, some of ancient origin, some recently planted. What limited grassland diversity exists is located to the west of the study area, in the main associated with the Stour Valley (Section G). The aerial photography mapping indicated that the habitat types appear to be broadly consistent with those recorded in 2012/13.
- 7.5.10 The UKHab survey of the draft Order Limits began in June 2021 and will continue into 2022 until the full project has been surveyed (where land access permits). Again, initial findings appear broadly consistent with habitat survey data collected previously, although where changes have been identified, these mainly relate to tree planting rather than further agricultural improvement.

Arable Plant Assemblage

- 7.5.11 Desk study suggests the presence of shepherd's-needle (*Scandix pecten-veneris*), an annual plant of arable fields that is a species of principal importance in England and categorised as Critical in the Vascular Plant Red Data List for Great Britain (Cheffings and Farrell, 2005), in the arable habitats to the east of the study area. Other plant species listed as Vulnerable in the Vascular Plant Red Data List recorded within the study area comprised dwarf spurge (*Euphorbia exigua*) and prickly poppy (*Papaver argemone*).

Species listed as Near Threatened in the Vascular Plant Red Data List and present within the study area were common cudweed (*Filago vulgaris*), field woundwort (*Stachys arvensis*) and hoary cinquefoil (*Potentilla argentea*). Additional species related to arable field margins that have been recorded previously include corn spurrey (*Spergula arvensis*), annual knawel (*Scleranthus annuus*) and field woundwort (*Stachys arvensis*). As an assemblage, this receptor is valued as **high**.

Watercourses and Aquatic Habitats

- 7.5.12 Chapter 9: Water Environment identifies the watercourses crossed by the draft Order Limits. These include five main rivers, namely the Belstead Brook, the River Brett, the River Box, the River Stour and the Henny Meadow Fleet. There are also numerous tributaries of these rivers, classified as ordinary watercourses. The watercourses generally flow in a northwest to southeast direction towards the Stour and Orwell Estuaries.
- 7.5.13 No River Habitat Survey data is available between 2010 and 2021 for a 2km buffer around the project. The watercourses within the draft Order Limits will be surveyed as part of the UKHab survey to inform the condition assessment. This preliminary assessment precautionarily assumes a **medium** value.
- 7.5.14 Appendix 9.2: Water Framework Directive Screening Report provides further details on the ecological status of the waterbodies crossed by the project.

Aquatic Ecology

- 7.5.15 Aquatic receptors, such as macroinvertebrates, fish, and aquatic flora are known to be present within the watercourses, ponds and ditches within the draft Order Limits. These features could support species of conservation and recreational fishing interest.
- 7.5.16 The fish communities with migratory life stages are particularly sensitive to in-channel works. The main rivers crossed by the draft Order Limits are known to support European eel (*Anguilla anguilla*), lamprey species and sea trout (*Salmo trutta trutta*) and so are considered to be of **medium** value as they are of county importance. Fish communities comprising non-migratory species, e.g. coarse fish, are typically ubiquitous to watercourses that pass through the draft Order Limits. These communities have a lower sensitivity to change and are therefore assessed as being of **low** value, as they are of local importance.
- 7.5.17 Environment Agency records (Environment Agency, 2020g) provided invertebrate data for the main river crossings. This data demonstrates good to high freshwater habitat quality, typified by invertebrate rich communities. However, no notable species have been reported from watercourse crossings upstream of the draft Order Limits from the Environment Agency records. Field surveys for aquatic macroinvertebrates in 2013 did not identify any nationally or locally important species. A **low** value is given as they are of local importance.
- 7.5.18 No notable, protected, or non-native macrophyte species were identified in the desk study. Field surveys in 2012 and 2013 did not identify any such species either. All species are considered to be common and ubiquitous to the habitats they were recorded in. However, a precautionary approach to valuing is used and a **low** value has been given, as they are of local importance.

Bats

- 7.5.19 The following bat species have been identified in the desk study and during previous field surveys undertaken in 2012/3:
- Common pipistrelle (*Pipistrellus pipistrellus*);
 - Soprano pipistrelle (*Pipistrellus pygmaeus*);
 - Daubenton's bat (*Myotis daubentonii*);
 - Natterer's bat (*Myotis nattereri*);
 - Brown long-eared bat (*Plecotus auritus*);
 - Noctule (*Nyctalus noctula*);
 - Serotine (*Eptesicus serotinus*); and
 - Barbastelle bat (*Barbastella barbastellus*).
- 7.5.20 Little Blackenham Pit SSSI, located approximately 2.9km north of the draft Order Limits, is designated for supporting one of the largest underground roosts for hibernating bats known in Great Britain. Three species of bat regularly use the tunnel between September and April, in numbers often totalling 450 or more. It is used principally by Daubenton's bat, Natterer's bat and brown long-eared bat, but occasional visitors are Whiskered bat (*Myotis mystacinus*) and Brandt's bat (*Myotis brandti*) (Natural England, 2021).
- 7.5.21 Bats are likely to be roosting in trees and agricultural buildings within and adjacent to the draft Order Limits. A known roost of barbastelle bat (Annex II species) was identified in Ramsey Wood, near Hintlesham and barbastelle bat activity was recorded during the 2012/13 bat surveys in Section E: Dedham Vale AONB and Section F: Leavenheath/Assington. The species has also been recorded incidentally during emergence bat surveys in July 2021, in Section H: GSP Substation.
- 7.5.22 The 2012/3 bat surveys identified trees with roosts supporting pipistrelle bat and some unknown species. Ground based roost assessment of trees and buildings for roosting bat potential (ongoing) have identified a number of trees with high and moderate potential to support roosting bats. Landowner anecdotal evidence also suggests a number of common bat species roosts in buildings around Culverdown.
- 7.5.23 Small bat roosts of rare species are described as being of regional/county value, but small roosts of common species are considered of local value (Wray *et al.*, 2010). A precautionary approach to the valuation of bats is given here as the surveys are ongoing.
- 7.5.24 The majority of the draft Order Limits and the surrounding areas are considered to be of local value for bats as the hedgerows and woodland blocks support small to moderate numbers of common bat species. However, the woodland and connective hedgerow habitats within the central and eastern sections of the project support an assemblage of bat species which includes the rarer barbastelle bat species (although in very low numbers). As such, the bats are given a **medium** value as they are of county level importance.

Breeding Birds and Raptors

- 7.5.25 There are numerous records of birds within the study area. These include species that have increased levels of legal protection or are listed under Local Biodiversity Action Plans and/or Section 41 of the Natural Environment and Rural Communities Act 2006.

Hintlesham Woods SSSI has breeding buzzard (*Buteo buteo*) and kestrel (*Falco tinnunculus*). Hobby (*Falco subbuteo*) have been recorded breeding in Brimlin Woods.

- 7.5.26 The project is hydrologically linked to the Stour and Orwell Estuaries SPA/Ramsar which is designated for breeding avocet (*Recurvirostra avosetta*). However, only a single record for avocet has been identified in the desk study and field survey.
- 7.5.27 Breeding birds, including notable species, could be present in almost all habitats within the study area, including arable fields, grassland, hedgerow and woodland.
- 7.5.28 Seventy-eight bird species were recorded across the full survey area during the bird surveys in 2012; of these 38 were Birds of Conservation Concern (Eaton *et al.*, 2015) and Schedule 1 Species. Eight of these species were confirmed as breeding; 24 species as probable breeding. Incidental records of bird species noted during the ongoing habitat survey include nightingale (*Luscinia megarhynchos*), skylark (*Alauda avensis*) and cuckoo (*Cuculus canorus*).
- 7.5.29 Breeding birds and raptors have been shown to be consistent with the range of habitats available within the local landscape. To value the overall breeding bird assemblage, Fuller (1980) describes a method to value the ornithological importance of sites using the number of breeding species present. A survey area with 25–49 breeding bird species is considered to have local level of importance. Therefore, the 32 species identified as breeding or probably breeding, mean that breeding birds and raptors outside of statutory designated sites are valued as **low**, as they are of local importance.

Hazel Dormouse

- 7.5.30 A desk study has identified hazel dormouse presence across the draft Order Limits. Eastern Essex and Suffolk are on the edge of the dormouse UK range (People's Trust for Endangered Species, 2021) and they are mostly confined to the south of the region associated with ancient woodland and hedgerows. Dormouse populations continue to decline in number and range, with the threat to their survival primarily due to loss and degradation of suitable habitat.
- 7.5.31 The wider landscape surrounding the project, particularly to the west, supports a large amount of optimal dormouse habitat, including hedgerows and broadleaved woodland, much of which is ancient in origin. The suitable dormouse habitat within the draft Order Limits is typically well connected to these wider landscape habitats by hedgerows, woodland belts and lines of trees.
- 7.5.32 Field surveys undertaken by the Suffolk Wildlife Trust, on behalf of National Grid in 2012 (unpublished) confirmed the presence of dormouse across the study area, with a suggestion that all suitable habitats may support dormouse even if they were not confirmed as present during the field survey. The population recorded was spread over a wide geographical area and was not focused on a specific location. The results do not suggest that any one particular survey sub-site is of high conservation value for dormouse. As such, the presence of dormouse in the study area is representative of the known dormouse population status in the region and is valued as **medium** as they are of county level importance.
- 7.5.33 An updated habitat suitability assessment for dormouse within the draft Order Limits will be undertaken as part of the UKHab survey to confirm the baseline assumption.

Riparian Mammals

- 7.5.34 A national water vole survey carried out in the 1990s suggested water vole (*Arvicola amphibius*) were on the brink of extinction in Essex and Suffolk. However, the Water for Wildlife Project run by the Suffolk Wildlife Trust has undertaken habitat management and mink control resulting in the presence of water vole in most suitable Suffolk habitat (Suffolk Wildlife Trust, 2021b) where mink are controlled. Desk study suggests the recent (within the last 15 years) recorded presence of otter (*Lutra lutra*) and water vole on the Rivers Box, Brett and Stour (Suffolk Wildlife Trust, 2021a).
- 7.5.35 Field survey in 2013 confirmed presence of water vole on the River Box and evidence of otter on watercourses sporadically across the study area. Further surveys for riparian mammals have been undertaken during 2021 and have identified the presence of water vole (burrows and feeding piles) on the River Stour.
- 7.5.36 Water vole are considered present across the draft Order Limits where they cross the main watercourses and are valued as **medium** as they are of county level importance.
- 7.5.37 Otter are considered widespread in Suffolk (Suffolk Wildlife Trust, 2021a). No direct field evidence of otter has been recorded to date but potential for otter was recorded at many of the watercourses crossed by the draft Order Limits. The desk study and field survey to date suggest the watercourses in the draft Order Limits are unlikely to make a significant contribution to breeding, commuting or foraging otter. However, otter could use any watercourses occasionally and as such otter are precautionarily valued as **medium** as they are of county level importance.

Reptiles

- 7.5.38 Desk study confirmed presence of grass snake (*Natrix natrix*), slow worm (*Anguis fragilis*) and common lizard (*Lacerta vivipara*) in the study area. During field surveys in 2013, low populations of grass snake, slow worm and common lizard were recorded in habitats that were identified as potentially suitable for reptiles. An updated habitat suitability assessment for reptiles will be undertaken as part of the UKHab survey.
- 7.5.39 The reptile species recorded in the desk study and the 2013 field surveys, are widespread and abundant, particularly in the southeast of England (Wilkinson and Arnell, 2013). The low populations of reptiles identified are highly unlikely to significantly contribute to county or regional populations and as such are valued as **low** as they are of local importance.

Terrestrial Invertebrates

- 7.5.40 Hintlesham Woods SSSI and Arger Fen SSSI, although not designated for their invertebrate assemblages, are noted as being valuable habitats for insects. Hintlesham Woods also supports saproxylic invertebrate fauna. Stag beetle (*Lucanus cervus*) and a range of butterfly species of principal importance and moth species of principal importance associated with woodland habitats were also identified in the desk study. The River Stour supports Scarce Chaser dragonfly (*Libellula fulva*) which are restricted to six main localities in the UK, although they are thought to be expanding their range.
- 7.5.41 Field survey in 2013 identified 22 species of local or national importance, mostly associated with designated sites. Isolated areas of invertebrate interest outside of designated sites were restricted to the more diverse habitats to the western end of the study area.
- 7.5.42 An updated habitat suitability assessment for terrestrial habitats within the draft Order Limits will be undertaken upon completion of the UKHab survey.

7.5.43 Although individuals of terrestrial invertebrate species may be sensitive to potential impacts, the local populations and assemblage of those are not considered sensitive to any impact which would be at the local level only. Outside of designated sites, terrestrial invertebrate presence is believed to be common and widespread although there are specific and localised areas of increased conservation interest. As such, terrestrial invertebrate assemblages outside of designated sites are valued as **low** as they are of local importance.

Wintering Birds

7.5.44 Desk study has identified limited wintering bird species diversity within the study area. A wintering bird survey was undertaken for the project in 2009/2010 and 2010/2011. These identified low numbers of lapwing (*Vanellus vanellus*), and a single golden plover (*Pluvialis apricaria*) while waders or wildfowl species were limited to occasional mallard (*Anas platyrhynchos*) and mute swan (*Cygnus olor*).

7.5.45 Farmland bird records of note in winter were restricted to linnet (*Linaria cannabina*), yellowhammer (*Emberiza citrinella*) and corn bunting (*Emberiza calandra*). The number and diversity of bird species recorded in winter was low. As such, wintering bird assemblages outside of designated sites are valued as **low** as they are of local importance.

7.5.46 The project is hydrologically linked to the Stour and Orwell Estuaries SPA and Ramsar, which are designated for overwintering bird populations. However, the desk study and field survey to date has identified very few of the qualifying bird species in the study area, and it can be reasonably concluded that the habitats within and surrounding the draft Order Limits are not functionally linked with the European site. This is further discussed in Appendix 7.2: Final HRA Screening.

Other Notable Species

7.5.47 Desk study data confirms the presence of several additional species of note within the study area. These species are listed in accordance with Section 41 of the Natural Environment and Rural Communities Act 2006 as species of principal importance in England and include brown hare (*Lepus europaeus*), harvest mouse (*Micromys minutus*), polecat (*Mustela putorius*), hedgehog (*Erinaceus europeus*) and common toad (*Bufo bufo*).

7.5.48 As a reflection of the habitats present within the draft Order Limits and the desk study records, it is confidently assumed that these species are relatively common and widespread in the study area. As such, these are given a **low** valuation as they are of local importance.

Invasive Non-Native Species (Plants and Animals)

7.5.49 The following INNS listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) have been identified from the desk study:

- Turkish crayfish (*Astacus leptodactylus*);
- signal crayfish (*Pacifastacus leniusculus*);
- American mink (*Neovison vison*);
- red-eared terrapin (*Trachemys scripta*);
- giant hogweed (*Heracleum mantegazzianum*);
- Himalayan balsam (*Impatiens glandulifera*);

- Japanese knotweed (*Fallopia japonica*);
- Nuttall's waterweed (*Elodea nuttallii*); and
- rhododendron (*Rhododendron ponticum*).

7.5.50 Field surveys undertaken in 2021 have identified Himalayan balsam, giant hogweed and Australian swamp-stonecrop (*Crassula helmsii*) within the draft Order Limits.

7.5.51 Invasive non-native aquatic invertebrate species, not listed in legislation, have also been identified in the desk study (Environment Agency, 2020g) namely Jenkins' Spire Snail (*Potamopyrgus antipodarum*); and freshwater shrimp species (*Crangonyx pseudogracilis/floridanus*). Zander (*Sander lucioperca*), rainbow trout (*Oncorhynchus mykiss*) and feral goldfish (*Carassius auratus*).

7.5.52 INNS do not have intrinsic value and will not be considered as a biodiversity receptor in the assessment but as a potential pathway to cause effects on other receptors.

Future Baseline

7.5.53 Large parts of land within the draft Order Limits are agricultural. The ecological conditions are unlikely to change significantly in the short term as current agricultural practices are likely to be maintained, i.e. arable land would likely be used for growing crops or used as ley-grassland; improved or semi-improved grasslands would likely continue to be used for grazing livestock. This assumption is given additional certainty when comparing habitats recorded during field survey in 2012 with those reviewed using aerial photography (dated 2017) and the habitats identified during the ongoing UKHab survey in 2021. Initial findings appear consistent through the years with changes tending to be increased tree and hedgerow planting while maintaining agriculture as primary land use.

7.5.54 In general, hedgerows, woodlands and trees are likely to be retained by landowners. National Grid undertakes routine management to cut back vegetation along the existing easement for operational and health and safety purposes (using its rights as a statutory undertaker) through woodlands over-sailed by overhead lines, for example at Hintlesham Woods; this will continue in the future while the overhead line is operational.

7.5.55 Changes in land use can affect the habitats present, e.g. a lowering of intensity in the farming regime, could encourage more diverse habitats to establish. This is increasingly likely where landowners engage with agri-environmental schemes, which, since the pause in the project, has seen hedgerow planting schemes, new areas of woodland being planted, woodland management and reversion of arable land to grassland (Dedham Vale AONB and Stour Valley Project, 2016b). Even so, unpredictable changes in the biodiversity value or spatial extent of semi-natural habitat are unlikely to occur.

7.5.56 The Dedham Vale AONB has selected the hazel dormouse as its flagship species for nature recovery following a consultation process in 2020 (Dedham Vale AONB and Stour Valley Project, 2021). As such further hedgerow, woodland and habitat connection planting can be expected in the area.

7.5.57 Long-term impacts from climate change could affect the species composition and types of habitats in and around the study area, and therefore types and diversity of fauna. Species could be affected by the change in temperatures making it hard for them to adapt and could lead to the dominance of certain species. However, it is not anticipated that the combined impact of the project and climate change would be any different to the impacts of climate change in isolation (i.e. without the project).

7.6 Likely Significant Effects (Without Mitigation)

- 7.6.1 This section sets out the likely significant effects of the project on biodiversity. It assumes that the relevant embedded measures and good practice measures outlined within Appendix 4.1: Outline CoCP are in place before assessing the effects.
- 7.6.2 As noted in Section 5.3 of Chapter 5: EIA Approach and Method, the likely significant effects are described under the phase within which the impact arises, e.g. vegetation loss would be assessed during the construction phase. The operational assessment only assesses the effects associated with maintenance activities, for example the maintenance of vegetation within the easement corridor. This is to avoid double counting of effects.

Embedded and Good Practice Measures

- 7.6.3 The project has avoided sensitive features such as ancient woodland through the options appraisal process. In addition, the assessment has assumed the following embedded measures relevant to biodiversity:
- A trenchless crossing is proposed at the River Stour and overhead lines are proposed to cross the Belstead Brook and River Brett. These would avoid physical changes and reduce effects on the watercourses and their riparian corridors during construction.
 - Removal of the existing 132kV overhead line sections between Burstall Bridge and Twinstead Tee, including complete removal between Burstall Bridge and to the south of Hintlesham Woods and within Section E: Dedham Vale AONB and Section G: Stour Valley, and removal of the 400kV overhead line between the diamond crossing and the Stour Valley West CSE compound. This would remove potential collision features for bird and bat species in the landscape.
- 7.6.4 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to biodiversity, including removal of vegetation outside of bird nesting season or under supervision of an Environmental Clerk of Works (B02) and cleaning machinery when used in areas of known INNS (B04).

Construction

Practices Common to Overhead Line and Underground Cables

Air Quality

- 7.6.5 Changes in air quality caused by nitrogen deposition generated from changes in vehicle emissions from construction traffic can cause adverse effects on sensitive features. Chapter 12: Traffic and Transport describes the highways affected during the construction phase of the project. The preliminary traffic assessment results indicate that the air quality effects associated with construction traffic are likely to be **not significant**. All designated sites, ancient woodland, veteran trees and sensitive priority habitats within 200m of the proposed construction routes and where significant changes in traffic levels would be expected, will be included in the ES stage assessment.
- 7.6.6 No European sites would be affected by changes to air quality due to the intervening distance between the proposed construction routes and the European sites.

Water Quality

- 7.6.7 Works to construct temporary crossings for access across watercourses (both main rivers and ordinary watercourses) during construction could open pollution pathways to these watercourses and to designated sites or priority habitats downstream. However, the crossing design (clear span Bailey bridges and temporary culverts) would follow the good practice measures set out within the Outline CoCP. This is anticipated to reduce the risk of pollution and the impacts of the temporary crossings to a **negligible** magnitude. Therefore, it is considered that there would be **minor** effects on the watercourses and any hydrologically connected designated site (e.g. Stour and Orwell Estuaries SPA, Arger Fen SSSI and concurrent Wildlife Trust Reserve, Sproughton Park CWS and Great Raydon Wood CWS) or priority habitat and effects would be **not significant**.

Overhead Line (Including CSE Compounds and Removal of the Overhead Line)

Statutory Designated Sites

- 7.6.8 The Stour and Orwell Estuaries SPA/Ramsar site (**very high** value) is located approximately 5.8km to the southeast of the draft Order Limits. The impact risk zones of the three underpinning SSSIs overlap with the overhead line section of the project. The River Brett and Belstead Brook (overhead line section) feed directly into the European site. No likely significant effect on the SPA/Ramsar site is anticipated due to the absence of functionally linked land within the draft Order Limits, i.e. that used by the qualifying feature species of the SPA/Ramsar.
- 7.6.9 The watercourse crossing at the River Brett would be via a Bailey bridge meaning no direct in-channel impact on the watercourses and subsequently the European site. In addition, the good practice measures within Appendix 4.1: Outline CoCP would further reduce any effects on watercourses. Appendix 7.2: Final HRA Screening concludes that there would be no likely significant effect on the Stour and Orwell Estuaries SPA/Ramsar. As such, there would also be a **neutral** effect on the underpinning Cattawade Marshes SSSI, Stour Estuary SSSI and Orwell Estuary SSSI sites which would be **not significant**.
- 7.6.10 There is a potential pathway to indirect effects on the bat features of the Little Blakenham Pit SSSI (**high** value). It is possible that the habitats within the draft Order Limits support the same or contributing SSSI feature bat population in the active season by providing active season roosting sites, feeding grounds and commuting routes. Any impact or loss on those active season roosts or habitats within the draft Order Limits could affect subsequent hibernation populations. Although any bat roost loss would be compensated for in the EPS licensing process, the scale of the potential loss is unknown and the current assumptions regarding limited replanting of habitat post construction means there is a feasible pathway to effect without further mitigation. A **medium** magnitude impact on a SSSI of **high** value would result in a **moderate** effect, which would be **significant**.

Hintlesham Woods Option

- 7.6.11 As noted in Chapter 5: EIA Approach and Method, the preliminary assessment has considered the likely significant environmental effects for the two options at Hintlesham Woods, which is designated as a SSSI (currently in favourable condition) and is ancient woodland: both **high** value receptors. The potential effects during construction are presented in Table 7.3. National Grid is currently consulting Natural England and RSPB regarding the effects and potential mitigation for both options.
- 7.6.12 The overall summary for the preliminary assessment has shown that the effects associated with Option 1 mainly originate from temporary disturbance to breeding bird

assemblage during construction around the edge of the woodland (equating to approximately 2km of woodland edge). Option 2, in the absence of mitigation, would result in the loss of SSSI and irreplaceable ancient woodland habitat, which would be significant. National Grid has experience of working within ancient woodland and would seek to agree a programme of mitigation so that the project results in no permanent loss of ancient woodland. A similar programme of mitigation was agreed with the Woodland Trust on the Richborough project.

Table 7.3: Comparison of the Two Options at Hintlesham Woods (Construction)

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
Hintlesham Woods SSSI (ancient woodland and breeding bird assemblage)	<p>Assumed no loss of additional ancient woodland due to works contained within the existing 400kV overhead line corridor. Potential indirect effect on woodland habitat where the working area for one pylon is located within 15m of the woodland boundary, where impacts on root system could occur.</p> <p>Potential disturbance to SSSI breeding bird assemblage (Schedule 1 bird species) (high sensitive receptor) as some of the construction works will need to be undertaken in outages which coincide with the bird breeding season. This impact would be of medium magnitude and would result in a moderate effect, which would be significant.</p>	<p>Direct habitat loss and modification due to the new swathe through the woodland affecting c.1.4% of the total SSSI area or c.2% of the combined Ramsey and Hintlesham Little and Great Wood components, which are in favourable condition.</p> <p>Ancient woodland (high sensitive receptor) is an irreplaceable habitat. National grid would seek to agree a programme of mitigation so that the project results in no permanent loss of ancient woodland, similar to what was undertaken on the Richborough project. The temporary impact would be of medium magnitude and would result in a moderate effect, which would be significant.</p> <p>Works would take place outside of bird breeding season, so there would be no disturbance.</p>
Invertebrates	<p>Minor amounts of hedgerow loss and temporary loss of arable habitat during construction. The impact would be negligible and the effect would be neutral and not significant.</p>	<p>Hintlesham Woods supports a range of diverse terrestrial invertebrate species. Supporting woodland habitat would be coppiced to ground level for a 20m swathe, and a graduated height reduction for a further 10m either side. This could reduce standing dead wood available for these species. Good practice measure B08, requiring the retention of deadwood, would reduce the potential habitat loss.</p> <p>This impact would be of small magnitude and would result in a minor effect, which would be not significant.</p>
Bats	<p>Temporary loss of hedgerow of up to 20m at each location where the overhead line oversails the hedgerow. The impact</p>	<p>Permanent loss of potential roosting habitat in trees that would require clearance/ modification for 20m and graduated height reduction for a further 10m either side to</p>

would be **negligible** and the effect would be **neutral** and **not significant**. allow conductor installation. At present, the ecology surveys are ongoing and the potential for roosting bats has not been established. Therefore, a precautionary approach to assessment is made. This impact would be of **medium** magnitude and would result in a **moderate** effect, which would be **significant**.

Dormouse Temporary loss of hedgerow of up to 20m at each location where the overhead line oversails the hedgerow. The impact would be **negligible** and the effect would be **neutral** and **not significant**. Supporting woodland habitat would be coppiced to ground level for a 20m swathe, and a graduated height reduction for a further 10m either side. This could result in some habitat loss and fragmentation of supporting woodland habitat. This impact would be of **medium** magnitude and would result in a **moderate** effect, which would be **significant**.

Non-Statutory Designated Sites

7.6.13 A number of unavoidable pathways to effect on several non-statutory designated sites have been identified. Table 7.4 lists the sites and their potential impact pathways. All lie within the draft Order Limits, except Tom's/Broadoak Wood CWS and AWI site, which lies immediately adjacent to the draft Order Limits. The RNR 195 designated for its botanical interest is located within the draft Order Limits, on the verges of Wormingford Road south of Moor's Farm. This route is included in the draft Order Limits as an access route only and no construction works are proposed to the road that would impact this site.

7.6.14 Although the draft Order Limits are adjacent to the following sites, no pathway to effect has been identified as these areas are included within the draft Order Limits for the purposes of BNG only. No construction works are proposed within or adjacent to these sites: Bullen Wood CWS and AWI site; Round Wood and Elms Grove CWS and AWI site.

Table 7.4: Non-statutory Designated Sites with Possible Pathways to Effect (Overhead Line Sections)

Site Name	Pathway to Effect	Preliminary Assessment in absence of mitigation	Value of Receptor	Magnitude of Impact	Significance (Significant in bold)
Tom's/Broadoak Wood CWS and AWI site	Indirect habitat damage	Groundworks within 15m of AWI sites can cause tree root damage. The draft Order Limits run adjacent to the northern boundary of the site for a distance of approximately 275m.	High	Small	Moderate
Valley Farm Meadow CWS	Temporary habitat loss	Approximately 2.0ha of this 3.1ha grassland site is located within the draft Order Limits. Temporary access during construction would be limited to approx. 0.08ha within this area and be reinstated post works.	Medium	Negligible	Neutral

Site Name	Pathway to Effect	Preliminary Assessment in absence of mitigation	Value of Receptor	Magnitude of Impact	Significance (Significant in bold)
Hadleigh Railway Walk CWS	Temporary habitat loss	Approximately 0.7ha of this 11.4ha site comprising a mosaic of habitats is located within the draft Order Limits. This linear site would be temporarily bisected by a haul route. Habitats would be reinstated post work with scrub planting rather than trees.	Medium	Negligible	Neutral
Valley Farm Wood CWS	Permanent and temporary habitat loss	Approximately 3.8ha of this 28ha habitat mosaic including AWI site is located within the draft Order Limits. While the pylon is assumed to be located within improved grassland, approximately 1.4ha of mature woodland could be impacted (some permanently lost, some coppiced) associated with the legal land right (easement or wayleave).	Medium	Medium	Moderate
Layham Pit Woodland and Meadow CWS	Temporary habitat loss	Approximately 1.3ha of this 6.8ha habitat mosaic site is located within the draft Order Limits. As part of an active quarry site habitat change is expected and a restoration plan is already agreed.	Medium	Small	Minor
The Dollops CWS and potential ancient woodland (PoAWS6)	Habitat gain	Approximately 0.5ha of this 14.6ha ancient woodland site is located within the draft Order Limits. An existing easement is present through the woodland and no additional clearance is anticipated. After removal of the overhead line, the swathe would be left to recolonise naturally.	High	Small (beneficial)	Minor (beneficial)
Ansell's Grove LWS and potential ancient woodland (PoAW10 and 11)	Habitat gain	Approximately 0.5ha of this 8.4ha potential ancient woodland site is located within the draft Order Limits: 0.5ha north of the Twinstead Tee and 0.02ha on the east to west overhead line. No vegetation clearance would be necessary beyond the existing easement which would be left to recolonise naturally.	High	Small (beneficial)	Minor (beneficial)
Loshes Meadow CWS and EWT	Temporary habitat loss	Approximately 0.5ha of this 8.4ha site is located within the draft Order Limits. Of this, approximately 0.2ha is existing hard standing with the remaining area comprising woodland. This would be cleared to permit construction and reinstated post works.	Medium	Small	Minor

Site Name	Pathway to Effect	Preliminary Assessment in absence of mitigation	Value of Receptor	Magnitude of Impact	Significance (Significant in bold)
Twinstead Marsh LWS	Temporary habitat loss	Approximately 1.4ha of this 3.8ha site comprising wet woodland, marsh and open water would be lost and reinstated post works.	Medium	Medium	Moderate

Habitats

- 7.6.15 Where AWI sites or potential ancient woodland would be directly impacted by the project, this is included in the corresponding designated sites assessment above and in Table 7.4. Ancient woodland and veteran tree habitats are considered irreplaceable (**high** value), and any loss would be considered permanent, of **small** magnitude (due to small area affected) and of **moderate adverse** effect which would be **significant**.
- 7.6.16 Priority habitats would require clearance for removal of the existing 132kv overhead line and installation of the new 400kv overhead line. With the exception of lowland broad-leaved woodland and lowland meadows, this would be considered temporary as these habitats can be replaced and reinstated after construction. Habitat survey in 2021 will establish the actual presence of priority habitats within the draft Order Limits (the Inventory has varying levels of certainty across England) and the impacts will be fully assessed at the ES stage. The areas of these **medium** valued habitats to be temporarily lost are yet to be defined but can be assumed to be of **small** magnitude, resulting in a **minor adverse** effect which is **not significant**.
- 7.6.17 At this stage of the project, it is assumed that a 45m working width is required through woodland habitats in the new 400kV overhead line sections (see Chapter 4: Project Description). Trees would be cut down to ground level for a width of 20m, with stump and root excavation required potentially along the haul route. An additional 12.5m of vegetation both sides of this would require a graduated cut. This would result in an approximate 8.2ha of woodland habitat (as identified by the Priority Habitat Inventory (Natural England, 2020)) being impacted as part of the temporary works. Approximately half of this would be permanent loss and half modification to lower the height of trees and scrub. General woodland loss would be larger but is yet to be fully defined.
- 7.6.18 Areas outside of the overhead line corridor would be replanted after construction. In areas of the existing 132KV overhead line removal, there would be a temporary loss of woodland during the works, although this would generally be confined to the overhead line corridor. Once completed, the swathe would be planted up with trees or left to naturally recolonise. This could lead to an additional 2ha of woodland, which will better connect the existing habitats previously severed by the overhead line. Combined, the potential impact on the **medium** valued broad leaved deciduous woodland habitats is precautionarily assumed to be of **medium** magnitude resulting in a **moderate adverse** effect, which would be **significant**.

Arable Plant Assemblage

- 7.6.19 The arable plant assemblage, by its very nature, is a product of disturbance and crop harvest. Crop and arable margin habitat removal for the project would be temporary and similar to the regular agricultural activities undertaken. In addition, good practice measures in regard to stripped topsoil and reinstatement post works would permit natural

re-establishment of the arable plant assemblage. Therefore, there would be **neutral** effects on the arable plant assemblage, which would be **not significant**.

Watercourses and Aquatic Habitats

7.6.20 With implementation of good practice measures, there would be **neutral** effects on watercourses and aquatic habitats from overhead line and associated infrastructure during construction, which would be **not significant**.

Aquatic Ecology

7.6.21 With implementation of good practice measures, there would be **neutral** effects on aquatic ecology from overhead line and associated infrastructure during construction, which would be **not significant**.

Bats

7.6.22 Essential vegetation clearance for construction of the overhead line section could result in the following impacts:

- loss of bat roosts if located in trees which require essential removal (survey of trees for bat roosting potential is ongoing);
- injury or mortality of bats should bats be present within trees requiring clearance without mitigation;
- temporary loss of foraging habitat (woodland, scrub, grasslands – exact extent of habitat to be confirmed);
- permanent fragmentation of woodland habitats where new overhead lines oversail woodlands, up to a width of 45m, although scrub regeneration would be permitted up to three years growth;
- temporary fragmentation of linear features such as hedgerows to have maximum clearance of 45m would result in temporary fragmentation effects but dead hedging would be provided where appropriate. Hedgerows would also be reinstated post works;
- disturbance (from changes in noise, vibration, visual and light stimuli); and
- loss of roosting sites, foraging habitat or fragmentation of commuting routes due to artificial lighting.

7.6.23 Although some flexibility within the draft Order Limits for micro-siting haul routes can avoid bat roosts in trees, the amount of woodland clearance necessary in the new overhead line sections, in the absence of further mitigation, is assessed as of **medium** magnitude on a receptor of **medium** value, resulting in a **moderate** effect. The loss of bat roosts, temporary and permanent loss of commuting and foraging habitat for bats and construction disturbance would give rise to a **significant** effect.

7.6.24 Injury or mortality of bats within trees to be cleared would be avoided with the implementation of method statements agreed with Natural England through the EPS licensing process and the effect would be **not significant**.

Breeding Birds and Raptors (Outside of Hintlesham Woods SSSI)

7.6.25 Effects on breeding birds and raptors at Hintlesham Woods SSSI is described in Table 7.3. Outside of Hintlesham Woods, the extent of temporary loss of woodland, hedgerow and suitable ground nesting habitats is yet to be defined, but the magnitude of the impact of temporary loss of habitat and disturbance to breeding birds in the overhead line

sections during construction is considered **negligible** due to the limited species diversity present, the availability of alternative similar habitats in the immediate area and the good practice measures (e.g. B02 in the Outline CoCP) that limit vegetation clearance to outside of the bird breeding season and the commitment to reinstatement habitats after construction. This would result in a **neutral** effect which would be **not significant**.

Hazel Dormouse

7.6.26 Essential vegetation clearance for construction of the overhead line section could result in the following impacts on hazel dormouse:

- Permanent and temporary loss of feeding and nesting habitat (this loss would be temporary where clearance is required through woodland, as scrub growth, suitable for dormouse, would be permitted to regrow);
- Injury or mortality of dormouse should they be present within vegetation requiring clearance without mitigation;
- Permanent fragmentation of woodland habitats where new overhead lines oversail woodlands, up to a width of 45m, although scrub regeneration would be permitted post works up to three years growth;
- Temporary fragmentation of linear features such as hedgerows to have maximum clearance of 45m would result in temporary fragmentation effects but dead hedging would be provided where appropriate. Hedgerows would also be reinstated post works;
- Disturbance (from changes in noise, vibration, visual and light stimuli).

7.6.27 The permanent and temporary woodland and hedgerow clearance necessary in the new overhead line sections, in the absence of further mitigation, is assessed to be of **medium** magnitude on a receptor of **medium** value, resulting in a **moderate** effect. The permanent and temporary loss of feeding and nesting habitat, the fragmentation of woodland habitats and construction disturbance would give rise to a **significant** effect.

7.6.28 Injury or mortality of dormouse within woodland and hedgerows to be cleared would be avoided with the implementation of method statements agreed with Natural England through the EPS licensing process and the effect would be **not significant**.

Riparian mammals

7.6.29 Essential vegetation clearance for construction of the overhead line section, temporary culverting of watercourses for haul routes and the required bailey bridge needed over the River Brett could result in the following impacts on riparian mammals:

- temporary loss of connected aquatic and riparian habitat; and
- disturbance from changes in noise, vibration, visual and light sources.

7.6.30 The necessary watercourse crossing for haul routes can be micro-sited within the draft Order Limits to avoid sensitive features, e.g. otter holts and water vole burrows. Implementation of good practice measures relating to species legislation compliance (e.g. B01 in the Outline CoCP) and maintaining the connectivity and flow of the water (e.g. W04 in the Outline CoCP) would have **negligible** magnitude impacts on riparian mammals and effects would be **neutral** and **not significant**.

Reptiles

- 7.6.31 Essential vegetation clearance could result in killing or injury of reptiles should they be present within the area to be cleared. Commitment B05 in the Outline CoCP details the approach to clearance of habitats suitable for reptiles that would avoid this potential impact through staged and directional clearance that persuade reptiles to naturally disperse into adjacent retained habitat, and ecological supervision. The magnitude of temporary habitat loss is considered **negligible** due to the plentiful alternative unaffected habitat nearby. Therefore, there would be **neutral** effects on reptiles which would be **not significant**.

Terrestrial Invertebrates

- 7.6.32 The active quarry area and Layham Pit and Meadow CWS within the draft Order Limits has been identified as a possible area of invertebrate interest. Should important or notable species or assemblage of terrestrial invertebrates be present at this location or any other suitable habitats within the overhead line working areas, the short duration of the construction activity means an adverse effect to the conservation status of the assemblage is unlikely. The updated habitat survey will be used in conjunction with the desk study to make an assessment on likely significant effects. Based on the preliminary assessment, the magnitude of any impact would be **negligible**, and the effects would be **neutral** and **not significant**.

Wintering Birds

- 7.6.33 The extent of temporary habitat loss for wintering birds is yet to be defined but the effect of that temporary loss in the overhead line sections during construction is considered negligible due to the limited species diversity present, the availability of similar unaffected habitat in the immediate vicinity and the commitment to reinstatement habitats post work. Therefore, there would be **negligible** impact on the wintering bird assemblage and effects would be **neutral** and **not significant**.

Other Notable Species

- 7.6.34 Notable species will be present within the draft Order Limits at various densities depending on their specific habitat requirements and the quality of the habitat present. The updated habitat survey will be used to undertake a revised assessment of likely presence. If present, the potential impacts would relate to temporary and permanent habitat loss, killing and injury, and disturbance. However, the short duration of the construction activity means an adverse effect to the conservation status of notable species is unlikely.
- 7.6.35 Vegetation clearance methodologies to be agreed with Natural England during the protected species licensing process and Outline CoCP measures designed to avoid impacts on protected species would also be beneficial for other notable species, reducing the potential for killing and injury and disturbance. Therefore, there would be **negligible** impacts on other notable species, and temporary loss of habitat, potential mortality and injury and disturbance would result in a **neutral** effect, which would be **not significant**.
- 7.6.36 The permanent loss of habitat, particularly of woodland and hedgerow habitats, in the absence of any further mitigation, is assessed as of **medium** magnitude on a **low** value receptor, resulting in a **minor** effect. This permanent loss of habitat would give rise to a limited degree of harm and any adverse effect would be **not significant**.

Underground Cables

Statutory Designated Sites

- 7.6.37 The Stour and Orwell Estuaries SPA/Ramsar site is located approximately 5.75km to the southeast of the draft Order Limits. The River Stour and River Box would be crossed by the underground cables and these watercourses feed directly into the European site. The River Stour would be crossed using a trenchless technique meaning no in-channel impact on the watercourse and subsequently the European site. Where bailey bridges are proposed, good practice measures would avoid any potential impacts.
- 7.6.38 Although the River Box would be crossed by open trench techniques involving direct excavation through the watercourse, good practice measures (e.g. W01, W02 in the Outline CoCP) would avoid any potential significant effect. Appendix 7.2: Final HRA Screening concludes that there would be no likely significant effect on the Stour and Orwell Estuaries SPA/Ramsar as even without good practice measures the dilution effect would limit any potential impact on the European site to less than significant. As such, there would also be **negligible** impacts on the underpinning Cattawade Marshes SSSI, Stour Estuary SSSI and Orwell Estuary SSSI of the European sites and the effects would be **neutral** and **not significant**.
- 7.6.39 The Conard Mere, Little Conard SSSI is located approximately 2km north of the draft Order Limits where the underground cable crosses the River Stour. The site is designated for its fen habitat. It is separated from the draft Order Limits by the River Stour which is likely to be more influential on groundwater levels than the proposed excavations for underground cables. The impact risk zone for the SSSI does not extend to the draft Order Limits. As such, there is no pathway to effect.

Non-Statutory Designated Sites

- 7.6.40 A number of potentially unavoidable pathways to effect on several non-statutory designated sites have been identified (Table 7.5).
- 7.6.41 Although the draft Order Limits are adjacent to Daws Hall CWS and Bushy Park Wood CWS, no pathway to effect has been identified as the draft Order Limits in these areas are included for the purposes of BNG only.

Table 7.5: Non-statutory Designated Sites with Possible Pathways to Effect (Underground Cable sections)

Site Name	Pathway to Effect	Preliminary Assessment in absence of mitigation	Value of Receptor	Magnitude of Impact	Significance (Significant bold)
Millfield Wood CWS and Broom Hill Wood CWS	Indirect habitat damage	Groundworks within 15m of AWI sites can cause tree root damage. The draft Order Limits run adjacent to the boundaries of these four CWS and AWI sites.	High	Small	Moderate
Pebmarsh House LWS	Temporary habitat loss	Clearance of mature boundary trees may be necessary for a distance of approximately 200m along the site's north and west boundaries.	Medium	Small	Minor

Site Name	Pathway to Effect	Preliminary Assessment in absence of mitigation	Value of Receptor	Magnitude of Impact	Significance (Significant bold)
Moat Farm/Burnt House Marsh LWS	Permanent and temporary habitat loss	Approximately 0.96ha of this 6.8ha wet woodland site is located within the draft Order Limits. As woodland planting cannot be used in reinstatement post works there would be a permanent loss of woodland.	Medium	Medium	Moderate
	Change in groundwater	Dewatering required during groundworks to bury underground cables could cause a temporary lowering of groundwater at GWDTEs causing adverse habitat changes.	Medium	Medium	Minor
Alphamstone Complex LWS	Permanent habitat loss	Approximately 0.49ha of this 7.8ha mosaic site is located within the draft Order Limits. The habitat comprises woodland and some recently cleared woodland. As woodland planting over underground cable is restricted, there would be a permanent loss of woodland and of the woodland connection between retained woodlands of the LWS to the north and south of the draft Order Limits.	Medium	Medium	Moderate
	Change in groundwater	Dewatering required during groundworks to bury underground cables could cause a temporary lowering of groundwater at GWDTEs causing adverse habitat changes.	Medium	Medium	Minor

Habitats

- 7.6.42 No additional AWI sites to those detailed in Table 7.5 as part of the non-statutory assessment would be affected, directly or indirectly, by the underground cable sections of the project. While ancient woodland and potential ancient woodland would be avoided where practicable, some clearance may be essential, and a precautionary approach has been assumed for the PEI Report.
- 7.6.43 The desk study has identified three areas of potential ancient woodland habitat located within the draft Order Limits. These comprise Dollops Wood (PoAWS6) in Section E: Dedham Vale and Ansell's Grove east and west (PoAWS 10 and PoAWS11 respectively) in Section G: Stour Valley. These are all locations where the existing overhead lines would be removed (the 132kV overhead line at PoAWS6 and the 400kV overhead line at

PoAWS 10 and PoAWS11). Construction works would generally be confined to being within the existing swathe to reduce the impact on these areas of woodland.

- 7.6.44 There are three areas of potential ancient woodland located immediately adjacent to the draft Order Limits, which could result in habitat damage where groundworks are within 15m, causing root damage. These are Alder Carr (PoAWS7) and woodland near Ash Ground and Henny Back Road (PoAWS7 and PoAWS8 respectively).
- 7.6.45 In the absence of details regarding how the work would be undertaken in these areas and taking a precautionary approach, the change to ancient woodland habitats is preliminary assessed as being of **medium** magnitude on a **high** value receptor, resulting in a **moderate** effect that would be **significant**.
- 7.6.46 Priority habitats would require clearance for installation of the new underground cable sections. Priority habitats, as identified by the Priority Habitat Inventory (Natural England, 2020), within the underground cable sections draft Order Limits comprise lowland broad-leaved deciduous woodland, lowland fen and coastal and floodplain grazing marsh and lowland meadows.
- 7.6.47 Habitat survey in 2021 and 2022 will establish the actual presence of priority habitats within the draft Order Limits (the Inventory has varying levels of certainty across England) and the impacts will be fully assessed at the ES stage. Loss of coastal and floodplain grazing marsh and lowland meadows would be considered temporary as these habitats can be replaced and reinstated after construction. The areas of these **medium** valued habitats to be temporarily lost are yet to be defined but can be assumed to be of **small** magnitude resulting in a **minor** adverse effect and **not significant**.
- 7.6.48 An 80m working width has been assumed to be required through woodland habitats for underground cabling. Trees would be cut down to ground level with the stumps and roots removed to allow excavation of the cable trenches. Trees would be unable to be planted over the top of the cables once works were complete. However, low growing scrub may be possible. The potential impacts on the **medium** valued woodland habitats to be lost are yet to be fully defined and a precautionary impact has been assumed at this stage. Loss of Priority woodland habitat (as identified by the Priority Habitat Inventory) is approximately 1.3ha. The loss of woodland habitat as a whole can be precautionarily assumed to be of **medium** magnitude due to their permanent nature, resulting in a **moderate** adverse effect that is **significant**.

Arable Plant Assemblage

- 7.6.49 The arable plant assemblage, by its very nature is a product of disturbance and crop harvest. Crop and arable margin habitat removal for the project would be temporary and similar to the regular agricultural activities undertaken. In addition, good practice measures in regard to stripped topsoil and reinstatement post works would permit natural re-establishment of the arable plant assemblage. The magnitude is assessed to be **negligible** resulting in a **neutral** effect on the arable plant assemblage, which would be **not significant**.

Watercourses and Aquatic Habitats

- 7.6.50 The River Stour and River Box would be crossed by underground cable sections of the project. A trenchless crossing of the River Stour is proposed, whereas the River Box and all other watercourses, would be crossed by an open cut method of up to 80m in width.
- 7.6.51 Whilst a trenchless crossing would avoid habitat loss and direct physical disturbance to the flow regime and form of the River Stour channel and riparian corridor, the technique

is not without risk of pollution, associated with inadvertent releases of drilling fluids/muds. Open cut crossings generate a direct loss of in-channel and riparian corridor habitat and could cause sedimentation of watercourses.

- 7.6.52 The design of the crossings and habitat reinstatement methods will follow the good practice measures set out within the Outline CoCP and consequently, the change to watercourses and aquatic habitats in the underground cable sections, is assessed as of **small** magnitude on receptors of **medium** value, resulting in a **minor** effect. Any impact upon watercourses and aquatic habitats would be temporary and localised such that any adverse effect will be **not significant**.

Aquatic Ecology

- 7.6.53 The proposed open cut watercourse crossing of the River Box could result in the temporary loss of approximately 80m of in-channel and riparian corridor habitat. This would be repeated at all other watercourses crossed by this open cut method. However, with the implementation of the good practice measures set out in the Outline CoCP the potential mortality and injury and disturbance effects on fish and freshwater macroinvertebrates are assessed as of **small** magnitude on receptors of **medium** value, resulting in a **minor** effect. Any impact upon aquatic ecology would be temporary and localised such that any adverse effect will be **not significant**.

- 7.6.54 As the crossing of the River Stour is via trenchless methods and the watercourse is to remain navigable there would be **no change** to aquatic species.

Bats

- 7.6.55 Essential vegetation clearance for construction of the underground cable section could result in the following impacts:

- loss of bat roosts if located in trees which require essential removal (survey of trees for bat roosting potential is ongoing);
- injury or mortality of bats should bats be present within trees requiring clearance without mitigation;
- permanent and temporary loss of foraging habitat (exact extent of habitat to be confirmed);
- permanent fragmentation of commuting routes – although the draft Order Limits may be up to 100m wide, hedgerow gaps would be limited to 50m. However, full reinstatement and replanting of hedgerow over the cable would not be possible;
- disturbance (from changes in noise, vibration, visual and light stimuli); and
- loss of roosting sites, foraging habitat or fragmentation of commuting routes due to artificial lighting.

- 7.6.56 The permanent and temporary woodland and hedgerow clearance necessary in the new underground cable sections, in the absence of further mitigation, is assessed as of **medium** magnitude on a receptor of **medium** value, resulting in a **moderate** effect. The loss of bat roosts, temporary and permanent loss of commuting and foraging habitat for bats and construction disturbance would give rise to a **significant** effect.

- 7.6.57 Injury or mortality of bats within trees to be cleared would be avoided with the implementation of method statements agreed with Natural England through the EPS licensing process and the effect would be **not significant**.

Breeding Birds and Raptors

7.6.58 The extent of permanent and temporary loss of woodland, hedgerow and suitable ground nesting habitats is yet to be defined but the impact of that habitat loss, killing and injury and disturbance to breeding birds is considered **small** in magnitude due to the limited species diversity present, the availability of alternative similar habitats in the immediate area and the good practice measures that limit vegetation clearance to outside of the bird breeding season (commitment B02) and the commitment to reinstatement habitats post work. The change to breeding birds and raptors outside of designated sites is assessed to be of **small** magnitude on a **low** value receptor. Following the implementation of good practice measures, the effect would be **minor** and **not significant**.

Hazel Dormouse

7.6.59 Essential vegetation clearance for construction of the underground cable sections could result in the following impacts on hazel dormouse:

- permanent and temporary loss of feeding and nesting habitat;
- injury or mortality of dormouse should they be present within vegetation requiring clearance without mitigation;
- permanent and temporary fragmentation of habitats – although the draft Order Limits may be up to 100m wide, hedgerow gaps would be limited to 50m and dead hedging would be used where suitable. Scrub would be permitted to re-establish in woodland areas and reinstatement and replanting of hedgerow over the cable may be possible in some areas; and
- disturbance (from changes in noise, vibration, visual and light stimuli).

7.6.60 The permanent and temporary woodland and hedgerow clearance necessary in the new underground cable sections, in the absence of further mitigation, is assessed as of **medium** magnitude on a receptor of **medium** value, resulting in a **moderate** effect. The permanent and temporary loss of feeding and nesting habitat, the fragmentation of woodland habitats and construction disturbance would give rise to a **significant** effect.

7.6.61 Injury or mortality of dormouse within woodland and hedgerows to be cleared would be avoided with the implementation of method statements agreed with Natural England through the EPS licensing process and the effect would be **not significant**.

Riparian mammals

7.6.62 The trenchless crossing of the River Stour would avoid direct impacts on the watercourse and its riparian habitats, thereby avoiding potential impacts on riparian mammals, but the potential for disturbance impacts remains. However, these would be temporary and limited in timescale. Measures in the Outline CoCP describe how connectivity and continuity of water flow would be maintained at all times.

7.6.63 The open cut crossing method, in-channel, proposed at the River Box and other smaller watercourses could cause the following impacts on riparian mammals:

- temporary loss of riparian habitat, including resting places, where watercourse crossings are required (potentially up to 85m wide but reduced to 50m where practicable);
- injury or mortality of individuals should they be present within resting places that are subsequently directly affected;
- temporary fragmentation or isolation of foraging, commuting and resting habitats; and

- disturbance from changes in noise, vibration, visual and light sources.

7.6.64 Bailey bridges for haul routes would be necessary at the River Box and River Stour.

7.6.65 The relatively wide working width required for installation of underground cables (approximately 100m) would result in temporary effects during construction. The temporary works in-channel and in riparian corridor habitat, in the absence of further mitigation, would result in an impact of **small** magnitude on a receptor of **medium** value, resulting in a **minor** effect. The habitat loss and watercourse fragmentation would be temporary and any adverse effect in the long term, post habitat reinstatement, would be **not significant**.

7.6.66 Injury or mortality of riparian mammals within watercourses and riparian habitats to be cleared would be avoided with the implementation of method statements agreed with Natural England through the protected species licensing process and the effect would be **not significant**.

Reptiles

7.6.67 Essential vegetation clearance could result in killing or injury of reptiles should they be present within the area to be cleared. Commitment B05 in the Outline CoCP details the approach to clearance of habitats suitable for reptiles that would avoid this potential impact through staged and directional clearance that persuade reptiles to naturally disperse into adjacent retained habitat, and ecological supervision. The impact of temporary habitat loss is considered to be of **negligible** magnitude due to the plentiful alternative unaffected habitat nearby. Therefore, there would be **neutral** effects on reptiles, which would be **not significant**.

Terrestrial Invertebrates

7.6.68 Should important or notable species or assemblage of terrestrial invertebrates be present in any suitable habitats within the underground cabling working areas, the short duration of the construction activity means an adverse effect to the conservation status of the assemblage is unlikely. The updated habitat survey will be used in conjunction with the desk study to make an assessment on likely significant effects within the ES. At this stage, it is assumed that the scale of any impact would be **negligible**, and the effect would be **neutral** and **not significant**.

Wintering Birds

7.6.69 The extent of temporary habitat loss for wintering birds is yet to be defined but the effect of that temporary loss in the overhead line sections during construction is considered negligible due to the limited species diversity present, the availability of similar unaffected habitat in the immediate vicinity and the commitment to reinstatement habitats post work. Therefore, there would be **negligible** impacts on the wintering bird assemblage, and the effect would be **neutral** and **not significant**.

Other Notable Species

7.6.70 Notable species will be present within the draft Order Limits at various densities depending on their specific habitat requirements and the quality of the habitat present. The updated habitat survey will be used to undertake a revised assessment of likely presence. If present, the potential impacts would relate to temporary and permanent habitat loss, killing and injury, and disturbance.

7.6.71 The short duration of the construction activity means an adverse effect to the conservation status of notable species is unlikely. Vegetation clearance methodologies to be agreed

with Natural England during the protected species licensing process and good practice measures set out within the Outline CoCP would be beneficial for other notable species, reducing the potential for killing and injury and disturbance. Therefore, there would be **negligible** impacts on other notable species, and temporary loss of habitat, potential mortality, and injury and disturbance effects would be **neutral** and **not significant**.

7.6.72 The permanent loss of habitat, particularly of woodland and hedgerow habitats, in the absence of any further mitigation, is assessed to be of **medium** magnitude on a **low** value receptor, resulting in a **minor** effect. This permanent loss of habitat would give rise to a limited degree of harm and any adverse effect would be **not significant**.

GSP Substation

Statutory Designated Sites

7.6.73 There are no pathways to effect on statutory designated sites from the construction of the GSP substation.

Non-Statutory Designated Sites

7.6.74 The GSP substation has a pathway to effect two non-statutory designated sites, both of which are also AWI sites. Waldegrave Wood LWS lies within the draft Order Limits and Butler’s Wood lies immediately adjacent to the draft Order Limits. These sites and the impacts are listed in Table 7.6.

7.6.75 Ancient woodland and veteran tree habitats are considered irreplaceable (**high** value), and any loss would be considered significant. However, both woodlands are bordered by a ditch in excess of 1m depth. The arboricultural survey concluded that the ditches create hydrological separation and enforce habitat separation between the woodlands and the adjacent arable land where the GSP substation is proposed. Together, these strengthen the likelihood of ancient woodland tree root zones being confined to woodland areas. Where any trimming of individual trees was necessary, this would be confined to the existing corridor. Therefore, the impact would be of **negligible** magnitude, resulting in a **neutral** effect, which would be **not significant**.

Table 7.6: Non-statutory Designated Sites with Possible Pathways to Effect at the GSP Substation

Site Name	Pathway to Effect	Preliminary Assessment in Absence of Mitigation	Value of Receptor	Magnitude of Impact	Significance (Significant in bold)
Waldegrave Wood LWS and AWI site	Permanent habitat loss	Approximately 0.45ha of this 8.9ha AWI site is located within the draft Order Limits. This is located within the existing swathe where minor trimming of the overhead line is already permitted.	High	Negligible	Neutral
Butler’s Wood LWS and AWI site	Indirect habitat damage	The draft Order Limits run adjacent to the southern boundary of Butler’s Wood LWS and AWI for a distance of c. 475m. However, a ditch separates the woodland which creates a barrier of tree root growth in to the proposed GSP construction area.	High	Negligible	Neutral

Habitats

- 7.6.76 No direct impacts on habitats of conservation value, including GWDTEs, are anticipated from the construction of the GSP substation, as the works are limited to arable and improved grassland habitats. Ancient woodlands are discussed above in relation to their concurrent non-statutory site designation.

Arable Plant Assemblage

- 7.6.77 The permanent loss of arable habitat from construction of the GSP substation is approximately 2.35ha. Additional arable habitat would be lost to post construction landscape planting. No species of arable plant interest have been recorded at this location in the desk study nor in the habitat survey undertaken in 2021. Therefore, there is no pathway to effect.

Watercourses and Aquatic Habitats

- 7.6.78 The nearest watercourse is a minor watercourse located approximately 350m southwest of the proposed GSP substation. Therefore, there is no pathway to effect on watercourses and aquatic habitats.

Aquatic Ecology

- 7.6.79 The nearest watercourse is a minor watercourse located approximately 350m southwest of the proposed GSP substation. Therefore, there is no pathway to effect on aquatic ecology from GSP substation construction.

Bats

- 7.6.80 The trees on either side of the GSP substation site may require trimming in order to maintain a safe working and long-term maintenance area, as is currently undertaken for maintenance works under the existing licence for the existing 400kV overhead line. Ground assessment of trees has identified a number of trees with bat roosting potential in Butler's Wood and Waldegrave Wood. It is possible that should bat roosts be confirmed as present, that some may be unavoidably lost or if retained, may be disturbed through construction activities (noise, vibration and artificial lightning, particularly from piling activities).
- 7.6.81 Initial tree climbing inspection and emergence/re-entry survey suggests no bat roosts are present indicating an absence of pathway to effect. Taking the precautionary approach to assessment, the potential loss or disturbance of bat roosts would be assessed as of **small** magnitude on a receptor of **medium** value, resulting in a **minor** effect. Any adverse effect would be **not significant**.
- 7.6.82 Injury or mortality of bats within trees to be cleared would be avoided with the implementation of method statements agreed with Natural England through the EPS licensing process and the effect would be **not significant**.

Breeding Birds and Raptors

- 7.6.83 Any essential vegetation trimming or clearance would be undertaken outside of the bird breeding season or under supervision following an inspection to confirm absence (e.g. B02 in the Outline CoCP), thereby avoiding potential mortality or injury effect. It is possible that construction activities may disturb breeding birds within the adjacent woodland habitats. This is assessed as of **small** magnitude on a **low** valued receptor, resulting in a **minor** effect. Any temporary disturbance would give rise to a limited degree of harm and would be **not significant**.

Hazel Dormouse

- 7.6.84 Any woodland or hedgerow vegetation trimming or clearance would be minor and not affect the availability or connectivity of habitat suitable for dormouse in the area. The potential loss or construction disturbance to hazel dormouse would be assessed as of **small** magnitude on a receptor of **medium** value, resulting in a **minor** effect that would be **not significant**.

Riparian mammals

- 7.6.85 There is no pathway to effect on riparian mammals from the construction of the GSP substation.

Reptiles

- 7.6.86 Reptiles are unlikely to be present within the arable field and associated habitats at the proposed GSP substation. However, a precautionary approach would be taken on the woodland edges, hedgerow and any rough grassland. Commitment B05 in the Outline CoCP details the approach to clearance of habitats suitable for reptiles to avoid any accidental killing or injury impact through staged and directional clearance that persuades reptiles to naturally disperse into adjacent retained habitat, and ecological supervision. The impact of habitat loss is considered to be of **negligible** magnitude due to the plentiful alternative unaffected habitat nearby. Therefore, there would be **neutral** effects on reptiles, which would be **not significant**.

Terrestrial Invertebrates

- 7.6.87 No protected or notable terrestrial invertebrate species or assemblages are likely to be present in the highly agricultural location where the GSP substation is proposed. Any impact would be **negligible**. Therefore, there would be **neutral** effects on terrestrial invertebrates, which would be **not significant**.

Wintering Birds

- 7.6.88 There is limited suitable wintering bird habitat present at the proposed GSP substation. Any habitat loss or disturbance effect would be **negligible**. Therefore, there would be **neutral** effects on wintering birds, which would be **not significant**.

Other Notable Species

- 7.6.89 Notable species will be present within the draft Order Limits at various densities depending on their specific habitat requirements and the quality of the habitat present. It is possible that species such as harvest mice and brown hare would be present within the arable habitats at this location. The potential impacts would relate to temporary habitat loss, killing and injury and disturbance. However, these effects are similar to those from the regular crop harvesting and agricultural activities at this location.
- 7.6.90 Vegetation clearance methodologies to be agreed with Natural England during the protected species licensing process and Outline CoCP measures designed to avoid impacts on protected species would also be beneficial for other notable species reducing the potential for killing and injury and disturbance. The potential impacts are assessed to be of **small** magnitude on a **low** value receptor, resulting in a **minor** effect which would be **not significant**.

Operation

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Statutory Designated Sites

- 7.6.91 The removal of the existing 132KV overhead line south of the Hintlesham Woods SSSI would remove approximately 4.9km of overhead line from the landscape, removing this as a potential collision feature for the breeding bird assemblage of the Hintlesham Woods SSSI. This change would give rise to a limited beneficial effect that will be **not significant**.
- 7.6.92 The removal of the existing 132KV overhead line would also remove a potential collision feature for bats which could be part of or contribute to the hibernation roosts at Little Blakenham Pits SSSI. The operational impact of the project is assessed as of **small** magnitude on a receptor of **high** value, resulting in a **minor beneficial** effect. This change would give rise to a limited beneficial effect that will be **not significant**.
- 7.6.93 No pathway to effect on other statutory designated sites has been identified.

Hintlesham Woods Option

- 7.6.94 As noted in Chapter 5: EIA Approach and Method, the preliminary assessment has considered the likely significant environmental effects for the two options at Hintlesham Woods. The overall summary for the preliminary assessment has shown that there are no significant operational impacts on biodiversity receptors anticipated for either option during operation. Where potential impacts have been identified, e.g. the new overhead line creating a potential collision feature for birds or bats, these have been assessed of similar magnitude in both options and **not significant** due to the new line being similar to the existing 400kV overhead line within this location.

Non-Statutory Designated Sites

- 7.6.95 No pathway to effect on non-statutory designated sites has been identified. Permanent loss of habitat within non-statutory designated sites is assessed in the construction phase and is not repeated here to avoid double counting.

Habitats and Arable Plant Assemblage

- 7.6.96 Once the construction areas have been reinstated there would be no pathway to effect on habitats or the arable plant assemblage in the operational phase.

Watercourses and Aquatic Habitats

- 7.6.97 There are no pathways to effects on watercourses and aquatic habitats from overhead line and associated infrastructure during operation.

Aquatic Ecology

- 7.6.98 There are no pathways to effects on aquatic ecology from overhead line and associated infrastructure during operation.

Bats

- 7.6.99 The presence of a new overhead line in the landscape could increase the risk of collision by bats resulting in injury or mortality. However, removal of the existing overhead line around Twinstead Tee in the west and at the far east of the route would remove that risk in those locations. Overall, the project will remove more overhead line than it will introduce. Taken together, there would be **negligible** impacts on bats, resulting in a **neutral** effect that is **not significant**.

Breeding Birds and Raptors

- 7.6.100 The potential bird collision risk with pylon and overhead wire infrastructure has been assessed as specified in NPS EN-5 planning policy. The presence of a new overhead line in the landscape could increase the risk of collision by birds resulting in injury or mortality. However, the embedded measures of removal of the existing 132kV overhead line between Burstall Bridge and Twinstead Tee and also removal of a section of the 400kV overhead line to the south of Twinstead, would remove that risk in those locations. Overall, the project will remove more overhead line than it will introduce, including one less overhead line in Section E: Dedham Vale AONB and parts of Section G: Stour Valley, effectively reducing the risk of collision.
- 7.6.101 The new 400kV overhead line will be higher than the existing 132kV overhead line, with pylons c.50m compared to the existing 30m. However, the new 400kV overhead line will be at the same height to the existing retained parallel 400kV overhead line, so there is unlikely to be any additional risk of collision.
- 7.6.102 Taken together, there would be **negligible** impacts on breeding birds and raptors, resulting in a **neutral** effect that would be **not significant**.

Hazel Dormouse

- 7.6.103 There are no pathways to effects on hazel dormouse from overhead line and associated infrastructure during operation.

Riparian mammals

- 7.6.104 There are no pathways to effects on riparian mammals from overhead line and associated infrastructure during operation.

Reptiles

- 7.6.105 There are no pathways to effects on reptiles from overhead line and associated infrastructure during operation.

Terrestrial Invertebrates

- 7.6.106 There are no pathways to effects on terrestrial invertebrates from overhead line and associated infrastructure during operation.

Wintering Birds

- 7.6.107 The presence of a new overhead line in the landscape could increase the risk of collision by birds resulting in injury or mortality. However, removal of the existing overhead line around Twinstead Tee in the west and at the far east of the route would remove that risk in those locations. Overall, the project will remove more overhead line than it will introduce. Taken together, there would be **negligible** impacts on wintering birds, resulting in a **neutral** effect that would be **not significant**.

Other Notable Species

- 7.6.108 There are no pathways to effects on other notable species from overhead line and associated infrastructure during operation.

Underground Cables

Statutory Designated Sites

- 7.6.109 No pathway to effect on statutory designated sites has been identified.

Non-Statutory Designated Sites

7.6.110 The following non-statutory designated sites have been identified as GWDTE and could be affected by the presence of deep underground features such as at the trenchless crossing and the underground cables:

- Alphamstone Complex LWS; and
- Moat Farm/Burnt House Marsh LWS.

7.6.111 The preliminary assessment presented in Chapter 10: Geology and Hydrogeology, states that with good practice measures in place that there is likely to be a **negligible** magnitude and a **neutral** effect on groundwater receptors (including GWDTE), which would be **not significant**.

Habitats and Arable Plant Assemblage

7.6.112 The temporary and permanent loss of habitats is assessed as part of the construction phase of the project. There are no pathways to effects on habitats and the arable plant assemblage from underground cables during operation (GWDTE are discussed above).

Watercourses and Aquatic Habitats

7.6.113 There are no pathways to effects on watercourses and aquatic habitats from underground cables during operation.

Aquatic Ecology

7.6.114 There are no pathways to effects on aquatic ecology from underground cables during operation.

Bats

7.6.115 The removal of existing overhead line in the underground cable sections will remove features where bat collisions could occur resulting in killing or injury. The operational impact on bats is assessed as **small** magnitude on a receptor of **medium** value, resulting in a **minor beneficial** effect, which would be **not significant**.

Breeding Birds and Raptors

7.6.116 The removal of existing overhead line in the underground cable sections will remove features where bird collisions could occur resulting in killing or injury. The operational impact on breeding birds and raptors is assessed as **small** magnitude on a receptor of **low** value, resulting in a **minor beneficial** effect, which would be **not significant**.

Hazel Dormouse

7.6.117 There are no pathways to effects on hazel dormouse from underground cables during operation.

Riparian mammals

7.6.118 There are no pathways to effects on riparian mammals from underground cables during operation.

Reptiles

7.6.119 There are no pathways to effects on reptiles from underground cables during operation.

Terrestrial Invertebrates

7.6.120 There are no pathways to effects on terrestrial invertebrates from underground cables during operation.

Wintering Birds

7.6.121 The removal of existing overhead line in the underground cable sections will remove features where bird collisions could occur resulting in killing or injury. The operational impact on wintering birds is assessed as **small** magnitude on a receptor of **low** value, resulting in a **minor beneficial** effect, which would be **not significant**.

Other Notable Species

7.6.122 There are no pathways to effects on other notable species from underground cables during operation.

GSP Substation

Statutory Designated Sites

7.6.123 There are no pathways to effect on statutory designated sites from the operation and maintenance of the GSP substation.

Non-Statutory Designated Sites

7.6.124 There are no pathways to effect on non-statutory designated sites from the operation and maintenance of the GSP substation.

Habitats and Arable Plant Assemblage

7.6.125 There are no pathways to effect on habitats or arable plant assemblages from GSP substation operation or necessary maintenance activities.

Watercourses and Aquatic Habitats

7.6.126 There are no pathways to effect on watercourses and aquatic habitats from GSP substation operation. The nearest watercourse is a minor watercourse located approximately 350m southwest of the proposed GSP substation.

Aquatic Ecology

7.6.127 There are no significant effects on aquatic ecology from GSP operation or maintenance, as there is no discharge to surface waters; the nearest watercourse being a minor watercourse located approximately 350m southwest of the proposed GSP substation.

Bats

7.6.128 Noise generated from the operational GSP substation and from ad hoc maintenance could cause disturbance effects on bats roosting in trees in the adjacent woodlands or commuting nearby. However, the GSP substation has embedded noise suppression in its design and maintenance disturbance would be short term. As such, there would be **negligible** disturbance impacts on roosting or commuting bats, resulting in a **neutral** effect that would be **not significant**.

7.6.129 Artificial lighting would only be required in emergency situations and would have **negligible** impacts on roosting and commuting bats, resulting in a **neutral** effect that would be **not significant**.

Breeding Birds and Raptors

7.6.130 There are no pathways to effects on breeding birds and raptors from GSP substation operation or from its maintenance activities.

Hazel Dormouse

7.6.131 Noise generated from the operational GSP substation could cause disturbance effects on dormouse. However, the GSP substation has embedded noise suppression in its design

and maintenance disturbance would be short term. As such there would be **negligible** impact on dormouse, resulting in a **neutral** effect that would be **not significant**.

7.6.132 Artificial lighting would only be required in limited situations. This would have **negligible** impacts on hazel dormouse, resulting in a **neutral** effect that would be **not significant**.

Riparian mammals

7.6.133 There is no pathway to effect on riparian mammals from GSP substation operation or maintenance activities.

Reptiles

7.6.134 There is no pathway to effect on reptiles from GSP substation operation or maintenance activities.

Terrestrial Invertebrates

7.6.135 There is no pathway to effects on terrestrial invertebrates from GSP substation operation or maintenance activities.

Wintering Birds

7.6.136 There is no pathway to effects on wintering birds from GSP substation operation or maintenance activities.

Other Notable Species

7.6.137 There is no pathway to effects on other notable species from GSP substation operation or maintenance activities.

Summary of Construction Effects

7.6.138 Although the potential impacts on biodiversity receptors are similar for the different aspects of the project, the extent and magnitude of those in the underground cable sections are higher than for the overhead line section and GSP substation. This is primarily due to the larger working area required to install the cables. Due to the requirement for permanent vegetation clearance, particularly of woodland swathes up to 45m wide in the overhead line sections and 80m in the underground cable sections, there are subsequent additional significant effects on bats and hazel dormouse. Potential effects would be reduced in areas where vegetation can be retained and reinstatement is possible. Further details will be set out within the ES.

7.6.139 The loss of or damage to ancient woodland habitat is a significant effect at any scale. Although the scale of impact would be relatively minor in comparison to that retained in the local landscape, as an irreplaceable habitat, any loss or damage cannot be mitigated, only compensated. Further details will be set out within the ES.

Summary of Operational Effects

7.6.140 There are limited pathways from operational effects, including ongoing maintenance, of the project on biodiversity receptors.

7.6.141 Beneficial effects include the removal of overhead lines in some sections, removing these potential collision features from the landscape. These are unlikely to be significant.

7.7 Sensitivity Testing

Flexibility in Construction Programme

- 7.7.1 This chapter assumes the base construction programme described in Chapter 4: Project Description for the purposes of the assessment. Seasonal constraints to vegetation clearance and works to avoid effects on biodiversity receptors are included in the good practice measures in the Outline CoCP. As such, sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be no new or different likely significant effects to those identified in the baseline scenario assessed in Section 7.6.

Flexibility in Design

- 7.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD. This sensitivity testing has shown that, while specific assessment of individual receptors may change, e.g. the working area within a non-statutory designated site or habitat, there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

7.8 Proposed Mitigation

- 7.8.1 This section sets out the proposed mitigation for the likely significant effects outlined in the previous section. These mitigation measures are additional to the relevant embedded measures in Chapter 4: Project Description, the good practice measures outlined within Appendix 4.1: Outline CoCP, and the reinstatement of vegetation within the draft Order Limits, unless restrictions apply (e.g. in the easement corridor of the underground cable).
- 7.8.2 There are no likely significant effects expected in relation to watercourses, aquatic habitats nor aquatic species. Therefore, no mitigation measures have been identified for these aspects.

Construction

- 7.8.3 It is assumed that woodland gaps and hedgerows currently beneath the existing 132kV and 400kV overhead lines that would be removed would be planted up or left to naturally regenerate.
- 7.8.4 There is the potential for ancient woodland loss or indirect effects due to the disturbance of the root zone, as anticipated in all the aspects of this project, and this cannot be mitigated against. Further work will be undertaken during the ongoing design work to seek buffer zones away from the edges of ancient (and potential ancient) woodland and to protect the rootzone, where practicable. Where this is not practicable, the Outline LEMP will identify further mitigation measures to protect the rootzone, which may include measures set out within the Standing Advice (Forestry Commission and Natural England, 2018) such as protective matting or hand digging.
- 7.8.5 The draft Order Limits also include additional areas for additional woodland planting, to compensate for woodland lost and for enhancement and management of existing and retained features, where this would benefit the existing habitat.

- 7.8.6 Species-specific mitigation is needed over and above the reinstatement of the habitats temporarily lost in the underground cable sections that support bats, dormouse and riparian mammals. This is likely to include:
- provision of bat roost boxes and dormouse nest boxes;
 - management and enhancement of retained habitats; and
 - additional habitat creation such as woodland and scrub planting.

Operation

- 7.8.7 The preliminary assessment has concluded that there are no likely significant effects in relation to biodiversity receptors during operation. Therefore, no mitigation measures have been identified beyond the good practice measures set out in Appendix 4.1: Outline CoCP.

7.9 Residual Significant Effects (With Mitigation)

- 7.9.1 Table 7.7 summarises the likely significant effects, proposed mitigation and residual effects for biodiversity. Residual significant effects are shown in bold.

Table 7.7: Summary of Likely Significant Effects

Aspect	Likely Significant Effect (Without Mitigation)	Proposed Mitigation	Residual Significant Effect (With Mitigation)
Construction			
All sections: Loss of Lowland broadleaved deciduous woodland	Long-term moderate adverse	Reduce working area where practicable. Otherwise, mitigation planting and enhancement of retained habitats within the site.	Long-term minor adverse
All sections: Loss of bat roosts and loss of foraging and commuting habitats; and disturbance, including at Little Blakenham Pit SSSI.	Long-term moderate adverse	Provision of bat boxes in retained trees. Mitigation planting (including linking existing habitats) and enhancement of retained habitats within the site.	Long-term minor adverse
All sections: Loss of hazel dormouse nesting and feeding habitat; and fragmentation of woodland habitats	Long-term moderate adverse	Provision of dormouse nest boxes. Mitigation planting (including linking existing habitats) and enhancement of retained habitats within the site.	Long-term minor adverse
Permanent and temporary loss of ancient woodland habitat at Hintlesham Woods SSSI (and impact on interest features).	Long-term moderate adverse	Option 1: Work within the existing maintained easement. Option 2: No mitigation. Detailed working method would be prepared to set out how to reduce effects on ancient woodland soil and surrounding features.	Option 1: Neutral Option 2: Long-term moderate adverse

Aspect	Likely Significant Effect (Without Mitigation)	Proposed Mitigation	Residual Significant Effect (With Mitigation)
		Compensation woodland planting and enhancement of retained woodland.	
Overhead lines: Disturbance to breeding birds at Hintlesham Woods SSSI.	Option 1: short-term moderate adverse Option 2: Neutral	Option 1 and 2: Seasonal restriction on construction works to avoid bird breeding season where practicable.	Option 1: short-term moderate adverse Option 2: Neutral
Overhead lines: Disturbance to bats at Hintlesham Woods SSSI.	Option 1: Neutral Option 2: Long-term moderate adverse	Option 1: Work within the existing maintained easement. Option 2: Provide bat boxes. Additional woodland planting and enhancement of retained habitats within the site.	Option 1: Neutral Option 2: Long-term moderate adverse
Overhead lines: Disturbance to dormouse at Hintlesham Woods SSSI.	Option 1: Neutral Option 2: Long-term moderate adverse	Option 1: Work within the existing maintained easement. Option 2: Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Option 1: Neutral Option 2: Long-term moderate adverse
Overhead line: Damage to ancient woodland habitat at Tom's/Broadoak Wood CWS and AWI site.	Long-term moderate adverse	Establish 15m exclusion zone around woodland during design work. Where this is not practicable, identify specific measures when working in 15m exclusion zone to avoid tree roots.	Long-term neutral
Overhead line: Temporary habitat loss at Twinstead Marsh LWS.	Short-term moderate adverse	Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Short-term minor adverse
Overhead line: Loss of woodland habitat at Valley Farm Wood CWS.	Long-term moderate adverse	Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Long-term minor adverse
Underground cables: Permanent and temporary habitat loss (Alphamstone Complex LWS and Moats Farm/ Burnt House Marsh LWS).	Long-term moderate adverse	Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Long-term minor adverse
Underground cables: Loss of potential ancient woodland habitat within draft Order Limits.	Long-term moderate adverse	No mitigation. Compensation woodland planting and enhancement of retained woodland.	Long-term moderate adverse

Aspect	Likely Significant Effect (Without Mitigation)	Proposed Mitigation	Residual Significant Effect (With Mitigation)
Underground cables: Working within the rootzone of ancient woodland (e.g. Millfield Wood CWS; Broom Hill CWS).	Long-term moderate adverse	Establish 15m exclusion zone around woodland during design work. Where this is not practicable, identify specific measures when working in 15m exclusion zone to avoid tree roots.	Long-term neutral

7.10 Conclusion

- 7.10.1 The identified residual likely significant effects on biodiversity receptors from the project during construction are mainly related to habitat loss. While habitat reinstatement post-construction would replace those habitats temporarily lost, meaning there would be no long term significant effects for these, some of the woodland habitats cannot be replaced due to statutory safety clearances regarding the planting of trees within the swathe, resulting in residual adverse significant effects. In addition, the loss of ancient woodland cannot be mitigated, as this is considered irreplaceable habitat: *'once lost it cannot be recreated'* (paragraph 5.3.14 of NPS EN-1). A residual significant effect will result.
- 7.10.2 The preliminary assessment has concluded that there are no likely significant residual effects in relation to biodiversity during operation.

8. HISTORIC ENVIRONMENT

8.1 Introduction

- 8.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on the historic environment. The chapter uses the term heritage asset, as used within NPS EN-1. Heritage assets can be designated or non-designated. Paragraph 5.8.3 of NPS EN-1 identifies the following categories of designated heritage assets: *'World Heritage Site; Scheduled Monument; Protected Wreck Site; Protected Military Remains; Listed Building; Registered Park and Garden; Registered Battlefield; Conservation Area; and Registered Historic Landscape (Wales only)'*.
- 8.1.2 Heritage assets considered within this chapter comprise the following:
- Archaeological remains: the material remains of human activity from the earliest periods of human evolution to the present. These may be buried traces of human activities, sites visible above ground or moveable artefacts.
 - Built heritage: architectural, designed or other structures with a significant historical value. These are predominantly historic buildings but may include structures that have no aesthetic appeal or structures not usually thought of as buildings, such as milestones or bridges, and also incorporates defined groups of buildings (such as conservation areas).
 - Historic landscapes: the current landscape, whose character is the result of the action and interaction of natural and/or human factors. This includes elements such as historic hedgerows which are regarded as landscape sub-elements and protected lanes in Essex.
- 8.1.3 The project could have a physical effect on heritage assets through damage to, or complete removal of, archaeological remains and historic landscape elements during construction. The potential for physical impacts on historic buildings is not anticipated but will also be assessed in subsequent stages.
- 8.1.4 All heritage assets (designated and non-designated) including buried remains have a setting, which is defined as the surroundings in which a heritage asset is experienced. The extent of the setting of a heritage asset is not fixed and may change as the asset and its surroundings evolve (MHCLG, 2021). The project has the ability to change how heritage assets are perceived through impacts to their setting during both construction and operation. The value of a heritage asset can be affected by impacts on setting.
- 8.1.5 This chapter has links with other topic chapters, in particular Chapter 6: Landscape and Visual. It also has links to Chapter 10: Geology and Hydrogeology, Chapter 12: Traffic and Transport, Chapter 13: Air Quality, and Chapter 14: Noise and Vibration, as each of these topics inform on the potential for physical or setting impacts on heritage assets.
- 8.1.6 This chapter is supported by the following appendices and figures:
- Appendix 8.1: Historic Environment Baseline;
 - Appendix 8.2: Archaeological Framework Strategy;
 - Figure 8.1: Designated Heritage Assets and Protected Lanes; and
 - Figure 8.2: Non-designated Heritage Assets.

8.2 Regulatory and Planning Policy Context

National Policy Statement

- 8.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on the historic environment which has been considered within this chapter.
- 8.2.2 Paragraph 5.8.12 of NPS EN-1 states, *‘In considering the impact of a proposed development on any heritage assets, the IPC should take into account the particular nature of the significance of the heritage assets and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between conservation of that significance and proposals for development’.*
- 8.2.3 Paragraph 5.8.14 of NPS EN-1 states, *‘There should be a presumption in favour of the conservation of designated heritage assets and the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be. ... Substantial harm to or loss of designated assets of the highest significance, including ... grade I and II* listed buildings; grade I and II* registered parks and gardens ... should be wholly exceptional’.*

Other Relevant Policy

- 8.2.4 Appendix 2.1: Local Planning Policy lists the local policy relevant to the historic environment. The Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP21 and Braintree District Council Local Plan (2017) Policy LPP46, LPP 50, LPP 56 and LPP 60 all protect heritage assets including listed buildings, conservation areas and protected lanes. In addition, Braintree District Council Local Plan (2017) Policy LPP 63 outlines that archaeological evaluations will be required where important archaeological remains are thought to be at risk.

8.3 Scoping Opinion

- 8.3.1 The scope of the assessment for the historic environment has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees and is summarised in Table 8.1.
- 8.3.2 Table 8.1 includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 8.1: Summary of Aspects Scoped In/Out Based on the Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction and Operation			
Designated built heritage	Physical effects (direct damage	Scoped out	(ID 4.3.2) The Inspectorate agrees that this matter can be scoped out of the ES on the

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
	and/or destruction) during construction and operation		basis that there will be no direct impacts on historic buildings. It is noted that indirect physical effects to historic buildings during construction, including from vibration and changes to groundwater levels are scoped in to the ES.
Designated historic landscapes (i.e. registered parks and gardens)	Physical effects (direct damage and/or destruction) during construction and operation	Scoped out	(ID 4.3.3) On the basis that there are no designated historic landscape elements within 2km of the Scoping Boundary, the Inspectorate agrees that it is unlikely that direct physical effects will occur on Registered Parks and Gardens, this matter can therefore be scoped out of the ES.

Construction

Designated archaeological remains	Physical effects (direct damage and/or destruction) to designated archaeological remains	Scoped out	(ID 4.3.5) The Inspectorate considers that although the precise alignment is not yet defined, that as there are no designated archaeological sites within the Scoping Boundary that significant effects from damage or destruction are unlikely to occur. The Inspectorate therefore agrees that this matter can be scoped out of the ES.
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Operation

Designated and non-designated archaeological remains	Physical effects on archaeological remains during operation	Scoped out	(ID 4.3.1) As there would be limited need for sub-surface excavation and that this is likely to only affect ground previously disturbed, the Inspectorate agrees that this matter can be scoped out of the assessment.
Non-designated historic landscapes	Physical effects (direct damage and/or destruction) during operation	Scoped out	(ID 4.3.4) On the basis that the physical effects of installation of the project and setting impacts are scoped in to the ES, the Inspectorate agrees that physical effects on non-designated historic landscapes can be scoped out of the ES, aside from where there is permanent loss of vegetation or other features that contribute to the historic landscape character arising from maintenance and decommissioning activity for the project. This matter should be scoped in to the ES where significant effects are likely to occur.

- 8.3.3 Non-designated built heritage was scoped out for physical effects (see ID 4.3.2 in Table 8.1). One non-designated historic building included within the HER has since been identified within the draft Order Limits and this receptor has therefore been scoped back into the assessment to allow consideration of any likely significant effects.
- 8.3.4 Table 8.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 8.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
<p>(ID 4.3.6) The Applicant should ensure that the ES demonstrates the sources of data that informed the assessment and where the desk study has been updated to ensure that an accurate baseline position is presented. The ES should also describe any limitations on the use of those data and any gaps in coverage, including differences between the study areas used.</p> <p>It is noted that aerial photographic report is dated and should be updated with use of new aerial coverage; consideration should be given to the use of Lidar.</p> <p>A description of the Grade II listed buildings and any non-designated features of historic, architectural, archaeological or artistic interest within the final study area should also be presented in the ES.</p>	<p>National Grid updated the desk-based data (for example requesting the HER data) in 2021. This is being supplemented by additional survey data including geophysical survey and an updated archaeological Aerial Investigation and Mapping survey (including Lidar). See Section 8.5 and Appendix 8.2: Archaeological Framework Strategy for further details.</p> <p>A description of the grade II listed buildings and any non-designated features of historic, architectural, archaeological or artistic interest within the final study area will be presented in the ES.</p>
<p>(ID 4.3.7). The ES should include a figure showing the location and extent of the Historic Landscape Types (HLT) and confirm any individual receptors located within them that will be subject to assessment. This should include consideration of direct physical impacts to receptors where these would give rise to likely significant effects, for example any realignment of protected lanes to accommodation construction traffic.</p>	<p>National Grid will be undertaking targeted walkover surveys to identify landscape elements which will form part of the impact assessment for that HLT.</p> <p>The ES will include a figure showing the location and extent of HLT, including protected lanes, and any specific landscape elements to be assessed, e.g. historically important hedgerows. The ES will also include an assessment of the potential for physical impacts to HLT.</p> <p>A preliminary assessment of the potential for significant effects, including physical impact, on HLT is presented within Section 8.6.</p>
<p>(ID 4.3.8) The Applicant's Scoping Report notes that a CoCP will contain good practice measures such as informing the local planning authority in the event of unexpected archaeological discoveries. The Inspectorate considers that the CoCP should also set out the processes that will be followed by the contractor in the event of unexpected archaeological discoveries, such as a commitment to halting work.</p>	<p>Commitment H02 in Appendix 4.1: Outline CoCP has been updated to reflect the Planning Inspectorate comment.</p> <p>Appendix 8.2: Archaeological Framework Strategy sets out the proposed approach for managing archaeological risk, including the measures to be taken in the event of unexpected archaeological discoveries.</p>
<p>(ID 4.3.9) As part of the assessment of archaeological remains, the ES should include consideration of the</p>	<p>A Palaeoenvironmental and Geoarchaeological Survey Report is being</p>

Matter Raised in the Scoping Opinion	Project Response
<p>potential effects of excavation on palaeoenvironmental and geoarchaeological deposits along the length of the route, including a review of borehole logs to determine the depth of deposits.</p>	<p>prepared for the project. This will present the baseline assessment on palaeoenvironmental and geoarchaeological deposits. The ES will present an assessment on the potential effects of the project on these deposits.</p>
<p>(ID 4.3.10) The Inspectorate considers that the ZTV, prepared for the LVIA, should be used to inform the extent of the study area to ensure that all heritage assets with potential for likely significant effects to setting are scoped into the assessment, including unknown non-designated heritage assets.</p> <p>The Inspectorate considers that there will be a requirement for visualisations to demonstrate the impact to the setting of historic buildings e.g. Hintlesham Hall and associated Grade II* buildings, and landscape types. The approach to selection of viewpoints should be discussed and agreed with relevant consultation bodies.</p>	<p>The ZTV is being used to support the extent of the study area and to inform the assessment on the setting of heritage assets. All viewpoints (including those identified for heritage purposes such as Hintlesham Hall) will be presented within the ES, and the list of viewpoints will be agreed with the relevant consultation bodies (Historic England and the historic environment advisors at the local planning authorities). The ES will include wireframe visualisations to inform the assessment of likely significant effects on setting.</p>
<p>(ID 4.3.11) The Applicant's Scoping Report indicates that deeper excavations have potential to affect paleoenvironmental and geoarchaeological deposits. The ES should clearly set out the methodology that will be used to assess potentially significant effects on all areas where there is potential to encounter paleoenvironmental and geoarchaeological deposits, with reference to appropriate policy and technical guidance.</p>	<p>A Palaeoenvironmental and Geoarchaeological Survey Report is being prepared which will present the findings of the baseline assessment on such deposits. The ES will present the methodology that will be used to assess potentially significant effects on all areas where there is potential to encounter such deposits, with reference to appropriate policy and technical guidance. The ES will also present an assessment on the potential effects of excavation on paleoenvironmental and geoarchaeological deposits.</p>
<p>(ID 4.3.12) The Scoping Report indicates that where desk based or non-intrusive surveys are insufficient to determine the archaeological potential of a particular location, that intrusive pre-construction surveys will be carried out. The Inspectorate considers that there may also be a need to carry out intrusive surveys, including trial trenching particularly for sections of proposed undergrounding, in order to inform the assessment of effects in the ES and the need for such surveys should be agreed through consultation with the relevant consultation bodies.</p>	<p>Appendix 8.2: Archaeological Framework Strategy sets out the proposed approach for the preconstruction surveys. National Grid is seeking to agree the Archaeological Framework Strategy with the relevant consultation bodies.</p> <p>National Grid is intending to start the intrusive surveys in advance of the application for development consent. The results from this survey will inform the assessment presented within the ES.</p>
<p>ID 4.3.13) The Inspectorate notes that the designated Polstead Conservation Area is located adjacent to one of the potential locations for a CSE compound, at the edge</p>	<p>The location of the CSE compound at Dedham Vale East has been relocated further east (approximately 1km away from</p>

Matter Raised in the Scoping Opinion	Project Response
of Dollops Wood. Dollops Wood and the surrounding farmland contribute towards the significance of the Polstead Conservation Area. The ES should include an assessment of the effects to the setting of the Polstead Conservation Area in addition to designated buildings.	the conservation area and Dollops Wood) in response to consultation feedback (see Chapter 4: Project Description for details). Having reviewed the position, given the distance between the proposed CSE compound and the Conservation Area there is no likelihood of significant effects.

Project Engagement

- 8.3.5 National Grid has held a number of meetings with relevant organisations, including Historic England, which has included discussions regarding the potential effects at Hintlesham Hall and the proposed mitigation at this location. There have also been discussions with Essex County Council and Suffolk County Council to discuss the approach to archaeological evaluation and mitigation, and these discussions have informed the development of the Archaeological Framework Strategy (Appendix 8.2). Further details can be found in Chapter 3: Scoping Opinion and Consultation.

8.4 Approach and Methods

- 8.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on the historic environment. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the EIA.

Data Sources

- 8.4.2 The baseline has been informed by a desk study which has drawn on the following key information sources:
- National Heritage List for England (NHLE) for information on nationally designated heritage assets, including World Heritage Sites, listed buildings, registered battlefields, registered parks and gardens, and scheduled monuments (Historic England, 2021);
 - Essex Historic Environment Record (EHER) for information on known heritage assets in Essex, mapped cropmarks which are either related to HER monument data or indicative of further potential sites, and data from the Essex Historic Landscape Characterisation Project (Dyson-Bruce and Bennet, 2013b);
 - Suffolk Historic Environment Record (SHER) for information on known heritage assets in Suffolk, national mapping programme data for the area, and data from the Suffolk Historic Landscape Characterisation Project (Suffolk County Council Archaeological Service, 2012);
 - Portable Antiquities Scheme data, provided by both Essex and Suffolk under condition of confidentiality;
 - Braintree, Babergh, and Mid Suffolk District Councils for information on conservation areas, locally listed buildings, and other locally designated sites, including protected lanes within Essex; and

- technical reports, drawings and previous historic environment assessments for the project, including reports for aerial investigation and mapping (Essex County Council, 2012; 2021b), geophysical survey (Bartlett-Clark Consultancy, 2013), and a watching brief conducted during ground investigations (Oxford Archaeology East, 2013).

Site Survey

- 8.4.3 The desk study has been supported by the archaeological geophysical survey undertaken for the 2013 underground cable route (Bartlett-Clark Consultancy, 2013). National Grid is currently undertaking further archaeological geophysical surveys at the GSP substation, CSE compounds, the main construction compound, and other large areas of proposed underground cables, that were not covered by the 2013 survey.
- 8.4.4 The desk study has also been supported by initial site inspections in June 2021 to some of the key heritage receptors situated in Hintlesham and Burstall. A field reconnaissance walkover will also be undertaken. The purpose of these visits is to view the heritage assets and get a better understanding of their condition and settings, and to be able to assess the potential for impact and potential options for mitigation. Further targeted site inspections are planned for other key heritage receptors where professional judgement indicates that there is the potential for significant effects or a need to confirm that there would be no significant effects.

Study Area

- 8.4.5 Two study areas have been used to establish the baseline environment:
- a 250m study area; and
 - a 3km study area.
- 8.4.6 The 250m study area is defined as the area contained within the draft Order Limits plus a 250m area surrounding this in all directions. This study area has been used to identify heritage assets that could be physically affected by the project and heritage assets (both designated and non-designated) that may experience significant impacts to their setting. This study area is considered to be sufficient to identify heritage assets known to be situated, or which may extend to, within the footprint of the project and to assess the potential for further unknown heritage assets which may be present. This is considered an appropriate study area based on technical knowledge of similar projects and accepted good practice. The 250m study area is shown on Figures 8.1 and 8.2.
- 8.4.7 A wider study area has been identified for potential significant effects on designated heritage assets as a result of development within their settings due to the higher sensitivity attributed to these assets. The draft ZTV (see Chapter 6: Landscape and Visual and Figures 6.7 to 6.13) has been used to undertake a preliminary assessment (in line with 'Step 1' of Historic England (2017)) for designated heritage assets situated up to 5km from the draft Order Limits.
- 8.4.8 This preliminary assessment has established that no significant effects are likely to result from the project on designated heritage assets situated beyond 3km from the draft Order Limits. Therefore, a 3km study area has been designed which extends from the limit of the 250m study area up to 3km in all directions from the draft Order Limits. This 3km study area is considered more than adequate to cover designated heritage assets where there is the potential for significant impacts from the project as a result of development within their settings.

8.4.9 The 3km study area is also used for non-designated protected lane Historic Landscape Types (HLTs). These are historic lanes within Essex which are protected within local planning policy. The 3km study area has been used for protected lane HLTs, as physical and setting impacts could be present beyond the extent of the 250m study area due to potential changes in traffic flows on the local road network. The 3km study area is shown on Figure 8.1

Assessment Methodology

8.4.10 This PEI Report is based on an EIA matrix approach to the assessment in order to establish an understanding of potential impacts. The level of assessment is currently proportionate to this stage of the project. More detailed assessment will be included in the ES, which will more explicitly set out what matters and why (IEMA, 2021) in terms of the heritage assets' significance and setting, together with the effects (including both beneficial and adverse effects) of the project upon them.

8.4.11 The assessment is based on guidance set out in DMRB LA 104 Environmental Assessment and Monitoring (Highways England *et al.*, 2020b) and DMRB LA 106 Cultural Heritage Assessment (Highways England *et al.*, 2020c), and guided by Conservation Principles (Historic England, 2008), Statements of Heritage Significance (Historic England, 2019), Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeology, 2014, updated 2020), Principles of Cultural Heritage Impact Assessment in the UK (IEMA, 2021), and professional judgement.

8.4.12 The contribution of setting to the value of heritage assets has been preliminarily assessed in accordance with the guidance provided in the Historic Environment Good Practice Advice Planning Note 3: The Setting of Heritage Assets (Historic England, 2017). The baseline setting assessment will be informed through a combination of desk-based assessment, online mapping and aerial imagery, the LVIA, including wirelines and photomontages, and targeted site inspections.

8.4.13 Significance has been derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects in the context of the EIA Regulations 2017 are effects assessed to be of moderate or greater significance.

Preliminary Assessment Key Parameters and Assumptions

8.4.14 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.

8.4.15 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.

8.4.16 The preliminary assessment assumes that all areas within the draft Order Limits could be disturbed by excavation, as specific pylon locations are not defined. It also assumes that all features and vegetation that are removed during construction would be reinstated, except where there are planting restrictions associated with the land rights.

Further Assessment Within the ES

8.4.17 This PEI Report provides a preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. The ES will include the results of the geophysical survey and the first phase of trial trenching, which will inform the baseline assessment presented in the ES along with updated desk-based assessment and results of other surveys such as the watching brief during the ground investigations.

8.5 Existing Baseline

Baseline Environment

Designated Heritage Assets

Archaeological Remains

8.5.1 There are 17 scheduled monuments within the 3km study area. These are outlined in Appendix 8.1: Historic Environment Baseline and shown in Figure 8.1.

8.5.2 There is one scheduled monument within the 250m study area, comprising the medieval 'Moated Site at Moat Farm, 450m south of Cobbler's Corner' (NHLE 1019889). This is situated approximately 180m from the draft Order Limits in Section AB: Bramford Substation/Hintlesham.

8.5.3 As indicated by their designated status, all scheduled monuments are of national significance and have been assessed to be of high value.

Built Heritage

8.5.4 There are 1,203 built heritage assets identified within the study area. These are outlined in Appendix 8.1: Historic Environment Baseline, shown in Figure 8.1 and summarised in Table 8.3.

Table 8.3: Summary of Designated Built Heritage

Receptor	Grade	Within the 250m Study Area	Within the 3km Study Area	Total Number
Listed buildings	I	2	26	28
	II*	3	58	61
	II	86	1,019	1,105
Conservation areas		0	9	9
Total number		91	1,112	1,203

8.5.5 The listed buildings within the baseline are predominantly:

- residential, rural or semi-rural buildings such as manor houses, cottages, farmhouses, and outbuildings which date to between the 16th and 19th centuries;
- parish churches, many of which have foundations dating to the medieval or early medieval periods;
- public buildings such as village halls, inns, public houses, post offices;
- street furniture such as telephone boxes and milestones; and

- public monuments such as war memorials.
- 8.5.6 As rural and semi-rural structures, these listed buildings are dispersed across the study area and wider study area as individual structures, isolated small groups, or in larger groupings within villages and towns, often demarcated by conservation areas.
- 8.5.7 There are no conservation areas within the 250m study area and nine within the 3km study area. The conservation areas which are situated nearest to the draft Order Limits comprise:
- Polstead, which is situated approximately 350m south of draft Order Limits in Section E: Dedham Vale AONB;
 - Hadleigh, which is situated approximately 500m north of the draft Order Limits in Section C: Brett Valley; and
 - Bures St Mary, which is situated approximately 900m south of the Stour Valley East CSE compound
- 8.5.8 As indicated by their designated status, listed buildings are of national interest and have therefore been assessed to be of **high** value. Though they contain heritage assets of national interest, the nine conservation areas are local planning authority designations of regional interest and have therefore been assessed to be of **medium** value.

Historic Landscapes

- 8.5.9 The historic landscape aspect has been divided into HLTs to facilitate assessment. HLTs are historic landscape parcels with a common character such as land use or field pattern. The HLTs are described in the Essex Historic Landscape Characterisation Project (Dyson-Bruce and Bennet, 2013b) and the Suffolk Historic Landscape Characterisation Project (Suffolk County Council Archaeological Service, 2012). For consistency, registered parks and gardens and protected lanes in Essex are also included under the heading of HLT.
- 8.5.10 There are two registered parks and gardens within the 3km study area. These comprise:
- Chantry Park (1000271; grade II), which is situated approximately 2.6km east of the draft Order Limits in Section AB: Bramford Substation/Hintlesham; and
 - Tendring Hall Park (1000406; grade II), which is situated approximately 2.3km south of the draft Order Limits in Section E: Dedham Vale AONB.
- 8.5.11 As indicated by their designated status, registered parks and gardens are of national value and have therefore been assessed to be of **high** value.

Non-designated Heritage Assets

Archaeological Remains

- 8.5.12 There are 199 non-designated heritage assets with archaeological interest within the 250m study area. These are outlined in Appendix 8.1: Historic Environment Baseline and shown in Figure 8.2. The non-designated archaeological remains comprise:
- 112 archaeological remains noted within the HER for Essex and Suffolk;
 - 73 sites or features recorded during aerial investigation and mapping undertaken for the project (Essex County Council, 2012; 2021b); and
 - 14 sites recorded during geophysical survey undertaken for the project to date (Bartlett-Clark Consultancy, 2013).

- 8.5.13 The location of artefacts recorded by the Portable Antiquities Scheme are confidential, so locations shown on Figure 8.2 are not exact.
- 8.5.14 Non-designated heritage assets are referred to, where available, by the unique ID provided by the EHER and SHER. Heritage assets identified only through the aerial investigation and mapping are referred to with the Site IDs provided in the reports (Essex County Council, 2012; 2021b); where no ID was provided, a unique identifier preceded by 'AIM' has been provided (e.g. AIM 01, AIM 02). Heritage assets identified only through geophysical survey have been identified with the unique field and feature numbers provided in the report preceded by 'GS' (Bartlett-Clark Consultancy, 2013) (e.g. GS 1A, GS 1B)
- 8.5.15 Aerial investigation and mapping was undertaken for the project in 2012, and updated again in 2021 (Essex County Council, 2012; 2021b). These investigations recorded a total of 73 sites and features within the 250m study area that are not otherwise recorded within the HER:
- one complex cropmark site with multiple enclosures, field boundaries and a possible round barrow (AIM Site 7);
 - eight enclosures (or sites with multiple enclosures);
 - one possible ring-ditch of unknown date;
 - seven sites associated with drainage and water management systems or simple ditches;
 - 53 field boundaries or field boundary sites;
 - one moated site;
 - one trackway; and
 - one potential former garden feature.
- 8.5.16 The geophysical survey identified a further 14 potential archaeological sites within the 250m study area, including two areas of more distinct and well-defined archaeological potential (Bartlett-Clark Consultancy, 2013):
- 'Field 11' in Section G: Stour Valley where the geophysical survey results suggest a potential enclosure (GS 11D), possible ditches (GS 11E), and a possible pit group (GS 11F). These features are all associated with the multi-period site at Hill Farm House (MEX30154).
 - 'Field 35' in Section E: Dedham Vale AONB where the geophysical survey results suggest a potential curvilinear enclosure (GS 35N), which has been interpreted as a possible Iron Age settlement site, and a rectilinear enclosure (GS 35O), which may also have pit-like features nearby. This site was not previously known from the HER or Aerial Investigation and Mapping.
- 8.5.17 A watching brief of 10 boreholes undertaken during ground investigations within Dedham Vale AONB (Oxford Archaeology East, 2013) predominantly recorded typical valley floor sequences of silty clays and gravels. The boreholes which had the most archaeological value, and included evidence of peat deposition, were two boreholes located in the Box Valley, and one borehole located in the Stour Valley. Overall, there is the potential for deposits of palaeoenvironmental interest focused predominantly within the river valleys.

- 8.5.18 Within the valleys of the Rivers Brett, Box and Stour, cropmark evidence and previous finds indicate a concentration of prehistoric and Roman activity, and the potential for unrecorded buried archaeology was considered particularly high in these areas. However, the combination of aerial photographic evidence and geophysical survey has provided strong evidence for the locations where buried archaeological remains are anticipated and the geophysical survey report concludes that *'the remainder of the route might not be archaeologically highly productive'* (Bartlett-Clark Consultancy, 2013).
- 8.5.19 Initial assessment of the non-designated heritage assets within the 250m study area indicate that three non-designated heritage assets with archaeological interest could be of **high** value. These assets are within the same location and may be associated. The assets comprise the following:
- The cropmark of a possible Neolithic long barrow or mortuary enclosure (MSF38093) which is recorded in the SHER.
 - AIM Site 7 which was recorded during Aerial Investigation and Mapping (Essex County Council, 2021b). This site incorporates the potential Neolithic long barrow feature (MSF38093), but also a number of other potentially associated cropmarks including a possible incomplete small circular enclosure, a possible round barrow (although there is the potential that this is a former pond), and field boundaries.
 - AIM Site 8 which was recorded during Aerial Investigation and Mapping (Essex County Council, 2021b) and comprises the cropmarks of a large circular enclosure that has been truncated by a modern road, immediately east of AIM Site 7. The Aerial Investigation and Mapping report (Essex County Council, 2021b) notes that, *'The positioning of a circular enclosure in proximity to both a possible round barrow and mortuary enclosure suggests it could be contemporary and is very similar to examples in Essex such as Rivenhall and Feering'*.
- 8.5.20 There are a number of non-designated heritage assets with archaeological interest which have been initially assessed to be of **medium** value. These include both individual features, such as isolated enclosures and ring ditches or round barrows, and broader sites such as moated sites, potential pottery manufacture sites, and the site of a potential Roman villa. Of note are two sites where Aerial Investigation and Mapping, Geophysical Survey, and the HER records all indicate the potential for more complex sites:
- Hill Farm House (MEX30154) in Section G: Stour Valley, which is an extensive, potentially multi-period cropmark complex. This site appears to incorporate a probable windmill mound, a potential enclosure (GS 11D), possible ditches (GS 11E), and a potential pit group (GS 11F) recorded during geophysical survey and numerous cropmarks mapped through Aerial Investigation and Mapping (Site G3 (Essex County Council, 2012) and Site 1 (Essex County Council, 2021b)); and
 - Near Grasmere Farm (MEX30109) in Section G: Stour Valley just east of the River Stour, which is another complex cropmark site that includes enclosures and ring ditches that may date to the prehistoric period. The southern portion of this site also incorporates Dedmans Hill Field (Tithe) (MSF15334), the placename for which suggests a burial mound or possible gallows location. This site incorporates features mapped through Aerial Investigation and Mapping (Site G1) and a linear feature recorded during geophysical survey (GS 19G) but which may be a recently infilled ditch or trench.

- 8.5.21 Initial assessment of all other non-designated heritage assets indicates that they range from **negligible** to **low** value as outlined in Appendix 8.1: Historic Environment Baseline. These include more common features such as field boundaries, isolated ditches or pits, and drainage systems, and heritage assets which are no longer extant or which have been removed, such as previously excavated sites, artefactual findspots and demolished structures.
- 8.5.22 Changes to all assessed heritage values may result from further assessment of the baseline, and any updates will be presented within the ES.

Built Heritage

- 8.5.23 There are six non-designated historic structures which have been identified within the EHER and SHER. These comprise four pillboxes (MEX1034883, MEX1034884, MEX1034885 and MSF26067), Burstall Bridge (MSF15844) and the Stour Valley Railway Line (Great Eastern Railway) (MSF35002). All of these non-designated historic structures have been assessed to be of local importance and are therefore of low value.

Historic Landscapes

- 8.5.24 There are 29 non-designated HLT (nine of which are protected lanes) which extend to within the 250m study area. There are a further 12 protected lanes which are within, or extend to within, the 3km study area. All HLT within the study area are outlined in Appendix 8.1: Historic Environment Baseline.
- 8.5.25 The historic landscape character of the area predominantly consists of rural fieldscapes formed from an undulating landscape dotted with isolated farmsteads and smaller built-up areas. In particular, there are a large number of areas of pre-18th century enclosure, fields with later boundary loss, and woodland (much of which is ancient). There are also more modern types, such as post-1950s agricultural landscape, 20th century enclosure, modern plantations, and current industrial landscapes. Preliminary assessment has valued the non-designated HLT to be of **negligible** to **medium** value.
- 8.5.26 The 21 protected lanes within the baseline have been identified as having a particular historic and landscape value for the character of the countryside (Essex County Council, 2013). They have a protected status through local planning policy which is based in part on their assessed historic integrity, their association with other heritage assets, and their archaeological potential. Preliminary assessment has valued the protected lanes within the baseline as **medium** value.
- 8.5.27 Hedgerows, along with other forms of vegetation, are regarded as landscape elements within HLT and not as independent heritage assets. However, it is recognised that hedgerows can be indicative of historic boundaries and can make an important contribution to the historic character of the landscape. For example, within the study area, historic hedgerows demark the parish boundary between Burstall and Bramford and form part of a pattern of pre-18th century enclosure. An assessment will be conducted for the ES to identify hedgerows within the study area which are 'important' as per the archaeology and history criteria as outlined within Schedule 1, Part II of the Hedgerows Regulations 1997.
- 8.5.28 The landscape in this area of south Suffolk and eastern Essex, also has important cultural associations that exist with artists such as John Constable (1776–1837), Thomas Gainsborough (1727–1788), John Nash (1893–1977), Sir Alfred Munnings (1878–1959), and the East Anglian School of Painting and Drawing under the direction of Sir Cedric Morris (1889–1982). These artists are associated with the Dedham Vale AONB and the

Stour Valley Project Area and painted many landscapes in the local area including The Hay Wain (Constable), Cornard Woods (Gainsborough), Barge on the Stour at Dedham (Munnings) and Wormingford Mill (Nash).

- 8.5.29 The Dedham Vale AONB and the Stour Valley Project Area are not categorised within this assessment to be heritage assets as they are primarily assessed within Chapter 6: Landscape and Visual. However, the cultural heritage aspects of the Dedham Vale AONB and the Stour Valley Project Area, as evident in its historic landscape character, archaeology and built heritage, will be considered in this historic environment assessment.

Future Baseline

- 8.5.30 No significant changes to the future historic environment baseline are anticipated.
- 8.5.31 Changes to the historic environment baseline conditions could occur as a result of:
- additional surveys identifying as yet unknown heritage assets within the draft Order Limits;
 - additional surveys resulting in a reassessment of the character, value or extent of a known heritage asset;
 - changes to the designation status of the known assets within the 250m or 3km study areas; and
 - changes to the condition of the known assets within the 250m or 3km study areas (for example removal of assets as a result of other development proposals).
- 8.5.32 However, the assessment has been undertaken on a precautionary basis, and there are no anticipated changes to the baseline data that would materially alter the assessment.

8.6 Likely Significant Effects (Without Mitigation)

- 8.6.1 This section sets out the likely significant effects of the project on the historic environment. It assumes that the relevant embedded measures in Table 4.1 and the good practice measures in Appendix 4.1: Outline CoCP are in place before assessing the effects.
- 8.6.2 A full impact and setting assessment has not been conducted at this stage. This will be presented as part of the ES and will identify the current setting of the heritage assets, the contribution that the setting makes to the value of the heritage assets, and the potential magnitude of impact on the heritage assets as a whole during construction and operation of the project. However, a preliminary assessment has been undertaken using the existing baseline data and professional judgement to identify the potential for likely significant effects.

Embedded and Good Practice Measures

- 8.6.3 Embedded measures relevant to the historic environment include positioning pylons, where practicable, to reduce effects on the key views from Hintlesham Hall, and landscape planting around the proposed CSE compounds and GSP substation.
- 8.6.4 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to the historic environment including protecting known archaeological features from damage (H01), halting works and informing the local planning authority where a significant unknown archaeological asset is discovered (H02), and compliance with

relevant legislation and best practice guidance in the event of finds of human remains, or 'treasure' as defined by the Treasure Act 1996 (as amended) (H03).

- 8.6.5 Good practice measure GG08 is also of key relevance to the historic environment, as it indicates that, where sensitive features (such as historic buildings) are to be retained within the Order Limits, they would be protected appropriately through fencing and signage.

Generic Construction (Common to Overhead Line and Underground Cables)

- 8.6.6 The construction of overhead line and underground cables could affect the historic environment through the following:
- Direct physical impacts, including damage to, or complete removal of, archaeological remains and historic landscape elements. Specifically, any below ground works including the construction of pylon bases, the underground cable working area and any temporary working areas, such as access tracks, crane bases and compounds, could affect buried archaeology. Direct physical impact on historic landscape elements is most likely to result from the removal of vegetation; which would be largely reversed on completion of the construction phase. Direct physical impacts on historic buildings are not anticipated.
 - Indirect physical impacts to archaeological remains and/or built heritage resulting from localised variations to ground water levels and vibration.
 - Direct impacts resulting from construction activities within the setting of a heritage asset, such as a-n increase in noise and visual intrusion resulting from development within the setting of heritage assets. The construction phase effects would be temporary and would be largely reversed on completion of the construction phase.
- 8.6.7 Chapter 10: Geology and Hydrogeology has assessed that there is likely to be a negligible magnitude of impact/change to groundwater levels during construction of the overhead lines and underground cables (including trenchless crossings). No scheduled monuments or listed buildings have been identified as being within an area of potential groundwater change, and no significant effects are considered likely.
- 8.6.8 Chapter 14: Noise and Vibration indicates that no listed buildings are expected to experience levels of vibration at which cosmetic or structural damage is likely. No scheduled monuments or listed buildings have been identified as being within an area of potential vibration, and no significant effects are therefore considered likely.
- 8.6.9 Overall, it is anticipated that there would not be any impact on scheduled monuments or registered parks and gardens during construction.
- 8.6.10 Potential effects on listed buildings and conservations areas resulting from development within their settings and on non-designated heritage assets are described below.

Construction

Overhead Line (including CSE Compounds and Removal of the Overhead Line) Designated Heritage Assets

- 8.6.11 The majority of listed buildings are at least partially separated from the project by the general topography, vegetation and/or neighbouring buildings, and many are set within working farm environments which will incorporate a base level of machine and general works noise within their setting as standard. In addition, while the cultural heritage value

of these listed buildings is enhanced by their rural setting, temporary noise and visual intrusion is unlikely to greatly affect the ability to understand and appreciate the historic and architectural value of these heritage assets. Therefore, the temporary construction impacts are likely to be **negligible**. On heritage assets of **high** value, this would result in a **minor** effect which would be **not significant**.

- 8.6.12 The impact could be greater than negligible where a listed building is particularly close to the draft Order Limits or identified as being in the ZTV, where there is a higher potential for visual or audible changes within their setting, and/or where the setting of a listed building contributes more highly to its value. A full assessment will be carried out for the ES, but a preliminary assessment of the listed buildings within the 250m and 3km study areas has indicated that listed buildings which have the potential for a higher than negligible impact may include Abbot's Farmhouse (NHLE 1122866), Hintlesham Hall (NHLE 1036917), Service Ranges, Stables, Former Coach House and Brewhouse Attached to Hintlesham Hall (NHLE 1036918), Park Farmhouse (NHLE 1193784), College Farmhouse (NHLE 1036919) and Mill Farm Cottage (NHLE 1036954).
- 8.6.13 Although reinstatement planting would be completed where practicable, there is also the potential for areas of longer-term vegetation loss within the settings of designated heritage assets. No significant effects on designated heritage assets through vegetation loss have been identified during the preliminary assessment. However, further assessment will be conducted for the ES based on additional design information and a better understanding of the potential vegetation loss, retention and reinstatement measures.

Non-designated Heritage Assets

- 8.6.14 There could be direct adverse physical impacts on known and previously unrecorded non-designated archaeological remains during construction. These may occur during a wide variety of construction activities including, but not limited to:
- the removal of archaeological remains during vegetation clearance, topsoil removal and any ground excavations (such as for pylon footings, the construction of access tracks, site compounds, vegetation planting); and
 - the compaction of archaeological remains by construction machinery and traffic, temporary storage of spoil, machinery, equipment and materials, and the erection of temporary site buildings during construction.
- 8.6.15 Partial or complete damage or destruction of archaeological remains could result in a **medium** or **large** adverse impact. This could result in a **significant** effect on any non-designated archaeological remains of **low** to **high** value.
- 8.6.16 The ground disturbance associated with the removal of the existing 132kV overhead line itself is not anticipated to extend beyond the area of the existing pylon bases and would therefore be limited to areas of pre-existing impact. Therefore, there would be **no change** to any non-designated archaeological remains (of any value), resulting in a **neutral** effect which would be **not significant**.
- 8.6.17 No significant effects through direct or indirect physical impact or impacts from development within their setting are considered likely on any other non-designated historic buildings due to the character of the structures and their locations in relation to the project.

- 8.6.18 There is the potential for adverse physical impacts on non-designated HLTs (including protected lanes) through damage or removal of historic landscape elements (such as hedgerows) during construction. During construction of the overhead line sections, there is potential for the removal of sections of up to 20m of historic hedgerows which would then be reinstated with low height vegetation. Some of these hedgerows may be classified as ‘important’ under the Hedgerows Regulations 1997. The range of potential impacts is likely to be assessed as of **negligible** to **small** magnitude. On any non-designated receptors of **low** to **medium** value, this would result in a **neutral** to **minor** adverse effect which is **not significant**.
- 8.6.19 There is the potential for adverse effects on non-designated HLTs during construction through changes to noise, dust, or visual intrusion (including the potential for effects on protected lanes from construction-related traffic) both within the boundaries of the HLTs and within their setting. Given the temporary nature of the potential impacts and the measures in the Outline CoCP (such as GG01, GG03, GG06, GG07, GG08, LV01, LV02 and LV03), the potential range of impacts are likely to be assessed as of **negligible** to **small** magnitude. On any non-designated HLTs of **low** to **medium** value, this would result in a **neutral** to **minor** adverse effect which is **not significant**.
- 8.6.20 Chapter 6: Landscape and Visual, has assessed that effects on Dedham Vale AONB and the Stour Valley Project Area during construction are likely to be **not significant**. This accords with the historic environment assessment of the potential for impact on the cultural heritage associations of these landscape areas which considered the:
- overall potential for impact on the individual HLTs within these areas;
 - importance of long views;
 - potential for disruption to the historic character of the areas through temporary visual intrusion and the removal of vegetation; and
 - temporary nature of the work which would be largely reversed on completion of the construction phase.

Hintlesham Woods Option

- 8.6.21 As noted in Chapter 5: EIA Approach and Method, the preliminary assessment has considered the likely significant environmental effects for the two options at Hintlesham Woods. These are presented in tabular format for ease of comparison (Table 8.4). The overall summary for the preliminary assessment has shown that neither option is likely to result in significant effects to heritage assets or the historic landscape.

Table 8.4: Comparison of the Two Options at Hintlesham Woods (Construction)

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
Designated heritage assets	Option 1 is not considered to be close enough to any listed buildings to result in a significant effect during construction, either from noise or visual intrusion from development within their setting or from the removal of vegetation within the setting of listed buildings. These effects would be temporary and would be largely reversed on completion of the construction phase. There could be temporary effects on the	This is the same as Option 1.

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
	<p>views to and from listed buildings during construction including Old Hall House (NHLE 1036920), Norman's Farmhouse (NHLE 1286010) and Wood Farmhouse (NHLE 1036913). The option would result in a new 400kV overhead line situated close to Hintlesham Hall (NHLE 1036917) and attached outbuildings (NHLE 1036918). The positioning of the proposed pylons would need to be considered in relation to the existing pylons and the intervisibility between the proposed pylons and the listed buildings.</p>	
Archaeological remains	<p>There is the potential for direct adverse physical impacts on known and previously unrecorded non-designated archaeological remains during construction in areas of ground disturbance. This can be mitigated through the programme of archaeological investigation and recording outlined in Appendix 8.2: Archaeological Framework Strategy.</p>	This is the same as Option 1.
Non-designated HLT	<p>Option 1 would extend through the pre-18th century enclosure HLT which incorporates a former medieval deer park, and vegetation that contributes to the value of this HLT could be removed. Reinstatement of removed vegetation would help to maintain the character of this HLT. The effect on the HLT (low value) would be negligible adverse and the effect would be not significant.</p> <p>This option also includes restringing of the existing conductors which cross Hintlesham Wood HLT, which and would require coppicing of the vegetation to ground level along the existing easement. This would allow for regrowth of the current vegetation.</p> <p>The magnitude of impact on the HLT (medium value) would be small adverse, and the resulting minor effect would be not significant.</p>	<p>Option 2 would extend through Hintlesham Wood HLT. Construction of a new overhead line through the wood would require coppicing the vegetation to ground level during construction on a new footprint, though regrowth of the existing vegetation is then possible. Hintlesham Wood is also associated with the designed landscape surrounding the grade I listed Hintlesham Hall (NHLE 1036917). The magnitude of impact on the HLT (medium value) would be small adverse, and the resultant effect would be minor, which would be not significant.</p>

Underground Cables

Designated Heritage Assets

- 8.6.22 The majority of listed buildings are at least partially separated from the project by the general topography, vegetation and/or neighbouring buildings, and many are set within working farm environments which will incorporate a base level of machine and general works noise within their setting as standard. In addition, while the cultural heritage value of these listed buildings is enhanced by their rural setting, temporary noise and visual

intrusion is unlikely to greatly affect the ability to understand and appreciate the historic and architectural value of these heritage assets. Therefore, the temporary construction impacts are likely to be of **negligible** magnitude. On heritage assets of **high** value, this would result in a **minor** effect, which would be **not significant**.

- 8.6.23 The impact could be greater than negligible magnitude where a listed building is particularly close to the draft Order Limits or identified as being in the ZTV, where there is a higher potential for visual or audible changes within their setting, and/or where the setting of a listed building contributes more highly to its value. A full assessment will be undertaken for the ES, but a preliminary assessment of the listed buildings within the 250m and 3km study areas has indicated that listed buildings which have the potential for a higher than negligible magnitude impact may comprise Abbot's Farmhouse (NHLE 1122866), The Cottage (NHLE 1122859), Nussteads (NHLE 1182274), High Tree Farmhouse (NHLE 1037082) and associated outbuildings (NHLE 1182361, 1446966 and 1446967).
- 8.6.24 Although reinstatement planting would be completed where practicable, there is also the potential for areas of longer-term vegetation loss within the settings of designated heritage assets. No significant effects on designated heritage assets through vegetation loss have been identified during the preliminary assessment. However, further assessment will be conducted for the ES based on additional design information and a better understanding of the potential vegetation loss, retention and reinstatement measures.

Non-designated Heritage Assets

- 8.6.25 There is the potential for direct adverse physical impacts on known and previously unrecorded non-designated archaeological remains during construction. This may occur during a wide variety of construction activities including, but not limited to:
- the removal of archaeological remains during vegetation clearance, topsoil removal and any ground excavations (such as for underground cables, the construction of access tracks, site compounds, vegetation planting); and
 - the compaction of archaeological remains by construction machinery and traffic, temporary storage of spoil, machinery, equipment and materials, and the erection of temporary site buildings during construction.
- 8.6.26 The preliminary assessment of the non-designated archaeological remains indicates that the following more complex sites of regional interest (medium value) lie within the draft Order Limits of the proposed underground cable route:
- Hill Farm House (HER MEX30154), which comprises an extensive, potentially multi-period cropmark complex that includes a number of probable Bronze Age ring ditches, a series of enclosures of probable prehistoric or Roman date, and a medieval or post-medieval post mill. The cropmarks have been primarily mapped through Aerial Photographic Assessment (Essex County Council, 2013), and geophysical survey (Bartlett-Clark Consultancy, 2013) has also identified magnetic anomalies interpreted to be ditched enclosures and some pits.
 - Near Grasmere Farm (HER MEX30109), which comprises a cropmark site that includes ring ditches and a rectangular enclosure of uncertain date. Aerial Photographic Assessment (Essex County Council, 2013) recorded a number of cropmarks, but these are all situated to the north of the draft Order Limits. Geophysical survey in this area recorded a '*linear feature of variable strength*:

perhaps recently infilled ditch or trench' (Bartlett-Clark Consultancy, 2013). The southern portion of this site also incorporates Dedmans Hill Field (Tithe) (HER MSF15334) which is a placename entry, which suggests that the location is associated with a burial mound or gallows and could be a burial site.

- 8.6.27 Partial or complete damage or destruction of non-designated archaeological remains within the proposed underground cable route, such as those outlined above, could result in a **large** magnitude impact. On non-designated archaeological remains of **medium** value, this would result in a **moderate** or **major** adverse effect which would be **significant**.
- 8.6.28 There is a single non-designated historic building within the draft Order Limits: 'Pillbox, Edgars Farm, Lamarsh' (HER MEX1034884). The pillbox is situated on the bank of the River Stour and close to the proposed underground cable route (within the area of a trenchless crossing) and the removal of the existing 132kV overhead line in Section G: Stour Valley. Measures within the Outline CoCP (such as GG08) would ensure that there are no direct physical impacts on this heritage asset. Therefore, there would be **no change** to this or any non-designated historic buildings (all of which are of **low** value) from physical impacts, resulting in a **neutral** effect which would be **not significant**.
- 8.6.29 Although the value of this non-designated pillbox (HER MEX1034884) lies predominantly in the material remains of the structure, the placement of it on the banks of the River Stour enhances the understanding and appreciation of this historic building as part of a continuous line of defence. There is the potential for temporary noise and visual intrusion within the setting of this non-designated pillbox which, due to the close proximity of the works, may result in a **small** magnitude impact. As a **low** value heritage asset, this would result in a **minor** adverse effect which would be **not significant**.
- 8.6.30 No significant effects through direct or indirect physical impact, or impacts from development within their setting, are considered likely on any other non-designated historic buildings due to the character of the structures and their locations in relation to the project.
- 8.6.31 There is the potential for adverse physical impacts on non-designated HLT (including protected lanes) through damage or removal of historic landscape elements (such as hedgerows) during construction. There is the potential, for example, of the removal of up to 80m of historic hedgerow during construction of the underground cables. Some of these hedgerows may be classified as 'important' under the Hedgerows Regulations 1997, and some of these sections of hedgerow would not be reinstated. The range of potential impacts is likely to be assessed as of **negligible** to **medium** magnitude. On any non-designated receptors of **low** to **medium** value, this would result in a **neutral** to **moderate** adverse effect which could be **significant**.
- 8.6.32 For example, the route of the underground cable in Section G: Stour Valley crosses Lamarsh Lane (BTELANE87) and Henny Back Road (BTELANE86), which may result in physical and setting impacts on these non-designated protected lanes. However, impacts to protected lanes will be avoided where possible (which relates to commitments GG03 and GG08 in the Outline CoCP), and any features removed at crossing locations would be reinstated where possible. Where it would not be possible to reinstate the roadside vegetation, this could result in a **small** to **medium** magnitude of impact, depending on the extent and nature of the vegetation removed. As HLT of **medium** value, there is the potential for a **minor** to **moderate** adverse effect, which may therefore be **significant**.

- 8.6.33 There is the potential for adverse effects on non-designated HLT during construction through changes to noise, dust, or visual intrusion (including the potential for effects on protected lanes from construction-related traffic) both within the boundaries of the HLT and within their setting. Given the temporary nature of the potential impacts and the measures in the Outline CoCP (such as GG01, GG03, GG06, GG07, GG08, LV01, LV02 and LV03), the potential range of impacts are likely to be assessed as of **negligible to small** magnitude. On any non-designated HLT of **low to medium** value, this would result in a **neutral to minor** adverse effect which is **not significant**.
- 8.6.34 The historic environment assessment has assessed the potential for impacts on the cultural heritage associations of the Dedham Vale AONB and the Stour Valley Project Area. It considered the following areas and concluded (in accordance with the assessment presented in Chapter 6: Landscape and Visual) that the effects during construction are likely to be **not significant**:
- overall potential for impact on the individual HLT within these areas;
 - importance of long views;
 - potential for disruption to the historic character of the areas through temporary visual intrusion and the removal of vegetation; and
 - temporary nature of the work which would be largely reversed on completion of the construction phase.

GSP Substation

Designated Heritage Assets

- 8.6.35 The closest scheduled monument to the proposed GSP substation is the Roman Villa 480m South East of Hill Farm (NHLE 1011806), which is situated approximately 1.7km from the GSP substation. No intervisibility or noise intrusion is considered likely at this distance, and therefore there would be **no change** to the setting of this heritage asset during operation (**not significant**).
- 8.6.36 There are no listed buildings within the 250m study area for the GSP substation and 136 listed buildings within a 3km study area. A preliminary assessment of the listed buildings within the 3km study area around the GSP substation, in combination with a historic environment walkover survey at this location, suggests that:
- the GSP substation itself is well shielded by the surrounding vegetation to the north and south; and
 - the majority of listed buildings are at least partially shielded from the proposed GSP substation by the general topography, vegetation and/or neighbouring buildings.
- 8.6.37 Of the 136 listed buildings within the 3km study area of the GSP substation, only Butlers Hall Farmhouse (NHLE 1169693, grade II*), which is situated approximately 500m to the northwest, has the potential for limited intervisibility with the proposed GSP substation. Given the limited intervisibility with the proposed GSP substation, the temporary nature of the construction impacts, and that the setting of Butlers Hall Farmhouse is a working farm environment that will experience a base level of machine and general works noise within the study area as standard, the magnitude of impact on this **high** value heritage asset is likely to be **negligible**. This would result in a **minor** effect which would be **not significant**.

- 8.6.38 There is the potential for an impact on Nether House Farmhouse (NHLE 1123031, grade II) through an increase in traffic due to the construction of an access route approximately 25m to the west of the listed building. There is some filtering of views and reduction in the potential intervisibility due to existing vegetation, but the close proximity indicates the potential for a **small** adverse impact from noise and visual intrusion. Due to the temporary nature of the construction and the increased traffic, and that the historic interest of the listed building will be maintained, the effect has been assessed to be **minor** which would be **not significant**.
- 8.6.39 Bulmer, situated approximately 2.6km to the north, is the only conservation area within the 3km study area of the GSP substation. Due to this distance and the intervening mature trees and hedges, neither Bulmer, nor any other conservation area, would be affected by the construction of the GSP substation.
- 8.6.40 The nearest registered park and garden to the GSP substation is Belchamp Hall (NHLE 1000737), which is situated approximately 3.5km to the north of the GSP substation. Due to this distance and the inherent lack of intervisibility of the site, neither Belchamp Hall, nor any other registered parks and gardens would be affected by the construction of the GSP substation.

Non-designated Heritage Assets

- 8.6.41 There is the potential for direct adverse physical impacts on known and previously unrecorded non-designated archaeological remains during construction of the GSP substation in areas of ground disturbance, such as:
- damage or destruction through removal of archaeological deposits; and
 - damage through compaction and/or removal of topsoil.
- 8.6.42 Chapter 10: Geology and Hydrogeology has assessed a **negligible** change to groundwater levels during construction of the GSP substation. The resultant effect on any non-designated archaeological remains of **negligible** to **medium** value which are close enough to experience any change, would therefore be a **neutral** to **minor** effect which is **not significant**.
- 8.6.43 One known archaeological remain is recorded within the GSP substation boundary, comprising the cropmarks of a former field boundary ('Bulmer' (MEX1031722)), which has been assessed to be of **low** value. Construction of the GSP substation could remove part of this archaeological remain, which has been assessed as a **medium** magnitude impact. This would result in a **minor** adverse effect which would be **not significant**.
- 8.6.44 Partial or complete damage or destruction of any further currently unknown archaeological remains could result in a **large** magnitude impact. On non-designated currently unknown archaeological remains which are likely to range between **negligible** to **medium** value, this would result in a **minor** to **major** adverse effect which could be **significant**.
- 8.6.45 No non-designated archaeological remains or historic buildings have been identified within the 250m study area of the GSP substation which would have an impact on their cultural heritage value due to development within their setting.
- 8.6.46 There are no non-designated historic buildings within the study area for the GSP substation. There is the potential for adverse physical impacts on one non-designated HLT through damage or removal of historic landscape elements during construction which would change the HLT of this land parcel. This land parcel is categorised as

modern 'Boundary Loss' and has been assessed to be of **negligible** value. The potential impact has been preliminarily assessed as of **medium** magnitude. This would result in a **minor** adverse effect which is **not significant**.

- 8.6.47 There is the potential for adverse effects on non-designated HLT during construction of the GSP substation through changes to their setting from noise, dust, or visual intrusion (including the potential for effects on the setting of protected lanes from construction-related traffic). Given the temporary nature of the potential impacts and the measures outlined in the Outline CoCP (such as GG01, GG03, GG06, GG07, GG08, LV01, LV02 and LV03), the range of potential setting impacts is likely to be assessed as of **negligible** to **small** magnitude. On any non-designated receptors of **low** to **medium** value, this would result in a **neutral** to **minor** adverse effect which is **not significant**.
- 8.6.48 Old Road (BTELANE84) is a protected lane situated approximately 300m from the GSP substation and which is crossed by the draft Order Limits. There is therefore the potential for a higher level of traffic on this route during construction. Given the temporary nature of the potential impacts and the measures outlined in the Outline CoCP (such as GG01, GG03, GG06, GG07, GG08, LV01, LV02 and LV03), the impact is likely to be of **small** magnitude. On a non-designated protected lane of **medium** value, this would result in a **minor** adverse effect which is **not significant**.

Operation

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

- 8.6.49 The primary adverse impact on the historic environment during operation of the overhead sections of the project (including the proposed CSE compounds) is considered to be the introduction of the proposed 400kV overhead line into the setting of heritage assets. In general, there would be less of an impact on heritage assets through changes to their setting where the proposed 400kV overhead line would replace the existing 132kV overhead line along a similar alignment or where overhead lines are already established.
- 8.6.50 Introduction of other above ground elements, such as CSE compounds, are not anticipated to have a significant effect on heritage assets as a result of development within their setting. This is due to the embedded planting in the design and appropriate siting of the CSE compounds.
- 8.6.51 No maintenance activities have been identified which are considered likely to cause a significant physical impact on any heritage assets during operation.

Designated Heritage Assets

- 8.6.52 There are no likely significant adverse effects on scheduled monuments, conservation areas or registered parks and gardens during operation.
- 8.6.53 The preliminary assessment undertaken has identified six listed buildings which, due to potential for a high level of intervisibility with the overhead line, are considered to be more likely to have significant effects as a result of development within their setting during operation of the overhead lines. These comprise the following:
- Hintlesham Hall (NHLE 1036917; grade I) and associated Service Ranges, Stables, Former Coach House and Brewhouse attached to Hintlesham Hall (NHLE 1036918; grade II*) – situated approximately 300m from the draft Order Limits at a location where the proposed 400kV overhead line would run in parallel to an existing 400kV overhead line. The Draft Alignment extends through the former parkland associated with the hall.

- Kiln Cottage (NHLE 1351736; grade II) – situated approximately 80m from the draft Order Limits. The cottage currently looks onto an arable field which is crossed by both the existing 132kV overhead line and the existing 400kV overhead line. The existing 132kV overhead line would be replaced with a 400kV overhead line along the same alignment at this location. This would be of limited impact; however, if a pylon were to be placed more directly in front of this listed building, the magnitude of impact may be higher.
- College Farmhouse (NHLE 1036919; grade II) and Park Farmhouse (NHLE 1193784; grade II) – both of which are situated approximately 50m from the draft Order Limits in a location where the proposed 400kV overhead line would run in parallel to the existing 400kV overhead line. Both the existing and proposed 400kV overhead lines would be visible from these farmhouses.
- Mill Farm Cottage (NHLE 1036954; grade II) – situated approximately 180m from the draft Order Limits in a location where the proposed 400kV overhead line would run in parallel to the existing 400kV overhead line. The existing and proposed 400kV overhead line would be visible from this cottage.

8.6.54 The preliminary assessment of the potential magnitude of impact on these six **high** value listed buildings has been assessed to be **small**. This would result in a **minor** or **moderate** significance of effect, which could therefore be **significant** without further mitigation.

8.6.55 There is the potential for a beneficial impact on designated heritage assets through the removal of current infrastructure, namely the existing 132kV and 400kV overhead lines in areas where they would not be replaced with an alternative overhead line, from within their settings. This impact is likely to be **negligible** magnitude on the following **high** value heritage assets, which would result in a **neutral** or **minor** effect which would be **not significant**:

- Moated site at Moat Farm, 450m south of Cobbler's Corner (NHLE 1019889) scheduled monument, which is situated approximately 180m from the draft Order Limits and is the only scheduled monument within the 250m study area;
- the conservation areas of Polstead and Stoke-by-Nayland which have the potential for long-distance views of the proposed removal of the existing 132kV overhead line conservation area; and
- Chantry Park (NHLE 1000271), which is situated approximately 2.5km from the draft Order Limits, but due to the potential for long views to the west, may have some intervisibility with the removal of the 132kV overhead line.

8.6.56 No other scheduled monuments, conservation areas or registered parks and gardens are likely to have a beneficial impact.

8.6.57 The extent of the potential beneficial impact on listed buildings which may result from the removal of the existing 132kV and 400kV overhead lines depends on the current level of intervisibility and the contribution which setting makes to the value of each individual heritage asset. The beneficial impact from existing overhead line removal on listed buildings is likely to range from **no change** to **small**. On heritage assets of **high** value, this would result in a **neutral** to **minor** effect, which would be **not significant**.

Non-designated Heritage Assets

8.6.58 There is the potential for long-term adverse impacts on the character of non-designated HLT (not including protected lanes, which will be discussed separately) during operation

of the overhead lines through the introduction of the proposed 400kV overhead line both within non-designated HLT and within their settings. Preliminary assessment of these potential impacts indicates that they may range from **negligible** to **medium** magnitude. On non-designated HLT of **low** to **medium** value, this may result in **neutral** to **moderate** adverse effects, which could be **significant**.

- 8.6.59 For example, within Section AB: Bramford Substation/Hintlesham, Option 1 would involve realigning the existing 400kV overhead line to the north and west of Hintlesham Woods to facilitate the use of the existing easement through the woods by the new 400kV overhead line. This realignment would extend through the pre-18th century enclosure HLT, which was a former medieval deer park, and would slightly decrease the legibility of this HLT. However, the nature of overhead lines means that intervisibility would be maintained and the boundaries of the HLT would still be able to be read within their wider setting. Reinstatement of removed vegetation where possible (such as commitments LV01, LV02 and LV03 in the Outline CoCP) would also help to maintain this legibility. The impact magnitude has been preliminarily assessed as **negligible**, which on an HLT of **low** value would be of **neutral** effect, which would be **not significant**.
- 8.6.60 As they pertain only to Essex, protected lanes are only present within Section H: GSP Substation and Section G: Stour Valley which is predominantly an area where the existing 132kV overhead line would be removed and underground cables are proposed. The operational components of the overhead line which would be visible to protected lanes in these sections, and which represent the primary change to the current baseline, are the operation of the Stour Valley West CSE compound. Ansells Farm Road (BTELANE86) is situated approximately 50m to the west of this CSE compound and provides the access to it. There is therefore the potential for visual impacts on this non-designated HLT during operation, but it is anticipated that planting would be present to soften the CSE compound from general view. The impact magnitude has been assessed as **small**. On an HLT of **medium** value, this would be of **minor** adverse effect and would be **not significant**.
- 8.6.61 There is the potential for a beneficial impact on non-designated heritage assets through the removal of current infrastructure, namely the existing 132kV and 400kV overhead lines in areas where they would not be replaced with an alternative overhead line, from within their settings. This impact is likely to be most notable for the following heritage assets:
- The single non-designated historic building within the draft Order Limits ('Pillbox, Edgars Farm, Lamarsh' (HER MEX1034884)) is situated close to the removal of the existing 132kV overhead line in Section G: Stour Valley. Due to the very close proximity, the removal of the existing 132kV overhead line would have a **small** beneficial impact on this heritage asset through the removal of existing development within its setting. As a **low** value heritage asset, this would result in a **minor** beneficial effect, which is **not significant**.
 - The Loshouse Farm Road (BTELANE81) and Twinstead Road (BTELANE83) protected lane HLT are currently crossed by the 132kV overhead line. The impact on these and other protected lanes where there is some intervisibility with the existing 132kV overhead line to be removed is likely to be of **negligible** to **small** magnitude. On non-designated protected lanes of **medium** value, this would result in a **neutral** to **minor** effect which is **not significant**.
 - Other non-designated HLT would also benefit from removal of the existing development either within the boundaries of individual HLT or within their setting.

Preliminary assessment of these potential impacts indicates that they may range from **negligible** to **medium** magnitude. On non-designated HLT (other than protected lanes) of **low** to **medium** value, this would result in **neutral** to **moderate** effects, which could be **significant**.

8.6.62 The assessment of the impact on cultural heritage associations of the Dedham Vale AONB has concluded that the removal of the existing 132kV overhead line is likely to have a **significant** beneficial effect on the cultural heritage associations of the Dedham Vale AONB and Stour Valley Project Area during operation. This accords with the assessment presented in Chapter 6: Landscape and Visual.

Hintlesham Woods Option

8.6.63 The preliminary assessment of the operational effects for the two options at Hintlesham Woods are presented in Table 8.5.

8.6.64 The overall summary for the preliminary assessment has shown that both options would result in changes to the views to and from listed buildings, but that these would be not significant. Option 2 would have slightly lower effects on the setting of listed buildings as the two lines would run parallel. Option 1 avoids the loss of additional trees within the ancient woodland, which would result in a slightly lower adverse effect on the historic landscape than Option 2, all be it that neither option would result in significant effects.

Table 8.5: Comparison of the Two Options at Hintlesham Woods (Operation)

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
Designated heritage assets	Option 1 would introduce up to four new pylons into views to and from Old Hall House (NHLE 1036920). Filtered views of pylons are also likely from Norman’s Farmhouse (NHLE 1286010). In both cases, the existing screening provided by mature trees that bound the curtilage to the listed buildings greatly lessens the potential for adverse impacts. In both cases, the magnitude of impact has been assessed as negligible magnitude, which on heritage assets of high value, would result in a minor effect which would be not significant .	The pylons outside of the woodland are likely to be visible from three grade II listed buildings (high value); Old Hall House (NHLE 1036920), Norman’s Farmhouse (NHLE 1286010) and Wood Farmhouse (NHLE 1036913). The new overhead line would be parallel with the existing overhead line and at a distance of separation where the effects are likely to be minor to neutral and not significant . The effect on Hintlesham Hall (NHLE 1036917) is likely to be neutral , given the distance of separation between the Hall and this option. Also, this part of the setting of the Hall has seen a considerable degree of change through modern farming practice. The drive through the woodland has been replanted and the woodland is within the wider estate rather than the parkland gardens and pleasure grounds at Hintlesham Hall.
Non-designated HLT	The nature of overhead lines with Option 1 means that intervisibility would be maintained, and the boundaries of the pre-18 th century enclosure HLT and	A new overhead line through the woods would result in the loss of trees in the historic woodland (a non-designated HLT). The loss of trees would be limited, therefore this

Aspect	Option 1: Northern Alignment	Option 2: Parallel Alignment
	<p>former deer park (low value) would still be legible. Reinstatement of removed vegetation would also help to maintain this legibility. The magnitude of impact has been assessed as negligible, which would result in a minor adverse effect which would be not significant.</p> <p>There would be no change to Hintlesham Woods HLT (medium value) as the existing alignment of the 400kv overhead line would be retained at this location. This would result in a neutral effect that would be not significant.</p>	<p>would have a neutral effect on historic landscape character.</p> <p>During operation, the coppiced vegetation under the new 400kv overhead line would be kept low. Although not reinstated to its full height, this would retain the physical and visual connectivity with the neighbouring Ramsey Wood and retain the character of Hintlesham Woods HLT (medium value). The magnitude of impact has been assessed as small, which would result in a minor adverse effect which would be not significant.</p>

Underground Cables

Designated Heritage Assets

- 8.6.65 Due to the lack of visibility, noise and maintenance activities which may cause physical harm, no impacts on designated archaeological remains, built heritage or HLT are anticipated during operation.

Non-Designated Heritage Assets

- 8.6.66 Due to the lack of visibility, noise and maintenance activities which may cause physical harm, no impacts on non-designated archaeological remains, built heritage or HLT are anticipated during operation.

GSP Substation

- 8.6.67 No maintenance activities have been identified which are considered likely to cause a significant physical impact on any heritage assets during operation.

Designated Heritage Assets

- 8.6.68 The closest scheduled monument (**high** value) to the proposed underground cables is the Roman Villa 480m South East of Hill Farm (NHLE 1011806), which is situated over 1.7km from the GSP substation. No intervisibility or noise intrusion is considered likely at this distance, and therefore **no change** to the setting of this heritage asset would be present during operation. This would be a **neutral** effect, which would be **not significant**.
- 8.6.69 As outlined in the 'Construction' section, only one listed building (**high** value) has the potential for intervisibility with the GSP substation. It is considered that the limited intervisibility with the GSP substation would have a **negligible** magnitude impact on the cultural heritage value of Butlers Hall Farmhouse (NHLE 1169693, grade II*). This would result in a **minor** effect, which would be **not significant**.
- 8.6.70 Bulmer, situated approximately 2.6km to the north, is the only conservation area within the 3km study area of the GSP substation. Due to this distance and the intervening mature trees and hedges, neither Bulmer, nor any other conservation area, would be affected by the operation of the GSP substation.
- 8.6.71 The nearest registered park and garden to the GSP substation is Belchamp Hall (NHLE 1000737), which is situated approximately 3.5km to the north of the GSP substation. Due to this distance and the inherent lack of intervisibility of the site, neither Belchamp Hall

nor any other registered parks and gardens would be affected by the operation of the GSP substation.

Non-designated Heritage Assets

- 8.6.72 No non-designated archaeological remains or historic buildings have been identified within the 250m study area of the GSP substation which would have an impact on their cultural heritage value due to development within their setting.
- 8.6.73 There is the potential for long-term adverse impacts on the setting of non-designated HLT during operation of the GSP substation through visual intrusion. However, due to the embedded design measure which sites the substation in a location that is well shielded by the dense vegetation of Butler's Wood to the north and Waldegrave Wood to the south, and the measures outlined in the Outline CoCP (such as GG01, GG03, GG06, GG07, GG08, LV01, LV02 and LV03), the potential setting impacts are likely to be assessed as being of **negligible** to **small** magnitude. On any non-designated HLT of **low** to **medium** value, this would result in a **neutral** to **minor** adverse effect, which is **not significant**.

Summary of Construction Effects

- 8.6.74 Given the embedded design measures, for example at Hintlesham Hall, the good practice measures outlined in the Outline CoCP (such as GG01, GG03, GG06, GG07, GG08, LV01, LV02, LV03, H01 and H02), and the predominantly temporary nature of the potential construction impacts on the setting of heritage assets, the potential for likely significant effects during construction on the historic environment is greatly reduced.
- 8.6.75 The key impact during construction on the historic environment is ground disturbance and the potential for physical effects on non-designated archaeological remains.

Summary of Operational Effects

- 8.6.76 Direct physical impacts during operation on all aspects has been scoped out. Adverse effects in the setting of heritage assets are most likely to be significant in areas where the project would:
- create a new overhead line where there was none previously; and
 - where the new overhead line runs in parallel to an existing line that is to be retained.
- 8.6.77 Areas where the proposed 400kV overhead line will replace the existing 132kV overhead line are less likely to create a level of change to the baseline setting of heritage assets that would be significant. The proposed above ground infrastructure (CSE compounds and the GSP substation) is also unlikely to result in significant effects, as embedded design and good practice measures, including proposed planting, are likely to effectively limit intervisibility.
- 8.6.78 There is also the potential for beneficial effects on the setting of heritage assets where the current overhead line would be removed, for example within the Dedham Vale AONB and the Stour Valley Project Area, which may be significant.

8.7 Sensitivity Testing

Flexibility in Construction Programme

- 8.7.1 This chapter assumes the base construction schedule described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be

no new or different likely significant effects to those identified in the baseline scenario assessed in Section 8.6.

Flexibility in Design

- 8.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD.
- 8.7.3 Changes to pylon position would have implications for the level of intervisibility with heritage assets and may result in either an increased or decreased level of harm to the setting of individual receptors. For example, moving a pylon location into an area with a higher potential for visual intervention, either through existing vegetation, the natural topography or in accordance with existing infrastructure, would likely decrease the significance of potential effects on heritage assets. This will continue to be reviewed as the designs evolve and an update presented within the ES.

8.8 Proposed Mitigation

- 8.8.1 This section sets out the proposed mitigation for the likely significant effects outlined in Section 8.6. These mitigation measures are additional to the good practice measures outlined within Appendix 4.1: Outline CoCP.

Construction

- 8.8.2 There is the potential for significant effects on non-designated archaeological remains during construction of the overhead line (including CSE compounds), the underground cables and the GSP substation. National Grid has committed to undertaking a programme of archaeological works, which will be secured through a requirement in the DCO. Appendix 8.2: Archaeological Framework Strategy outlines the measures that would be carried out as part of a proportionate programme of archaeological works to record and advance the understanding of any heritage assets affected by the project.

Operation

- 8.8.3 There is the potential for significant effects on the setting of listed buildings and non-designated HLT (including protected lanes) during operation of the overhead lines. A full impact assessment will be undertaken and reported with the ES in order to establish the full nature of these potential impacts, and mitigation identified accordingly.
- 8.8.4 Specifically, there is the potential for a significant effect on Hintlesham Hall (NHLE 1036917; grade I) and the Service Ranges, Stables, Former Coach House and Brewhouse Attached to Hintlesham Hall (NHLE 1036918; grade II*). Specific mitigation measures would include landscape planting, the preliminary proposals for which would be secured through a requirement in the DCO. The planting would provide an appropriate level of visual intervention through enhancement of the current vegetation, while still maintaining a level of interconnectivity between the buildings and the surrounding landscape. There is also the potential to enhance the setting of Hintlesham Hall through the considered placement of vegetation which reinstates or reinforces elements of the historic designed landscape. National Grid is discussing the mitigation proposals with Historic England.

8.9 Residual Significant Effects (With Mitigation)

8.9.1 Table 8.6 summarises the likely significant effects, proposed mitigation and residual effects for the historic environment during construction and operation.

Table 8.6: Summary of Likely Significant Effects

Aspect	Likely Significant Effect (Without Mitigation)	Proposed Mitigation	Residual Significant Effect (With Mitigation)
Construction			
All areas (overhead line, underground cables and GSP substation): Direct impact on non-designated archaeological remains through below ground disturbance.	Long-term minor to major adverse	A programme of archaeological works as outlined in Appendix 8.2: Archaeological Framework Strategy.	Long-term neutral to minor adverse
Underground cables: Loss of characteristic features of non-designated HLT (including protected lanes) that cannot be replaced <i>in situ</i> .	Long-term neutral to moderate adverse	Where reinstatement of landscape element such as vegetation is not possible, planting in alternative locations would be used to enhance the character of the historic landscape overall	Long-term neutral to minor adverse
Operation			
Overhead lines: Designated historic buildings (not including conservation areas)	Long-term minor to moderate adverse	Detailed design measures such as protecting and maintaining landscape elements which enhance the setting of historic buildings and the use of appropriate landscape planting for screening.	Long-term neutral to minor adverse
Overhead lines: Non-designated historic landscapes (not including protected lanes)	Long-term neutral to moderate adverse	Detailed design measures such as protecting and maintaining landscape elements and the use of appropriate landscape planting for enhancing the historic landscape and screening.	Long-term neutral to minor adverse
Overhead lines: Non-designated historic landscapes (not including protected lanes)	Long-term neutral to moderate beneficial	Not applicable.	Long-term neutral to moderate beneficial

8.10 Conclusion

- 8.10.1 This chapter presented the results of a preliminary assessment which has identified the likely significant effects on the historic environment, in accordance with the requirements set out within the NPS. With the proposed mitigation in place, no residual significant adverse effects have been identified for the historic environment. This preliminary assessment also identified where the project would result in a beneficial impact and make a positive contribution to the significance of heritage assets.
- 8.10.2 Further detailed assessment is required as part of the EIA process to clarify the value of individual heritage assets and the potential for this to be affected by the project.
- 8.10.3 This chapter outlined how embedded and good practice measures, supplemented by mitigation measures where required, would be established to ensure that designated heritage assets would not be substantially harmed.
- 8.10.4 It is recognised that the project is likely to have an impact on archaeological remains, and Appendix 8.2: Archaeological Framework Strategy outlines the steps to be taken to ensure that the impact on archaeological remains are clearly identified and that appropriate procedures are in place for the treatment of any as yet undiscovered archaeological remains.

9. WATER ENVIRONMENT

9.1 Introduction

- 9.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on the water environment. The receptors covered within this chapter comprise surface water features (e.g. rivers and minor watercourses), functional floodplain and surface water interests such as abstractions and discharges.
- 9.1.2 During the construction phase, the temporary haul route would cross watercourses and ditches, which could affect water quality and flows. In addition, works would take place within the floodplain, which could affect floodplain capacity and flood flows. The above ground features (GSP substation and the CSE compounds) are located within Flood Zone 1 (the lowest risk of the three categories of flood risk, as defined by the Environment Agency) and there are no permanent discharges or abstractions required on the project, there would be limited effects from the project during operation.
- 9.1.3 This chapter has links with other topic chapters, including Chapter 7: Biodiversity, which assesses the effects on aquatic species such as fish and eels; Chapter 10: Geology and Hydrogeology, which assesses the effects on groundwater; and Chapter 11: Agriculture and Soils, which assesses the effects on the land drainage properties of soils.
- 9.1.4 This chapter is supported by the following appendices and figures:
- Appendix 9.1: Water Environment Baseline;
 - Appendix 9.2: Water Framework Directive Screening Assessment;
 - Figure 9.1: Water Environment Features; and
 - Figure 9.2: Water Framework Directive Waterbody Status.

9.2 Regulatory and Planning Policy Context

National Policy Statement

- 9.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on the water environment which has been considered within this chapter.
- 9.2.2 Paragraph 5.15.2 of NPS EN-1 states, '*Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent*'.
- 9.2.3 Flood risk is also a consideration, and paragraph 5.7.4 of NPS EN-1 states, '*Applications for energy projects of 1 hectare or greater in Flood Zone 1 in England ... and all proposals for energy projects located in Flood Zones 2 and 3 ... should be accompanied by a flood risk assessment (FRA). ... This should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account*'.
- 9.2.4 NPS EN-5 contains paragraph 2.4.2 relating to the water environment, which states '*the resilience of the project to climate change should be assessed in the Environmental*

Statement (ES) accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment’.

Other Relevant Policy

- 9.2.5 Appendix 2.1: Local Planning Policy, lists the local policy potentially relevant to the water environment. The Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP29 and the Braintree District Council Local Plan (2017) Policies LPP78, LLP79 and LLP80 are relevant to the FRA. All of these policies advocate development in areas at low risk of flooding and the sustainable management of surface water runoff. Where development must be located in higher risk areas, it should be designed to be flood resilient and safe over the development lifetime, taking climate change into account. New development must not increase flood risk elsewhere, and the policies encourage incorporation of above ground, appropriate Sustainable Drainage Systems (SuDS) wherever possible.

9.3 Scoping Opinion

- 9.3.1 The scope of the assessment for the water environment has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.
- 9.3.2 Table 9.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 9.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction			
Watercourses	Water quality effects	Scoped out	(ID 4.4.1) The Inspectorate does not consider that there is sufficient information available to scope out effects of watercourse crossings during construction on water quality. The ES should therefore consider effects on water quality during construction (scoped in). This should include potential for adverse effects from break out of drilling mud onto the bed of the watercourse. Where temporary culverting is required, the ES should also set out the reasons for selection of the culverting method, and the alternatives considered.
Surface water abstractors and watercourses	Water abstraction	Scoped out	(ID 4.4.2) The Planning Inspectorate agrees to scope out this aspect, on the basis that water for trenchless crossings will be tankered in.

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Vulnerable infrastructure and communities	Effects on flood risk and drainage during construction	Scoped out	(ID 4.4.6) The Planning Inspectorate does not agree that this can be scoped out at this stage. Effects on flood storage, flow routes and rainfall infiltration and runoff rates should be scoped in to the ES. (ID 4.4.8) It is agreed that flood risk from the sea and reservoirs can be scoped out .
Watercourses	Baseline water quality data	No new surveys proposed to collect baseline data	(ID 4.4.9) The Planning Inspectorate agrees that no water quality surveys are required and these can be scoped out of the ES.

Operation

Watercourses	Water quality effects during operation	Scoped out	(ID 4.4.3) The Planning Inspectorate agrees that this can be scoped out due to a lack of pathways to surface water receptors once the project is in place.
Surface water abstractors and dischargers	Effects on existing abstractors and discharges during operation	Scoped out	(ID 4.4.4) The Planning Inspectorate agrees that this can be scoped out based on a lack of permanent effects on watercourse flow regimes and water quality.
Watercourses	Effects on hydromorphology during operation	Scoped out	(ID 4.4.5) The Planning Inspectorate agrees that this aspect can be scoped out as watercourses would be reinstated once construction is complete.
Vulnerable infrastructure and communities	Effects on flood risk and drainage during operation	Scoped out	(ID 4.4.7) The Planning Inspectorate does not consider that there is sufficient information at this stage to scope out effects on groundwater flood risk and overland fluvial flow paths (scoped in).

9.3.3 There is agreement from the Planning Inspectorate to scope out operational effects on several attributes of water environment receptors. These include effects on the hydromorphology (ID 4.4.5), water quality of rivers and other waterbodies (ID 4.4.3) and effects on existing surface water abstractions and discharges (ID 4.4.4). It has also been agreed the flood risk to the project and other vulnerable infrastructure and communities from the sea and reservoirs can be scoped out of the FRA (ID 4.4.8).

9.3.4 Table 9.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed by the project.

Table 9.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.4.8) information on the existing sewage network and any connections to it should be provided.	Chapter 4: Project Description states that no new sewage connections are proposed. The GSP substation would require a waste/foul water system (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 amenities buildings.
(ID 4.4.10) There should be sufficient crossovers and linkages between those chapters that have interrelationships, in particular Water Environment and Geology and Hydrogeology.	Key interrelationships between surface and groundwater receptors are captured in Section 9.6. Potential for effects on groundwater as a source of flood risk will also be addressed within the FRA.
(ID 4.4.11) Baseline data presented in the PEI Report should include any relevant data supplied by the Environment Agency and LLFA, such as information regarding private water supplies.	Additional baseline data has been collected from the Environment Agency and the LLFA, including information on private water supplies. This data is presented in Section 9.5, with information on private water supplies provided in Chapter 10: Geology and Hydrogeology.
(ID 4.4.12) Trenchless methods can have potentially significant environmental effects e.g. due to dewatering of excavations or from run-off of soil to watercourses and should be addressed in the ES where significant effects are likely to occur.	The potential effects of the dewatering of excavations and trenchless methods of construction are presented in Chapter 10: Geology and Hydrogeology.
(ID 4.4.13) The ES should take into account the latest Environment Agency guidance on climate change, including climate change allowances (currently UKCP18).	The project is accounting for the latest Environment Agency guidance on climate change, in particular climate change allowances for rainfall intensity. This will inform surface water drainage design for above ground infrastructure, e.g. the GSP substation and CSE compounds. Further details will be provided in both the ES and the FRA.
(ID 4.4.14) There is no specific reference to potential effects of piling on existing abstractions. The ES should consider the effects of piling on relevant receptors where significant effects are likely to occur.	The effects of piling on existing groundwater and surface water fed abstractions are assessed in Chapter 10: Geology and Hydrogeology.

Project Engagement

- 9.3.5 National Grid has held several meetings with relevant organisations, including the Environment Agency, and Essex County Council and Suffolk County Council in their role as LLFAs, as summarised in Chapter 3: Scoping Opinion and Consultation. This has included discussing the good practice measures within the Outline CoCP.

9.4 Approach and Methods

9.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on the water environment. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Sources

9.4.2 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:

- Anglian River Basin Management Plan (RBMP) (Environment Agency, 2015);
- Catchment data explorer database of Cycle 2 WFD information (Environment Agency, 2020a);
- East Suffolk Drainage Board internal drainage district map (East Suffolk IDB, 2021);
- Water quality data archive (Environment Agency, 2021b);
- Long-term flood risk map for England (Environment Agency, 2021a);
- Flood Map for Planning (Environment Agency, 2021e);
- Main River map for England (Environment Agency, 2019);
- Historic Flood Map (Environment Agency, 2021d); and
- Flood Estimation Handbook webservice (UK Centre for Ecology and Hydrology, 2021) defining surface water catchment areas and hydrological properties (e.g. rainfall, slopes, soil permeability).

9.4.3 In addition, data requests have been made to the Environment Agency, Suffolk County Council and Essex County Council (in their role as LLFAs) and Braintree District Council and Babergh and Mid Suffolk District Council to provide information on the following to support the assessment:

- consented discharges to surface waters and licensed abstractions from surface waters;
- deregulated surface water abstractions (private water supplies);
- information on historical flood events; and
- modelled flood water level and flood extent data from the Rivers Stour, Box, Brett and the Belstead Brook.

9.4.4 All of the information received has been incorporated into the baseline environment description presented in Section 9.5, excluding information on private water supplies, which is presented in Appendix 10.1.

Site Survey

9.4.5 The desk study has also been supported by information gathered during ecology site walkovers, in particular otter and water vole surveys in June 2021. Details of these surveys are provided in Chapter 7: Biodiversity. Photographs and relevant field notes have been incorporated in Appendix 9.2: WFD Screening Assessment.

- 9.4.6 Both Essex and Suffolk County Council have stated that no mapping of ordinary watercourses is available for the draft Order Limits, so a walkover survey will be undertaken to map all watercourses within the draft Order Limits.

Study Area

- 9.4.7 The study area for the water environment includes land and water features directly affected by the project and is currently assumed to be 500m around the draft Order Limits (Figure 9.1). The study area includes reaches of watercourses and floodplains that will be crossed by, or be likely to receive discharges from, the project, extending 500m downstream. This is considered an appropriate study area based on technical knowledge of similar projects and has been set following consideration of the distance over which likely significant effects can reasonably be expected to occur. The study area has been discussed in meetings with the Environment Agency and the LLFAs.

Assessment Methodology

- 9.4.8 The assessment is based on guidance set out in the DMRB LA 113 (Highways England *et al.*, 2019a). This promotes assessment that is proportionate to the scale and nature of the proposals and that considers the sensitivity of the local water environment to change. A range of other guidance specific to assessing the flood risk and land drainage effects of development projects (a list of which was set out in Appendix 2.1 of the Scoping Report), as well as compliance with the requirements of the WFD have also been followed.
- 9.4.9 For the PEI Report, likely significant effects have been assessed using professional judgement considering the sensitivity (or value) of the water environment receptors within the study area, and the magnitude of change (impact) likely to be caused by project activities. These factors are combined to give an overall significance of effect. The assessment has been undertaken based on available project design information. This information is iterative and will be updated for the ES as the design evolves and relevant changes accounted for in the assessment.
- 9.4.10 Appendix 5.1 contains the value (sensitivity) and magnitude tables that form the basis of the assessment relevant to this chapter. Significance has been derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the EIA Regulations 2017, are effects of moderate or greater significance.

Preliminary Assessment Key Parameters and Assumptions

- 9.4.11 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.
- 9.4.12 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.

- 9.4.13 It is currently assumed that no new abstractions or discharges are required for the project. It is also assumed that the trenchless crossing at the River Stour would use water brought to site in tankers.
- 9.4.14 It is also assumed that dewatering is not required for the open cut trenches or trenchless crossings, except to remove rainwater and any groundwater seeping into temporary excavations. It has been assumed that these discharges would be made to ground, rather than to watercourses. As set out in Chapter 4: Project Description, it is assumed that drainage design for the GSP substation and CSE compounds would be in the form of soakaways and French drains.
- 9.4.15 As stated in Chapter 4: Project Description, the River Stour would be crossed via trenchless methods and other rivers would be crossed via open cut methods. In terms of the haul route, it is assumed that a bailey bridge would be used for crossing the River Brett, Box and Stour. The bailey bridge for the River Stour would be of a sufficient size and design to allow non-motorised vessels to continue to navigate the river during construction. Minor watercourses would be crossed using temporary culverts along construction haul routes, with banks excavated to install the culvert and the watercourse subsequently reinstated at the end of construction.

Further Assessment Within the ES

- 9.4.16 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. The ES will include a crossing schedule, which will document the temporary works expected for each watercourse within the draft Order Limits.

9.5 Existing Baseline

Watercourses, their Water Quality and Hydromorphology

- 9.5.1 There are five main rivers in the study area (Figure 9.1) namely the Belstead Brook, the River Brett, the River Box, the River Stour and the Henny Meadow Fleet. There are also numerous tributaries of these rivers, classified as ordinary watercourses. The watercourses generally flow in a northwest to southeast direction towards the Stour and Orwell Estuaries. Their catchments can be categorised as generally rural in their land use, with moderately sloping topography, receiving an average annual rainfall ranging from approximately 580mm to 600mm (UK Centre for Ecology and Hydrology, 2021).
- 9.5.2 Most of the study area is in a Drinking Water Safeguard Zone (surface water) as defined by the Environment Agency. A large zone (Ref. SWSGZ1024) covers the catchments of the Rivers Brett, Box and Stour and Henny Meadow Fleet. This is noted to be at risk from pesticides. The Belstead Brook catchment is included within zone SWSGZ1022 where the risk is also attributed to pesticides.
- 9.5.3 With the exception of the Henny Meadow Fleet, the main rivers are all included within the Anglian RBMP (Environment Agency, 2015). Baseline WFD status data (Environment Agency, 2020a) is summarised in Table 9.3.

Table 9.3: Summary of WFD Status Data (Cycle 2) (Environment Agency, 2020a)

Waterbody	Overall Status	Ecological Status	Chemical Status
Belstead Brook	Poor	Overall – Poor	Overall – Fail

Waterbody	Overall Status	Ecological Status	Chemical Status
		Biological – Poor Hydromorphology – Supports Good Physico-chemical – Moderate Specific Pollutants – High	Priority Hazardous Substances – Fail Priority Substances – Good
River Brett	Moderate	Overall – Moderate	Overall – Fail
River Box	Moderate	Biological – Moderate Hydromorphology – Supports Good Physico-chemical – Moderate Specific Pollutants – High	Priority Hazardous Substances – Fail Priority Substances – Good
River Stour (Lamarsh to R. Brett)	Moderate	Overall – Moderate Biological – Good Hydromorphology – Supports Good Physico-chemical – Moderate Specific Pollutants – High	Overall – Fail Priority Hazardous Substances – Fail Priority Substances – Good

- 9.5.4 As Table 9.3 shows, the waterbodies share similar quality characteristics. The Rivers Stour, Box and Brett all share a Moderate overall status and are failing with regard to chemical status. The Belstead Brook is currently (Environment Agency, 2020a) achieving Poor overall status and is failing regarding chemical status.
- 9.5.5 Reasons for not achieving Good status common to all these waterbodies are reported as point source pollution from wastewater treatment works; diffuse pollution due to poor agricultural and soil management; and physical modifications causing barriers to the movement of aquatic species. The RBMP sets out measures for the waterbodies to help them reach a target status of Good by 2027. These focus on improving wastewater treatment to reduce phosphate discharges, as well as measures to improve fish passage, for example the installation of fish passes. Further details are provided in Appendix 9.2: WFD Screening Assessment.
- 9.5.6 The Environment Agency also monitors a range of parameters that are indicators of water quality on the main rivers in the study area (except for the Henny Meadow Fleet) (Environment Agency, 2021a). Available data has been reviewed and is summarised in Appendix 9.1: Water Environment Baseline, with monitoring locations illustrated in Figure 9.1. The data indicates that, for most parameters, measured values are within typical ranges for achieving ‘High’ WFD status. The exception on all the watercourses is orthophosphate, which is recorded in concentrations that are indicative of nutrient enrichment.
- 9.5.7 In accordance with the criteria presented in Appendix 5.1, the water quality attributes of the Rivers Brett, Box and Stour and the Belstead Brook are assigned **high** sensitivity (value). This is because they are all named in an RBMP and have Q95 flows less than 1m³/s. The Henny Meadow Fleet and several ordinary watercourses in the study area are assigned **medium** sensitivity, as these watercourses are not named in the RBMP and, due to their catchment sizes, support Q95 flows generally exceeding 0.001m³/s. Some of the smaller ordinary watercourses are likely to meet the criteria for **low** sensitivity, as they

support lower summer flows, or dry out, but a precautionary **medium** sensitivity has been assigned for the PEI Report.

- 9.5.8 With regard to their physical form, many of the watercourses in the study area have been subject to modifications for the purposes of land drainage and flood defence. All of the main rivers noted above, except for the Belstead Brook, have a 'heavily modified' designation. The ordinary watercourses in the study area also serve a land drainage function and have a relatively low hydromorphological diversity, typically having uniform channel profiles and straightened channel forms. Further details are presented in Appendix 9.2: WFD Screening Assessment.
- 9.5.9 The hydromorphological attributes of the watercourses in the study area are therefore assigned values of **high** sensitivity for the Belstead Brook (not designated as heavily modified), **medium** sensitivity for the other main river watercourses, and **low** sensitivity for the ordinary watercourses. This is because these primarily serve a land drainage function and have the least hydromorphological diversity.

Existing Water Interests (Surface Water Abstractions and Discharges)

- 9.5.10 Data to characterise existing water interests has been collected from the Environment Agency and district councils. The data, which is presented in Appendix 9.1: Water Environment Baseline and illustrated in Figure 9.1, shows that watercourses in the study area receive, transport and dilute consented and informal discharges. There are multiple consented discharges from single and groups of domestic dwellings, involving small volumes (typically less than 5Ml/d) and several consents for larger volumes of discharges from wastewater pumping stations and treatment works.
- 9.5.11 The Rivers Box, Brett and Stour also support abstraction of water for a range of uses, including agricultural spray irrigation, and industrial processes. These abstractions and discharges influence the quantity and quality of water in the rivers.
- 9.5.12 In accordance with the value criteria presented in Appendix 5.1, the discharges and abstractions are locally important, and abstractions support non-potable uses. The water supply and wastewater transport and dilution attributes of the rivers are therefore assigned **medium** sensitivity.
- 9.5.13 Information on private water supplies is provided in Appendix 10.1: Geology and Hydrogeology Baseline.

Flood Risk and Land Drainage

- 9.5.14 Based on the online Flood Maps (Environment Agency, 2021a), the main sources of flood risk within the study area are the River Brett, River Box, River Stour and Belstead Brook, with areas of Flood Zones 2 and 3 (medium to high risk) associated with these watercourses. As the project is classified as essential infrastructure, the floodplains of the watercourses in the study area are assigned **very high** sensitivity in line with the criteria presented in Appendix 5.1. However, most of the study area is at low risk of flooding from rivers (in Flood Zone 1), as illustrated in Figure 9.1.
- 9.5.15 Baseline flood conditions within the mapped Flood Zones 2 and 3 have been characterised using data from available Environment Agency flood models. Table 9.4 presents a summary of the key data describing baseline river flooding conditions within the study area.

Table 9.4: Summary of Environment Agency Fluvial Flooding Data

Flood Model (Date)	Width of 1 in 100-year flood extent at the project crossing location (m)	1 in 2-year flood level at the project crossing location (m AOD)	1 in 50-year flood level at the project crossing location (m AOD)	1 in 100-year flood level at the project crossing location (m AOD)
Essex, Norfolk and Suffolk: Belstead Brook (2015)	78	21.60	21.90	21.94
River Box Broadscale model (2018)	123	18.92	No data	19.29
Stour Middle (2019)	480	19.80	20.60	20.72

- 9.5.16 The data presented gives an indication of baseline flood conditions near the project crossings of these watercourses for a range of flood events, from more frequent events to those with a low annual probability. The data will be used, together with topographical data, to inform the FRA that will be prepared for the project.
- 9.5.17 The Environment Agency has also supplied information about existing flood defences within the study area. There are three defences, all situated on the banks of the River Stour: two of the defences are located upstream and downstream of the draft Order Limits, with one defence (asset ID 149771) located within the draft Order Limits. The defences comprise raised earth embankments that have an overall condition grade of 3 (Fair). No details on the standard of protection offered by these defences have been provided.
- 9.5.18 Flood risk from surface water runoff varies across the study area, with most areas at low risk from this source. Areas mapped as at higher risk closely align with watercourse corridors. Environment Agency data indicates that, in higher risk areas, the depths of surface water flooding are expected to be relatively shallow (less than 300mm).
- 9.5.19 With regard to other potential flooding sources, the Environment Agency reservoir flood risk map shows that the project is not at risk of flooding from this source and, given the project's inland location, there is no flood risk from the sea.
- 9.5.20 The rural setting corresponds to a low risk of flooding from sewers. Further information on the sewer network will be collected, and information regarding any connections to this network will be provided in the FRA.
- 9.5.21 Available data indicates that groundwater poses a low risk as a source of flooding. Further assessment of the project's interactions with groundwater aquifers and any resulting effects on the groundwater flood risk baseline is provided in Chapter 10: Geology and Hydrogeology and will also be presented within the FRA.

Future Baseline

- 9.5.22 With regard to flood risk and drainage, future baseline conditions within the ES will be forecast, drawing on current best practice guidelines (Environment Agency, 2020b),

taking into account the likely impacts of climate change on rainfall intensities. These future conditions will be considered to factor in climate change resilience into the project drainage design.

- 9.5.23 The implementation of future cycles of WFD management plans driving future improvements in the ecological and chemical quality of waterbodies has been considered when assigning value to water environment resources and receptors.

9.6 Likely Significant Effects (Without Mitigation)

- 9.6.1 This section sets out the likely significant effects of the project on the water environment. It assumes that the relevant embedded measures and good practice measures outlined within Appendix 4.1: Outline CoCP are in place before assessing the effects.
- 9.6.2 Effects on watercourses, their water quality and hydromorphology are scoped out for operation, and effects on existing surface water interests (abstractions and discharges) have been scoped out for both construction and operation (see ID 4.4.3 and ID 4.4.4 respectively in Table 9.1).

Embedded and Good Practice Measures

- 9.6.3 The project has avoided sensitive features such as areas at medium and high risk of river flooding (defined by Flood Zones 2 and 3) when locating the most vulnerable project infrastructure, such as the GSP substation and CSE compounds.
- 9.6.4 It is proposed to cross the River Stour, which is the widest, deepest watercourse within the study area, using a trenchless construction method to reduce disturbance within the riparian corridor and avoid physical changes to the riverbed and channel (embedded measure, see Table 4.1 in Chapter 4: Project Description).
- 9.6.5 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to the water environment. These include measures to safeguard surface water quality during construction (e.g. W09 and W10) and measures to manage construction site runoff, land drainage and temporary works in the floodplain, to prevent increases in flood risk (e.g. W03 to W08). In addition, the pylons would be located at a suitable distance (16m) to avoid any direct disturbance to main river watercourses (W14).
- 9.6.6 Any works with the potential to affect the floodplain or flow regime of a main river would be subject to consent under the Environmental Permitting (England and Wales) Regulations 2017. Similarly, works with potential to impede land drainage or the flow regime of any ordinary watercourse would be subject to consent under the Land Drainage Act 1991.

Construction

Practices Common to Overhead Line and Underground Cables

Watercourses, their Water Quality and Hydromorphology

- 9.6.7 During construction, new crossings of watercourses would be required for temporary access and could result in channel bed/bank modifications causing disruption to flow regimes and increased flood risk. There is also an associated risk of pollution from construction traffic using these temporary access routes, for example linked to mud from tyres and other debris entering the watercourses. Other construction activities with a risk of opening pollution pathways to water environment receptors include the dewatering of excavations and drilling for trenchless crossings (with potential for outbreaks of drilling

muds). There would also be changes to land surface permeabilities at the GSP substation, CSE compounds and at permanent access tracks which could disrupt the current land drainage regime. There would be limited potential for likely significant effects during operation as the working areas, including watercourse crossing and existing land drainage regimes, would be reinstated.

- 9.6.8 There are five main rivers within the draft Order Limits (illustrated in Figure 9.1), namely the Belstead Brook, the River Brett, River Box, the River Stour and the Henny Meadow Fleet. There are also ordinary watercourses within the draft Order Limits which will be quantified following a walkover survey.
- 9.6.9 Temporary crossings of watercourses would be required for access (both main rivers and ordinary watercourses) during construction. The River Brett, River Box and River Stour would be crossed by clear spanning bailey bridges, while the smaller watercourses, including the Belstead Brook and Henny Meadow Fleet, would be crossed by temporary culverts. The River Stour crossing will be designed to allow continued navigation of the river by small vessels. Works to construct these crossings could open pollution pathways to these watercourses, as well as to temporarily and locally degrade the hydromorphology of the watercourses.
- 9.6.10 The watercourse crossing design would follow the good practice measures set out within the Outline CoCP (Appendix 4.1). In addition, the construction accesses would be undertaken within any conditions set out within the consents and permits from the relevant authorities (Environment Agency for main rivers, and the LLFA for ordinary watercourses).
- 9.6.11 The good practice measures within the Outline CoCP will reduce pollution risks and the impacts of the temporary watercourse crossings to a **negligible** magnitude (on watercourses assigned a **low** to **high** sensitivity depending on the watercourse in question). Therefore, it is considered that there would be **minor** to **neutral** effects on the quality attributes of the water environment (depending on the watercourse) which would be **not significant**.
- 9.6.12 Whilst temporary effects on the hydromorphology of the watercourses that are crossed cannot be avoided, the design of temporary crossings would reduce temporary effects on the watercourses flow regimes and channel forms. For the smaller ordinary watercourses, assigned **low** sensitivity, an impact of **small** magnitude is assessed, with **minor** adverse effects that are **not significant**.
- 9.6.13 For the larger main river watercourses to be crossed by bailey bridges, assigned **high** sensitivity, an impact of **negligible** magnitude is assessed, with a **neutral** effect that is **not significant**. The exception is the Belstead Brook which has **high** sensitivity. This is assessed as a **small** magnitude impact, with a **minor** effect that is **not significant**.

Existing Water Interests (Surface Water Abstractions and Discharges)

- 9.6.14 The potential for effects on existing water interests are linked to changes in flow regime and/or water quality, any detriment to which would reduce the capacity of the rivers to support existing abstractions or assimilate existing discharges. The water supply and wastewater transport and dilution attributes of the Rivers Box, Brett and Stour and several of their ordinary watercourse tributaries have been assigned **medium** sensitivity. An impact magnitude of **no change** on existing water interests during construction is assessed, with an overall **neutral** effect that is **not significant**.

9.6.15 An assessment of impacts on private water supplies is provided in Chapter 10: Geology and Hydrogeology.

Flood Risk and Land Drainage

9.6.16 The floodplains of the River Brett, River Box, River Stour and Belstead Brook lie within the draft Order Limits (Flood Zones 2 and 3, **medium to high** sensitivity).

9.6.17 There is the potential for the project to increase flood risk during construction through the creation of soil stockpiles and temporary works areas, which could result in the temporary loss of floodplain storage or could impede flood flows.

9.6.18 The project would introduce new areas of temporary impermeable land cover, such as construction compounds and haul routes, along the cable section and roads providing access to pylons, along with topsoil stripping and earthworks, which could locally reduce rainfall infiltration rates, increase runoff rates and induce overland flow during construction. This could contribute to localised changes to the land drainage regime, resulting in ponding of water or waterlogging of soils. Areas with a sloping topography where topsoil has been stripped would be particularly vulnerable to these changes.

9.6.19 The design provides for stone roads for pylon access tracks which have a degree of permeability, and good practice measures (e.g. W07, GG15) in the Outline CoCP, will combine to reduce the magnitude of impact. The haul routes and compound areas (which are located outside of the floodplain (Flood Zones 2 and 3)) would have suitable drainage provision that encourages infiltration of surface water runoff to ground, for example French drains. Therefore, it is considered that there would be **negligible** magnitude of impact on the flood storage and floodplain flow attributes (of **very high** sensitivity). Considering the nature and footprint of the project and using professional judgement, the effect would be **minor** and **not significant**.

9.6.20 Consequently, changes to the land drainage regime and rainfall infiltration and runoff patterns are assessed to be of **negligible** magnitude on receptors, which include local land uses and the project itself, ranging in sensitivity from **medium** to **very high**. Therefore, there would be a **neutral** effect. In addition, works affecting the land drainage regime would be temporary and localised, with land reinstated on completion of construction works. Considering the nature and footprint of the project, and using professional judgement, any adverse effect would be **not significant**.

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Watercourses, their Water Quality and Hydromorphology

9.6.21 The new 400kV overhead line sections of the project would require construction works in the Belstead Brook and the River Brett catchments. Works to remove the existing 132kV overhead line would take place just in the Belstead Brook catchment, the draft Order Limits crossing Bestead Brook in two locations.

9.6.22 In the overhead line sections, the amount of topsoil strip would be less than in cable sections, so the potential for surface water quality to deteriorate from receiving silted runoff is comparatively lower. The good practice measures within the Outline CoCP will reduce pollution risks to a **negligible** magnitude. Therefore, it is considered that there would be **minor** effects on the water quality attributes of the Belstead Brook and the River Brett (**high** sensitivity) and a **neutral** effect on their ordinary watercourse tributaries (**medium** sensitivity). These effects would be **not significant**.

- 9.6.23 During the new 400kV overhead line construction and existing 132kV overhead line removal works, there would be limited physical disturbance to the channels, beds, riparian corridors or flow regimes of these rivers. The closest pylons to be removed, lie approximately 75m from the Belstead Brook. In addition, there would be no construction compounds in close proximity (none within 100m of a main river). Very localised disturbances at watercourse access crossings are assessed above.
- 9.6.24 The CSE compounds are located in the catchments of the River Stour (including its main river tributary the Henny Meadow Fleet) and the River Box. The CSE compounds are small in size and would be situated far (more than 1km) from the rivers.
- 9.6.25 As a result of the distance between the River Box and River Stour (all **high** sensitivity) and its tributary the Henny Meadow Fleet (**medium** sensitivity), and the CSE compounds, there would be no pathways for potential pollutants arising from construction activities at the CSE compound sites, for example silted runoff, to reach these receptors. An impact magnitude of **no change** is therefore assessed on the water quality attributes of these watercourses. Combined with their **high/medium** sensitivity, the overall effect would be **neutral** and **not significant**.

Flood Risk and Land Drainage

- 9.6.26 The pylons associated with the new 400kV overhead line sections of the draft Alignment, and the pylons to be removed from the existing 132kV overhead line, are all located outside of Flood Zone 3. The CSE compounds are located in the low-risk fluvial flood zone (Flood Zone 1).
- 9.6.27 The Outline CoCP contains good practice measures (e.g. W07, GG15) to reduce the magnitude of impact. Therefore, it is considered that there would be **negligible** magnitude impacts on the flood storage and floodplain flow attributes of the Belstead Brook and the River Brett (**high** sensitivity), the overall effect would be **minor** and **not significant**.
- 9.6.28 Consequently, changes to the land drainage regime and rainfall infiltration and runoff patterns are assessed to be of **negligible** magnitude on receptors of **medium** sensitivity. Therefore, there would be a **neutral** effect. In addition, works affecting the land drainage regime would be temporary and localised, with land reinstated on completion of construction works, such that any adverse effect would be **not significant**.
- 9.6.29 Whilst piled foundations may be required for the proposed pylons and CSE compounds, the majority of the construction activities would take place above the groundwater table, and piling, if required, would be undertaken in accordance with the recommendations of site-specific Foundation Works Risk Assessments (GH06). As a result, there would be **negligible** magnitude impacts on existing groundwater flows and levels, and effects on baseline groundwater flood risk would be **not significant**. Further details on groundwater levels and flows are provided in Chapter 10: Geology and Hydrogeology.

Underground Cables

Watercourses, their Water Quality and Hydromorphology

- 9.6.30 The River Stour and River Box would be crossed by underground cable sections of the project. A trenchless crossing of the wider, deeper River Stour is proposed, whereas the River Box, which is narrower, and any smaller ordinary watercourses, would be crossed by an open cut method.
- 9.6.31 Whilst a trenchless crossing would avoid physical disturbance to the flow regime and form of the River Stour channel and riparian corridor, the technique is not without risk of

pollution, associated with inadvertent releases of drilling fluids/muds. Open cut crossings could cause sedimentation of watercourses.

- 9.6.32 The design of the crossing methods will follow the good practice measures set out within the Outline CoCP, and the designs will need to be in accordance with any conditions set out within the consents and permits from the relevant authorities (Environment Agency for main rivers, and the LLFAs for ordinary watercourses).
- 9.6.33 Soil stripping and the subsequent stockpiling and storage of soil also could cause deterioration of surface water quality through silted or polluted runoff. In the cable section of the project, the width of soil stripping would be more extensive (approximately 100m corridor) than in overhead line section. However, the protocols described in the Outline CoCP would manage runoff and reduce the potential for pollution via this pathway.
- 9.6.34 Consequently, the change to the water quality attributes of the River Stour and the River Box is assessed to be of **medium** magnitude on receptors of **medium** sensitivity. Therefore, there would be a **minor** effect. Any detriment to water quality would be temporary and localised such that any adverse effect will be **not significant**.
- 9.6.35 Interactions with groundwater in cable sections of the project are assessed in Chapter 10: Geology and Hydrogeology.

Flood Risk and Land Drainage

- 9.6.36 There are existing flood defences along the River Stour and there will need to be further discussions with the Environment Agency to understand the effects of any temporary works on the design and integrity of these. It is anticipated that any requirements in relation to the flood defences would be agreed as part of the protective provisions agreed with the Environment Agency.
- 9.6.37 The effects of the underground cable construction on flood risk and the land drainage regime in the catchments of the River Stour and River Box would be reduced by providing crossings that are suitably sized to accommodate the flow regimes of the rivers and by avoiding any large-scale stockpiling or storage of cable trench arisings in the floodplain.
- 9.6.38 The land drainage and rainfall infiltration and runoff regimes would experience very little change, given the nature of the works required, which would not introduce any large areas of impermeable land cover. Where areas of topsoil are stripped, rainfall runoff would be managed in accordance with the good practice measures in the Outline CoCP to reduce temporary ponding of overland flows in topographical low spots during periods of heavy rainfall.
- 9.6.39 Consequently, the change to flood risk and land drainage in the River Stour and the River Box catchments is assessed to be of **negligible** magnitude (+/- 10mm change to baseline flood levels) on receptors of **medium** sensitivity. Therefore, there would be a **neutral** effect. Any detriment to the rainfall infiltration and runoff regime would be temporary and localised such that any adverse effect would be **not significant**.

GSP Substation

Watercourses, their Water Quality and Hydromorphology

- 9.6.40 The GSP substation is located within the catchment of, but remote from, the River Stour. Potentially polluting construction activities would be managed in accordance with good practice measures described in Appendix 4.1: Outline CoCP. As such, there would be no likely pollution pathways to the River Stour. There would therefore be no change, so a **neutral** overall effect on the water quality of this river is assessed, which would be **not**

significant. Next to the GSP substation site, the headwaters of an ordinary watercourse flow north alongside the western boundary. The flow regime and water quality attributes of this watercourse (which are of **medium** sensitivity) would be protected during construction by the good practice measures in Appendix 4.1: Outline CoCP. A **negligible** magnitude of impact and a **neutral** overall effect on the water quality of this watercourse is assessed, which would be **not significant**.

Flood Risk and Land Drainage

- 9.6.41 The GSP substation would be constructed in Flood Zone 1. There would be no works within any floodplain, so no change to floodplain storage or flow routes, and consequently no change to baseline fluvial flood risk.
- 9.6.42 The GSP substation would be constructed on greenfield land, so changes to existing rainfall infiltration and runoff patterns would be induced. The GSP substation will incorporate drainage systems to appropriately manage surface water runoff from the site. This would be designed in accordance with commitment W12 in the Outline CoCP.
- 9.6.43 The change to the land drainage regime is assessed to be of **negligible** magnitude on receptors of **medium** sensitivity. There would therefore be a **neutral** effect that would be **not significant**.

Operation

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Flood Risk and Land Drainage

- 9.6.44 Once the new 400kV overhead line is complete and the existing 132kV overhead line has been removed, land and any associated land drainage would be reinstated, and all temporary watercourse crossings would be removed.
- 9.6.45 There would be a permanent impermeable footprint associated with the CSE compounds and their associated permanent access tracks. The majority of the CSE compound surface cover would comprise stone chippings, and the access track would have permanent drainage. The impermeable footprint of these elements would be small, and any above ground operational infrastructure would incorporate appropriate surface water drainage measures in accordance with commitment W07 and W12 in Appendix 4.1: Outline CoCP. Permanent change to flood risk and the land drainage regime is therefore assessed as of **negligible** magnitude and any effects would be **not significant**.

Underground Cables

Flood Risk and Land Drainage

- 9.6.46 Once the underground cables have been installed, the land (including watercourses and riparian habitat) would be reinstated. Any land drainage would be reinstated in accordance with commitment AS05 in Appendix 4.1: Outline CoCP. There would be no impermeable footprint associated with the underground cable sections. Permanent change to flood risk and the land drainage regime is therefore assessed as **neutral**, and any effects would be **not significant**.
- 9.6.47 Most of the underground cable construction would take place above the groundwater table. As a result, there would be **neutral** effects on existing groundwater flows and levels, and effects on baseline groundwater flood risk would be **not significant**. Further details on groundwater levels and flows are provided in Chapter 10: Geology and Hydrogeology.

9.6.48 The potential for likely significant effects on all other attributes of receptors in the water environment during operation of the project have been scoped out.

GSP Substation

Flood Risk and Land Drainage

9.6.49 Surface water runoff from the GSP substation would be drained using appropriate SuDS techniques to meet the discharge requirements of the Essex LLFA (W12). The substation would not be permanently staffed, so low volumes of foul water drainage would be generated during operation. This would be discharged to the public foul sewer network in accordance with a utilities provider agreement. The change to the land drainage regime is assessed to be of **negligible** magnitude on receptors of **medium** sensitivity, resulting in a **neutral** effect that would be **not significant**.

9.6.50 The potential for likely significant effects on all other attributes of receptors in the water environment during operation of the project have been scoped out.

Summary of Construction Effects

9.6.51 The construction phase of the project, in particular construction of watercourse crossings for underground cables and for access, carries risks of opening pollution pathways to water environment receptors, and for temporary effects on their flow regimes. However, the watercourse crossings will be designed in accordance with good practice and would be in compliance with the consenting requirements for such works. There are **no likely significant effects** expected in relation to the water environment during construction.

Summary of Operational Effects

9.6.52 Flood risk and land drainage effects during operation have been avoided through design, locating vulnerable components, such as the GSP substation, in the low-risk flood zone, and managing surface water runoff from the GSP substation, as well as from haul roads and construction compounds, in accordance with good practice. There are **no likely significant effects** expected in relation to the water environment during operation.

9.7 Sensitivity Testing

Flexibility in Construction Programme

9.7.1 This chapter assumes the base construction programme described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be no new or different likely significant effects to those identified in the baseline scenario assessed in Section 9.6.

Flexibility in Design

9.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD. It is assumed that pylons would not be located within 16m of a main river or within 2m of an ordinary watercourse, based on Environment Agency guidance. This sensitivity testing

has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

9.8 Proposed Mitigation

- 9.8.1 The preliminary assessment has concluded that there are no likely significant effects in relation to water environment receptors during construction or operation. Therefore, no mitigation measures have been identified beyond the good practice measures set out in Appendix 4.1: Outline CoCP.

9.9 Residual Significant Effects (With Mitigation)

- 9.9.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to water environment receptors during construction or operation.

9.10 Conclusion

- 9.10.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to water environment receptors during construction or operation. In accordance with paragraph 5.7.4 of NPS EN-1, an FRA will be submitted as part of the application for development consent, and will document the project design measures included to make the project resilient to climate change.

10. GEOLOGY AND HYDROGEOLOGY

10.1 Introduction

- 10.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on geology and hydrogeology. The receptors considered within this chapter comprise hydrogeology (groundwater resources), mineral deposits and receptors that could be affected by contaminants in the soil, such as people, ecological receptors and water.
- 10.1.2 During construction, the project has the potential for effects to geology and hydrogeology through excavation or disturbance of soil that could be contaminated and through the installation of features, such as foundations, that disrupt natural groundwater movements or groundwater quality. Construction works, particularly associated with deeper excavations such as at trenchless crossings, can require dewatering which can affect groundwater levels. The project could also affect mineral resources by limiting the future potential for these to be extracted.
- 10.1.3 This chapter has links with other topic chapters including Chapter 9: Water Environment, which assesses the effects on surface water and also groundwater flood risk; Chapter 7: Biodiversity, which assesses the effects on GWDTE; and Chapter 11: Agriculture and Soils, which considers the effects of the project on soil. Effects on private water supplies are covered within this chapter.
- 10.1.4 This chapter is supported by the following appendix and figures:
- Appendix 10.1: Geology and Hydrogeology Baseline;
 - Figure 10.1: Contaminant Sources and Receptors; and
 - Figure 10.2: Mineral Reserves.

10.2 Regulatory and Planning Policy Context

National Policy Statement

- 10.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on geology and hydrogeology which has been considered within this chapter.
- 10.2.2 Paragraph 5.10.9 of NPS EN-1 states, '*Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place*'. In addition, paragraph 2.8.9 of NPS EN-5 states that electricity infrastructure, particularly underground cables, can have an impact on geology.

Other Relevant Policy

- 10.2.3 Appendix 2.1: Local Planning Policy lists the local policy potentially relevant to geology and hydrogeology. The Suffolk Minerals and Waste Local Plan (Suffolk County Council, 2020), Policy MP10, and the Essex Minerals Local Plan Review (Essex County Council, 2014), Policy S8, both define Mineral Safeguarding Areas (MSAs) and set out the approach to safeguarding minerals that are potentially viable to extract. The draft Order

Limits also cross Layham Quarry, which is subject to Policy MS5 in the Suffolk Minerals and Waste Local Plan.

- 10.2.4 The Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP17, and Braintree District Council Local Plan (2017) Policy LPP73, advocate that developments should take a precautionary approach where contamination is suspected and that there should be no unacceptable risk to health or the environment.
- 10.2.5 Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP18 gives a level of protection to local sites of geodiversity value.

10.3 Scoping Opinion

- 10.3.1 The scope of the assessment for geology and hydrogeology has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.
- 10.3.2 Table 10.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 10.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction and Operation			
Mineral reserves	Restriction of access to mineral reserves	Scoped out	(ID 4.5.8) The Planning Inspectorate does not agree with this being scoped out of the ES and suggests it is scoped in to the ES.
Construction			
Groundwater	Dewatering and discharge– effects to groundwater levels	Scoped in for trenchless crossings only	(ID 4.5.1) The Planning Inspectorate agrees on the proposed approach to undertake further scoping using the Environment Agency guidance and considers that this approach should be applied to all instances of temporary dewatering (scoped in).
Groundwater	Dewatering and discharge – pumped discharge	Scoped out	(ID 4.5.2) Given that there is no information available to determine the duration and location of dewatering activities, the Planning Inspectorate considers that further scoping should be applied to all instances of temporary dewatering (scoped in).
Groundwater	Spills or accidents involving plant to groundwater quality	Scoped out	(ID 4.5.4) Due to good practice measures set out in the Outline CoCP, the Planning Inspectorate agrees that this can be scoped out of the ES.

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Groundwater	Effects on groundwater quality and ground disturbance on flow	Scoped in for trenchless crossings only	(ID 4.5.5) The Planning Inspectorate agrees that it is unlikely that shallow depth excavations would give rise to likely significant effects; however, there is potential for change to flow that could impact shallow wells and/or create pathways to groundwater receptors at shallow depths. Therefore, this matter should be scoped in to the ES or a robust justification demonstrating the absence of transport pathways should be presented. This should also include consideration of potential for mobilisation of contamination around the Sudbury Branch Railway Line.
Groundwater, surface water, ecology and human health	Ground disturbance effects on receptors	Scoped in for potentially contaminated land, scoped out for non-contaminated land	(ID 4.5.6) Given the lack of baseline information, and as potential receptors or potential pathways are not yet defined, the Planning Inspectorate does not agree that non-contaminated land can be scoped out of the assessment (scoped in).
Operation			
Groundwater	Effects of dewatering and discharge	Scoped out	(ID 4.5.3) The Scoping Report indicates there is a potential requirement for discharges requiring a discharge consent from the GSP substation. Discharges from the GSP substation should be quantified and assessed within the ES, where significant environmental effects are likely to occur (scoped in).
Groundwater	Infiltration and recharge	Scoped out	(ID 4.5.7) The Planning Inspectorate agrees that effects of infiltration and recharge from new hardstanding are not likely to be significant and can be scoped out of the ES. However, new underground cabling could impact infiltration and recharge of groundwater and should be scoped in to the assessment where significant effects are likely to occur.

10.3.3 There are no permanent discharges required at the GSP substation (see paragraph 4.7.17 in Chapter 4: Project Description). Therefore, operational effects of dewatering and discharge associated with ID 4.5.3 will be scoped out of the assessment.

10.3.4 Table 10.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 10.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.5.9) The scope of the assessment should include consideration of impacts associated with the proposed trenchless crossings, including loss of cable oil to watercourses via groundwater, and creation of preferential pathways that could result in impact to habitats and flow volumes.	The likely significant effects of trenchless crossings on groundwater quality, habitats and flow volumes are presented in this chapter and will also be reported within the ES.
(ID 4.4.14) There is no specific reference to potential effects of piling on existing abstractions. The ES should consider the effects of piling on relevant receptors where significant effects are likely to occur.	The likely significant effects from piling on existing groundwater and surface water fed abstractions are presented in this chapter and will also be reported within the ES.

Project Engagement

10.3.5 National Grid has held a number of meetings with relevant organisations including the Environment Agency, Essex County Council and Suffolk County Council. These discussions are summarised in Chapter 3: Scoping Opinion and Consultation.

10.4 Approach and Methods

10.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on geology and hydrogeology. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Sources

10.4.2 The baseline environment has been defined by a desk study which has drawn on the following key information sources:

- British Geological Survey (BGS) online mapping for bedrock and superficial geology (BGS, 2021);
- BGS Hydrogeological Map of southern East Anglia (BGS, 1981);
- The Physical Properties of Minor Aquifers in England and Wales (BGS, 2000);
- The Physical Properties on Major Aquifers in England and Wales (BGS, 1997);
- Defra mapped information, via Magic.gov.uk (Defra, 2021c) for Source Protection Zones (SPZs), aquifer designations, hydrological features, groundwater vulnerability, drinking water safeguard zones and statutory designated sites;
- Landfill site locations for historical and active landfill sites (Environment Agency, 2020b; 2020c);
- Local Minerals Plan (Suffolk County Council, 2020) (Essex County Council, 2014) for mineral reserves;
- Information provided from local authorities, including contaminated land sites, private water supply information and sites of local geological interest;
- Information provided by the Environment Agency on groundwater abstraction licences;

- Phase 1 Environmental Studies for the project (RSK, 2013a-h) and Geotechnical Site Investigation Report (Cat Surveys Group Limited, 2013 a and b).

Site Survey

- 10.4.3 Ground investigation was undertaken in 2013 and reported prior to the project pause. These were undertaken within the underground sections (Section E: Dedham Vale AONB and Section G: Stour Valley), focusing within areas of proposed river crossings. Appendix 10.1: Geology and Hydrogeology Baseline contains a summary of the 2013 ground investigation results.
- 10.4.4 Further ground investigation is proposed over autumn/winter 2021. The results of this will be used to inform the project designs and will provide baseline information to support the geology and hydrogeology baseline presented in the ES.

Study Area

- 10.4.5 The study area for geology and hydrogeology comprises the area directly affected by the project (the draft Order Limits) as the focus for the detailed assessment. The 'wider study area' extends to 1km around the draft Order Limits to provide environmental context and identify potential receptors. This is considered an appropriate study area based on technical knowledge of similar projects.

Assessment Methodology

- 10.4.6 The proposed assessment methodology was set out within Chapter 10: Geology and Hydrogeology of the Scoping Report (National Grid, 2021b). Appendix 5.1 contains the value (sensitivity) and magnitude criteria that form the basis of the assessment relevant to this chapter. The likely significance of effect is derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable has been explained to give the rationale behind the values assigned. Likely significant effects in the context of the EIA Regulations 2017 are effects of moderate or greater significance.

Groundwater Receptors and Interests

- 10.4.7 In terms of groundwater flow, geological cross-sections will be undertaken following the proposed ground investigations and presented as part of the ES. These will be examined to identify any potential for low-permeability strata to be breached. In such cases, the respective groundwater levels above and below the low-permeability strata will be reviewed, and groundwater flow calculations will be used to determine whether the potential movement of groundwater through the breach created would impact significantly on receptors. In the event that a potentially significant effect is identified, this will be taken into account as part of any design evolution, and where required, mitigation measures will be set out within the ES.

Contaminated Land

- 10.4.8 The approach to assessing risks in relation to contaminated land is being undertaken following a tiered approach as recommended within the Environment Agency guidance on Land Contamination Risk Management (2021c). Tier 1 assessment results will determine whether Tier 2 assessment is necessary, and likewise, Tier 2 results will determine the need for Tier 3.

10.4.9 The defined Tiers are as follows:

- Tier 1: Preliminary risk assessment – a qualitative assessment of historical and published information, together with a site reconnaissance, undertaken in order to develop a preliminary conceptual site model and inform a preliminary risk assessment.
- Tier 2: Generic quantitative risk assessment – an assessment of ground condition data using published generic assessment criteria to screen the site and establish whether there are actual, or potential, unacceptable risks.
- Tier 3: Detailed quantitative risk assessment – detailed a quantitative assessment involving the generation of site-specific assessment criteria.

10.4.10 A Tier 1 preliminary risk assessment has been undertaken for the PEI Report. It is currently assumed that a Tier 2 assessment is not necessary, as the potential source risks identified are not above a moderate/low risk. However, the results of the Tier 1 assessment will be reviewed going forward, and any updates will be presented within the updated assessment within the ES.

10.4.11 In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences, a source-pathway-receptor methodology has been adopted. The contamination may be a hazard but does not constitute a risk unless a pathway and receptor are also present.

Mineral Resources

10.4.12 The Government's PPG for Minerals (MHCG, 2014) and the BGS Minerals Safeguarding in England: Good Practice Advice (BGS, 2011) provide guidance on how to implement national policy with respect to safeguarding of minerals and this will form the basis of the assessment.

10.4.13 The desk-based assessment has identified the baseline conditions from a review of available published information. The likely significant effects of the project in relation to mineral resources is determined based on:

- consideration of the importance of the affected resource;
- the potential effects such as sterilisation of the mineral resource; and
- changes that might prejudice the future working of identified mineral resources.

10.4.14 The criteria for determining the importance of the affected mineral resources have been developed from a consideration of the economic importance of minerals to the UK (ODPM, 2004). A high importance is given to specified industrial and energy minerals, such as china clay, ball clay, coal, natural gas and crude oil. A medium importance is given to industrial and unevenly distributed construction minerals such as salt, gypsum and crushed rock aggregates. A low importance is given to widely distributed construction minerals such as sand and gravel aggregates and brick-clay. A very low importance is given to materials of no particular economic value, such as subsoils and soils arising from bulk earthworks and excavations.

Preliminary Assessment Key Parameters and Assumptions

10.4.15 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and

continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.

- 10.4.16 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.
- 10.4.17 It is currently assumed that no new abstractions or discharges are required for the project. It is also assumed that dewatering is not required for the open cut trenches or trenchless crossings, except to remove rainwater and any groundwater seeping into temporary excavations. However, if dewatering was required, an assessment of the groundwater depressions and the impacts on groundwater receptors and interests will be undertaken as part of the ES based on the approach and methodology described in Environment Agency Hydrogeological impact appraisal for dewatering guidance (2007).
- 10.4.18 As stated in Chapter 4: Project Description, percussive piling may be required at some pylon locations and for the foundations of the CSE compounds and GSP substation, depending on ground conditions. The preliminary assessment set out in this PEI Report assumes that piling is required at all pylon locations and at the CSE compounds and GSP substation. Further details on the need for piling and specific locations will be set out within the ES.
- 10.4.19 As stated in Chapter 4: Project Description, the River Stour would be crossed via trenchless methods and that other rivers will be crossed via open cut methods. It is assumed that the trenchless crossing at the River Stour would use water brought to site in tankers.

Further Assessment Within the ES

- 10.4.20 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point, the assumptions and assessment will subsequently be developed and presented in the ES.
- 10.4.21 The updated design and methodology for construction will be reviewed for their potential to introduce contaminants to the subsurface or to provide transport pathways for existing contamination. Material and chemicals used in the construction process will be assessed for their potential impact on aquifer quality and the potential effects will be quantified using the hydrogeological risk assessment processes described in Environment Agency (2006) guidance. If a plausible linkage exists, the potential magnitude of impact will be quantitatively assessed in the ES and compared to relevant environmental standards and regulation, using the precautionary principles embedded in Environment Agency (2018) guidance.

10.5 Existing Baseline

Designated Sites

- 10.5.1 There are no statutory designated sites for geological importance within the wider study area (e.g. SSSIs designated for their geological importance). There is one notified Local Geological Site and two potential Local Geological Sites within the wider study area, but none of these fall within the draft Order Limits. These also relate to sarsen stones within a churchyard, which are not considered to be receptors affected by the project.

Geology

- 10.5.2 The geology of the wider study area comprises superficial Glacial Till (Boulder Clay) overlying undifferentiated Glacial and Fluvial Sands and Gravels (BGS, 2021). Where river valleys cross the draft Order Limits, Alluvium and River Terrace Deposits are present, occasionally underlain by Glacial Till deposits and underlain by the local bedrock where the river valleys are incised through the superficial geology.
- 10.5.3 Beneath the superficial deposits, the bedrock comprises either Red Crag deposits or the underlying London Clay Formation, dependent on the local topography. Where large river valleys are present, these are generally incised through the near-surface bedrock deposits into the underlying Woolwich and Reading Formations (Lambeth Group) and, in two locations (River Stour and River Brett valley), into the underlying White Chalk subgroup.
- 10.5.4 Further detail on the published geology and ground investigation data undertaken for the project to date can be found in Appendix 10.1. The 2013 ground investigation data shows that the surveyed geology was found to be in general agreement with the regional geological mapping.

Hydrogeology

Groundwater Bodies

- 10.5.5 The draft Order Limits cross four groundwater bodies (Environment Agency, 2020a), which are shown in Table 10.3. These are all classified as poor, either because of their poor chemical quality, due to exceedances of certain chemical compounds (due to rural land management practices), or because of detrimental change to the resource flow or quantity.

Table 10.3: Groundwater Bodies Crossed by the draft Order Limits

Groundwater Body	Areas Encountered	Quantitative Class	Chemical Class	Overall Class
Essex Gravels	Extensive areas between Twinstead and Hadleigh, including the valleys of the Rivers Stour, Box and Brett	Good	Poor	Poor
North Essex Lower London Tertiaries	Narrow bands in the main river valleys and located within areas of overhead and underground cable sections	Poor	Good	Poor
North Essex Chalk	River Stour valley, around Leavenheath, River Brett valley, and east of Hadleigh, crossed by overhead and underground cable section of the project.	Poor	Poor	Poor
Waveney and East Suffolk Chalk and Crag	Present from Hintlesham to Bramford, underlying an overhead section of the project.	Poor	Poor	Poor

- 10.5.6 The hydrogeology is classified by the Environment Agency (Defra, 2021b) as follows:
- Principal aquifers (**high** value): Red Crag and underlying White Chalk subgroup;

- Secondary A aquifers (**medium** value): The Thanet sands and Woolwich and Reading Formations; Alluvium, River Terrace Deposits and Glacial and Fluvial Sands and Gravels; and
 - Unproductive strata (**negligible** value): Lowestoft Formation and the London Clay Formation.
- 10.5.7 Details from the physical properties of minor aquifers (BGS, 2000) and major aquifers (BGS, 1997) indicate that the Red Crag is a complex aquifer with numerous clay and silt layers which strongly influence the permeability of the formation which can impede the vertical movement of water from one horizon to another. Groundwater flow within the Red Crag is dominated by intergranular flow, and pumping tests suggest that the Red Crag is consistently a productive aquifer.
- 10.5.8 The Chalk outcrops to the north of the wider study area in a broad band through Cambridgeshire and West Suffolk (BGS, 2000) and is noted to be highly variable and can change dramatically over short distances. Within the wider study area, it is only exposed within the River Stour valley. Groundwater flow within the Chalk is generally via solution fissures and fractures, and the transmissivity is usually higher in river valleys where fissures are enhanced due to groundwater movement than in the interfluvial areas. The chalk matrix tends to have very limited permeability. Where the top part of the Chalk forms a chalk marl, this can restrict the vertical movement of groundwater between the Chalk and the overlying units.
- 10.5.9 The Fluvioglacial Sands and Gravels, Kesgrave Sands and Gravels and, potentially at a greater depth, the Red Crag Formation are characterised as a confined aquifer in Section AB: Bramford Substation/Hintlesham, and the western areas of Section C: Brett Valley, due to the overlying clay-rich deposits.
- 10.5.10 The underlying London Clay and (where clay beds persist laterally within them) the Woolwich and Reading beds, can act as an aquiclude, restricting the downwards migration of shallow groundwater (and mobile contaminants, if present) to deeper groundwater resources.
- 10.5.11 The regional flow direction within the Chalk aquifer is broadly towards the southeast, away from the outcrop area (BGS, 1981). There is a significant inflection in the piezometric surface under the River Stour valley and smaller inflections under the River Box and River Brett valleys. It is likely that there are upwards gradients and potentially flows from the Chalk into the superficial strata within these valleys. In the case of the River Stour, which has incised down into the Chalk, there may be discharges from the Chalk to the River.
- 10.5.12 At the River Stour, the piezometric surface within the Chalk is approximately 18m AOD, which is similar to ground level at the crossing point.

Groundwater Vulnerability

- 10.5.13 Groundwater vulnerability is mapped as low or medium across much of the study area (Defra, 2021c), where superficial deposits are clayey or are underlain by London Clay. In some areas this rises to medium-high, where clay cover is thin or absent. These include the Stour Valley and an area immediately east of it, a narrow strip in the valley of the River Box, the area north of Polstead, and the Brett Valley, which also includes a narrow strip of high vulnerability groundwater where the Lambeth Group is exposed.
- 10.5.14 The draft Order limits are located within a SPZ 3 (**medium** value) and they also cross two public water supply SPZ 2 (**medium** value), in the Brett Valley near Upper Layham and

in the Stour Valley near Lamarsh (Figure 10.1). The draft Order Limits also fall within a very small part of SPZ 1 (**high** value) within Section G: Stour Valley, but no penetrative works are currently proposed within this area. The draft Order Limits do not fall within a Drinking Water Safeguard zone for groundwater.

Groundwater Dependent Terrestrial Ecosystems

10.5.15 There are six GWDTEs (all **medium** value) identified within the wider study area that could be affected by changes to groundwater (see Chapter 7: Biodiversity, for details):

- Bushy Park Wood CWS;
- Sroughton Park CWS;
- Valley Farm Meadows CWS;
- Alphamstone Complex LWS;
- Ansell's Grove/Ash Ground LWS; and
- Layham Pit Woodland and Meadow CWS.

Groundwater Abstractions

10.5.16 There are a small number of licensed groundwater abstractions, deregulated abstractions and private water supplies within the wider study area (details are provided in Appendix 10.1: Geology and Hydrogeology Baseline) and shown in Figure 10.1. These are valued as **high** for public water supplies and **medium** for abstractions and private water supplies.

10.5.17 Details of the groundwater encountered during the historical ground investigation are shown within Appendix 10.1: Geology and Hydrogeology Baseline. This shows that, even within low-lying valley areas, a trench depth of c.1m is unlikely to encounter groundwater.

Mineral Deposits

10.5.18 Suffolk County Council has identified a Minerals Consultation Area for large parts of the draft Order Limits (Suffolk County Council, 2020). The draft Order Limits also cross one MSA in Suffolk: Layham (M5) to the south of Hadleigh (see Figure 10.2). The southern section of Layham Quarry is also identified as a mineral extraction site (Suffolk County Council, 2020) for the extraction of sands and gravel until 2032. In addition, large parts of Essex, including almost all of the draft Order Limits within Essex, are designated as an MSA for sand and gravel (**low** value).

10.5.19 Layham Quarry is currently dormant with no imminent plans for Brett Aggregates to restart extraction. Further discussions will be undertaken with Brett Aggregates to inform the ES. The draft Order Limits currently sit within an area of Layham Quarry that is likely to have already been extracted and infilled. The area directly south of the draft Order Limits is still a minerals void which is biodiversity rich and therefore unlikely to be landfilled/restored. There are no further proposed or current mineral extraction sites within the draft Order Limits.

Historical and Current Land Use

10.5.20 Land in the wider study area is dominated by arable farmland with occasional orchards and juvenile woodland. Other features of note include several historical sand and gravel pits and Layham Quarry, which is a current sand and gravel pit. There is an existing landfill, Layham Quarry Landfill, which is a permitted non-hazardous waste landfill

(Environment Agency, 2020d). The environmental permits for the site suggest the landfill has been infilled with non-biodegradable waste, mining waste and inert fill. The permits are dated from 2001 to the present (see Appendix 10.1 for further details).

10.5.21 There is potential for contaminated ground to be present beneath parts of the wider study area. This includes areas associated with historical and present-day land uses such as landfills, sewage treatment works and rail infrastructure, as well as contaminative industrial sites. Some small pieces of registered contaminated land (Babergh and Mid Suffolk District Council, 2021; Braintree District Council, 2021) are noted within the wider study area, including historical quarries and the former rail line south of Hadleigh (which also crosses the draft Order Limits). These locations are shown on Figure 10.1.

10.5.22 Table 10.4 summarises the potential contaminative land uses and contamination sources, based on the current and historical land uses, which have been identified within the baseline assessment (Babergh and Mid Suffolk District Council, 2021; Braintree District Council, 2021). These are listed in Appendix 10.1 and shown on Figure 10.1, the IDs relate to the District Council source information. The baseline conditions have not (at this stage) identified any likely ongoing significant contamination, within the draft Order Limits.

Table 10.4: Potential Sources of Contamination and Contaminants of Concern

ID	Potential Sources	Contaminants of Concern
1	Bramford Electrical Substation	Polychlorinated biphenyls (PCBs), mineral oils, asbestos, hydrocarbons
12, 75, 45, 46, 143	Gravel/sand pits and quarries (1900s to 1980s)	Potential infilling in quarried areas with unknown fill material (potential for heavy metals, sulphates, hydrocarbons, asbestos).
58	Hadleigh Railway Walk – including historical use as a railway line from the 1800s through to the 1970s	Unknown fill material (potentially including heavy metals, ash, clinker, sulphates, hydrocarbons, asbestos) and possible residues from railway use including fuel oils, lubricating oils.
-	Layham Quarry (including areas of landfilling)	Infilling in quarried areas with non-biodegradable waste, mining waste, inert fill material. Landfilling is believed to have been undertaken in accordance with an environmental permit for the above-mentioned waste from 2001 to present.
23	Great Eastern Railway within Section G: Stour Valley	Unknown fill material (potentially including heavy metals, ash, clinker, sulphates, hydrocarbons, asbestos) and possible residues from railway use including fuel oils, lubricating oils.

10.5.23 The conceptual model outlined within the Phase 1 Environmental Study (RSK, 2013a-h) for the project did not identify any potential risk greater than moderate/low from any of the sources identified within Table 10.4.

Future Baseline

10.5.24 There are no anticipated changes to the baseline expected over the design life of the project in relation to geology and hydrogeology. There are currently no known planning applications for new mineral extraction or sites allocated for mineral extraction within the

Local plans (with the exception of Layham Quarry which has already been discussed) within the draft Order Limits.

10.6 Likely Significant Effects (Without Mitigation)

10.6.1 This section sets out the likely significant effects of the project on geology and hydrogeology. It assumes that the relevant embedded good practice measures outlined within Appendix 4.1: Outline CoCP are in place before assessing the potential effects. The assessment assumed at this stage that no water abstractions or discharges are required during construction or operation (see Chapter 4: Project Description).

Embedded and Good Practice Measures

10.6.2 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to geology and hydrogeology including GH01, which commits to further investigation in areas where potential contamination is known or strongly suspected to inform the assessment of the risks to receptors, and good practice measures and working methods to control those risks will be developed. In addition, the project will be required to comply with all legislation, consents and permits (GG01), which would include permits and consents at Layham Quarry.

Construction

Practices Common to Overhead Line and Underground Cables

Mineral Deposits

10.6.3 There are currently no permissions to extract minerals during the construction phase of the project within the draft Order Limits. Therefore, there will be a magnitude of **no change** and a **neutral** effect on mineral resources (**low** sensitivity) during the construction stage, which would be **not significant**.

Historical and Current Land Use (Contaminated Land)

10.6.4 Construction of pylon bases, foundations, underground cables and particularly the deeper trenchless crossings could create new pathways for contamination within the soil and groundwater, and hence to affect groundwater quality where constructed through or next to land that has a risk of contamination being present. There is also a risk of introducing new contaminants such as those used to facilitate drilling, including bentonite.

10.6.5 The baseline conditions for the study area have been identified using a Tier 1 preliminary risk assessment, which has identified the potential risk from potential sources of contamination to be, at worst, moderate/low within discrete areas of the draft Order Limits. With the implementation of good practice measures detailed within the Outline CoCP, including the production of a CEMP (GG03); appropriate excavation of material and testing where required (GH02); and a risk assessment in accordance with the Environment Agency (2001) guidance 'Piling and Penetrative Ground Improvement Methods' (GH06), the risk of contamination to groundwater would be reduced and there is unlikely to be any significant effects.

10.6.6 Risks associated with land that is not suspected of contamination will be managed through the good practice measures identified within the Outline CoCP.

10.6.7 Further assessment will be undertaken within the ES to determine the potential for contamination to exist and to introduce those contaminants to the subsurface; to provide transport pathways for existing and new contamination to groundwater; and also

determine the interaction of the sections with the natural geology and groundwater and assess whether low permeability strata are likely to be breached. This will be undertaken via a hydrogeological impact assessment process described in the Environment Agency (2006) guidance.

- 10.6.8 Based on the assessment undertaken at this stage, there is likely to be a **negligible** magnitude and **neutral** effect on groundwater receptors with a **high and medium** sensitivity from contamination, and the effects would be **not significant**.
- 10.6.9 Areas of unexpected contamination within the soil and groundwater could affect construction workers if the contaminated areas are disturbed through construction. However, the potential risk identified as part of the baseline assessment would be, at worst, moderate/low. With the good practice measures within the Outline CoCP along with National Grid's processes for managing risk, the risks to construction workers would be reduced, and as such, no further assessment is required.
- 10.6.10 Therefore, there are likely to be **negligible** magnitude and **minor** effects on construction workers (**high** sensitivity), and effects would be **not significant**.

Overhead Line (including CSE Compounds and Removal of the Overhead Line) Geology and Hydrogeology

- 10.6.11 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced through drilling or through permeable backfill material. New pathways are potentially damaging if they alter flow regimes unacceptably. In contrast, installation of impermeable structures or backfill could impede groundwater flow.
- 10.6.12 Both the construction of piled foundations within the new pylon bases and the grubbing out of pylon foundations associated with the removal of the existing 132KV overhead line could introduce new pathways between aquifer bodies. The Outline CoCP contains commitment GH06, which commits to undertaking a Foundation Works Risk Assessment once the proposed foundation solutions are known. The locations where a Foundation Works Risk Assessment is required will be identified within the ES.
- 10.6.13 With the implementation of the good practice measures mentioned within Appendix 4.1: Outline CoCP, the risk of introducing new pathways for contamination where piling is proposed will be a **negligible** magnitude on groundwater receptors (assigned a **medium to high** sensitivity depending on the aquifer present). Therefore, there is considered to be a **minor** effect which would be **not significant**.

Mineral Deposits

- 10.6.14 Layham Quarry is the only location within the draft Order Limits where overhead line is proposed that has permission to extract minerals. The site currently has planning permission to extract minerals until 2032. However, the site appears to currently be dormant with no imminent plans to restart extraction. In addition, the draft Order Limits are across the northern section of Layham Quarry which is anticipated to have already been infilled, with the area directly to the south of the draft Order Limits unlikely to be landfilled/restored.
- 10.6.15 Further discussions will be undertaken with the local planning authority and Brett Aggregates to determine the current plans for the site and to determine areas which have already been worked and landfilled/restored. Therefore, based on the current information there will likely be **no change** magnitude and **neutral** effect on mineral resources at

Layham Quarry (**low** sensitivity) during the construction stage, and the effects are **not significant**.

Historical and Current Land Use (Contaminated Land)

- 10.6.16 Currently, areas designated as potentially contaminated land by the local planning authorities are being crossed via overhead lines, and pylon locations will avoid these areas. The exception to this is Layham Quarry, which is designated as a landfill, but the permit for the site suggests that any material placed within the quarry is inert. It is currently unknown if material has been deposited within the quarry, and further discussions will be undertaken with the local planning authority and Brett Aggregates to identify the areas of undisturbed ground.
- 10.6.17 There are no additional effects expected in addition to those stated under the 'Practices Common to Overhead Line and Underground Cables' section.

Underground Cables

Geology and Hydrogeology

- 10.6.18 Dewatering has the result of reducing groundwater levels as nearby groundwater drains into the dewatered excavation. Lowering of groundwater levels could impact on nearby abstractions and private water supplies, habitats that rely on shallow groundwater, and surface water bodies (ponds, lakes, drains or watercourses) in hydraulic continuity with groundwater. However, dewatering that would lower the groundwater is currently not proposed, and the short-term and shallow nature of any dewatering required for construction means that such impacts are very unlikely. As shown within the baseline section, the trench depth is also unlikely to encounter groundwater even within low-lying valley areas.
- 10.6.19 Where temporary works require dewatering that is either to a depth at least 1.5m below rest water level, or for a time period in excess of 100 days; and within 500m of a potential receptor that is likely to be in hydrological continuity with the groundwater, the dewatering will be assessed as part of the ES using the methodology set out in the Hydrogeological Impact Appraisal for Dewatering Abstractions guidance (Environment Agency, 2007).
- 10.6.20 As outlined in the 'Key Parameters and Assumptions' section, it is assumed that dewatering is not required for the open cut trenches or trenchless crossings, except to remove rainwater and any groundwater seeping into temporary excavations. Because trench depth will be limited, there would therefore be no lowering of the water table beyond 1.5m below the rest water level. Where trenched river crossings are proposed, the bulk of the water pumped would be surface water, and groundwater is expected to provide a very small component.
- 10.6.21 There are currently no proposed dewatering activities which would require assessment in accordance with the methodology set out within the Scoping Report and Hydrogeological Impact Appraisal for Dewatering Abstractions guidance (Environment Agency, 2007). In addition, all discharges will also be managed and regulated in accordance with the discharge permits process (GG01) where volumes dictate that a permit is required. Therefore, there is likely to be a **negligible** magnitude and a **neutral** effect on groundwater receptors (**medium to high** sensitivity), and the effects would be **not significant**.
- 10.6.22 Deeper workings carry a greater risk of pathway creation by penetrating low-permeability deposits between aquifers. Therefore, trenchless crossings and open cut sections will be assessed within the ES by the use of geological cross-sections to identify the potential

for low permeability strata to be breached and whether this will impact significantly on groundwater receptors. Where low permeability strata are found to be breached, a hydrogeological impact assessment will be undertaken, as described in the Environment Agency (2006) guidance, to confirm that there will be no adverse impact on groundwater receptors as part of the ES.

- 10.6.23 Good practice measures within Appendix 4.1: Outline CoCP would provide controls to reduce the effects of ground disturbance on flow such as to undertake ground investigation (GH01) and to complete a Foundation Works Risk Assessment in accordance with the Environment Agency (2001) guidance 'Piling and Penetrative Ground Improvement Methods' (GH06). This is likely to further reduce the impacts on groundwater flow. Therefore, there is likely to be a **negligible** magnitude and a **neutral** effect on groundwater receptors (**medium to high** sensitivity depending on the aquifer present), and the effects would currently considered to be **not significant**.

Mineral Deposits

- 10.6.24 There are currently no permissions to extract minerals during the construction phase of the project within the draft Order Limits. Therefore, there will be a magnitude of **no change** and a **neutral** effect on mineral resources (**low** sensitivity) during the construction stage, which would be **not significant**.

Historical and Current Land Use (Contaminated Land)

- 10.6.25 The baseline assessment indicates that the sections of underground cabling do not cross any areas of landfilling or areas designated as potentially contaminated land by the local planning authorities. The exception to this is a small unknown quarry (ID 143) within Section E: Dedham Vale AONB. However, this has been given a low risk rating and it is not considered that any additional measures are required beyond those mentioned within the 'Practices Common to Overhead Line and Underground Cables' section.

GSP Substation

Geology and Hydrogeology

- 10.6.26 There are currently no discharges proposed for the GSP substation during construction. Other than rainwater ingress, dewatering is only proposed when seepages of groundwater into trenches occur, and the shallow excavation depth proposed means that there will be no lowering of the water table below 1.5m below the rest water level. Therefore, there are currently no proposed dewatering activities which would require assessment in accordance with the methodology set out within the Hydrogeological Impact Appraisal for Dewatering Abstractions guidance (Environment Agency, 2007). Therefore, there is likely to be a **negligible** magnitude and **neutral** effect on groundwater receptors (**medium to high** sensitivity), and the effects would be **not significant**.
- 10.6.27 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced through piling or through permeable backfill material. New pathways are potentially damaging if they alter flow regimes unacceptably. In contrast, installation of impermeable structures or backfill could impede groundwater flow.
- 10.6.28 The construction of foundations for the new GSP substation could introduce new pathways to aquifer bodies within the superficial sands and gravel deposits (Secondary A) beneath the Lowestoft Formation. The Outline CoCP contains commitment GH06,

which commits to undertaking a Foundation Works Risk Assessment once the proposed foundation solutions are known.

- 10.6.29 With the implementation of the good practice measures mentioned within the Outline CoCP, the risk of introducing new pathways for contamination where piling and deeper foundation solutions are proposed will be a **negligible** magnitude on groundwater receptors (assigned a **medium** sensitivity in this location). Therefore, there is considered to be a **neutral** effect, which would be **not significant**.

Mineral Deposits

- 10.6.30 There are currently no permissions to extract minerals during the construction phase of the project within the draft Order Limits. Therefore, there will be a magnitude of **no change** and a **neutral** effect on mineral resources (**low** sensitivity) during the construction stage, which would be **not significant**.

Historic and Current Land Uses (Contaminated Land)

- 10.6.31 Baseline assessment has indicated that there are no areas defined as potentially contaminated land by the local councils. There are no current or historical landfills identified or substantial potential sources of contamination within Section H: GSP substation.
- 10.6.32 With the implementation of good practice measures detailed within the Outline CoCP, including the production of a CEMP (GG03); appropriate excavation of material and testing where required (GH02); and a risk assessment in accordance with the Environment Agency (2001) guidance 'Piling and Penetrative Ground Improvement Methods' (GH06), the risk of contamination to groundwater would be reduced and there is unlikely to be any significant effects.

Operation

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Geology and Hydrogeology

- 10.6.33 Effects on infiltration and recharge of groundwater may arise if the permeability of ground surfaces is changed. However, the project only requires small areas of new hardstanding and these would be designed to meet existing drainage standards (see Chapter 9: Water Environment).
- 10.6.34 The small overall footprint of the pylon base (potentially constructed using piles) means there is likely to be **no change** to infiltration and recharge, and **no change** on waterbodies supported by groundwater recharge, or groundwater flow pathways (on groundwater assigned a **medium to high** sensitivity). Therefore, the effects would be **neutral** and **not significant**.
- 10.6.35 There are no discharges proposed during operation within the overhead line sections. Therefore, there is a **no change** magnitude and **neutral** effect on groundwater receptors (**medium to high** sensitivity), and the effects would be **not significant**.

Mineral Deposits

- 10.6.36 Sections of overhead line pass through areas designated as MSAs in local policy. The area in Layham identified during the baseline studies is a section of the project where the existing 132kV overhead line would be replaced with a 400kV overhead line. Therefore, there would be no effect on the MSA by the removal of the 132kV line and replacement with the 400kV, as there would be no change to the status of this mineral reserve

compared to the baseline. There is likely to be a **no change** to mineral reserves (although pylons will be larger), and the effect would be **not significant**.

Historical and Current Land Use (Contaminated Land)

10.6.37 Where the overhead lines are concerned, potential effects during the operational phase would only occur during routine maintenance and checks and where there was an accidental release of contaminants. However, these would be appropriately managed through National Grid operational processes. Therefore, there is likely to be **negligible** magnitude and **neutral** effects on maintenance workers (**high** sensitivity), and the effects would be **not significant**.

Underground Cables

Geology and Hydrogeology

10.6.38 There are currently no operational discharges proposed within the underground cable sections. Effects on the potential for significant quantities of recharge to be re-routed from one groundwater catchment to another are judged to be insignificant given the scale of works and the small amount of impermeable surface that would be constructed within the underground sections. The small overall footprint of the trench also means the effects on recharge would be limited.

10.6.39 Effects on groundwater flow from the underground cables are only likely to occur where the trench is below the water table, which is considered to be unlikely from the baseline assessment.

10.6.40 From the above assessment, there is likely to be a **negligible** magnitude and **neutral** effect on infiltration and recharge of groundwater and waterbodies (**medium** and **high** sensitivity) supported by groundwater recharge and groundwater flow, and the effects would be **not significant**.

Mineral Deposits

10.6.41 Almost all of Section G: Stour Valley is located in a large area designated as an MSA for sands and gravels (Essex County Council, 2014). The MSA extends across large areas of the county. The draft Order Limits do not fall into a preferred or reserve mineral site in accordance with the Essex Minerals Local Plan Review (Essex County Council, 2014). The draft Order Limits affect a very small percentage of the overall MSA, as can be seen on Figure 10.2, and the proportion of the potential resource affected is minor since the county-wide safeguard areas are very large and also include substantial buffers around minerals.

10.6.42 In addition, underground cables are proposed within Section G: Stour Valley as the area is considered to be of high landscape quality and has a number of ecologically designated sites. This suggests the area would be unsuitable for future extraction.

10.6.43 The combination of the limited area of the MSA affected, along with the sensitivity of this area to a potential mineral extraction project, means that it is unlikely that this area would be suitable for mineral extraction. A landowner could still seek planning permission to quarry areas of land along the proposed reinforcement but would need to consult National Grid as part of this process.

10.6.44 Taking the above into account, it is concluded that the project would not result in a likely significant effect to mineral resources as a result of sterilisation. There is likely to be **negligible** magnitude and **neutral** effect on mineral deposits (**low** sensitivity), and the effects would be **not significant**.

Historic and Current Land Use (Contaminated Land)

10.6.45 Potential effects during the operational phase would occur if excavation and reinstatement is required to rectify a fault and encountering unforeseen contamination. However, the risk of this is considered to be very low – it is unlikely that a pollutant linkage would exist that would cause harm to maintenance workers and the baseline conditions have not identified any ongoing sources of significant contamination. Risks to maintenance workers would be managed through National Grid operational processes. Therefore, there is likely to be a **negligible** magnitude and a **neutral** effect on maintenance workers (**high** sensitivity), and the effects would be **not significant**.

GSP Substation

Geology and Hydrogeology

10.6.46 As noted in Chapter 4: Project Description, there would be no permanent discharges required at the GSP substation 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. Therefore, there is likely to be a **negligible** magnitude and a **neutral** effect on groundwater receptors, and the effects would be **not significant**.

10.6.47 Effects on infiltration and recharge of groundwater and groundwater flow may arise if the permeability of ground surfaces is changed. The project requires areas of new hardstanding, but this would be designed to meet existing drainage standards (see Chapter 9: Water Environment). Similarly, the potential for significant quantities of recharge to be re-routed from one groundwater catchment to another is judged to be insignificant given the scale of works and the amount of impermeable surface that would be constructed.

10.6.48 Effects on infiltration and recharge from the GSP substation are only likely to occur where the foundations are above the water table. Due to the small overall footprint, there is likely to be a **negligible** magnitude and therefore **neutral** effect on infiltration and recharge of groundwater and waterbodies (**medium** and **high** sensitivity) supported by groundwater recharge. Therefore, the effects would be **not significant**.

Mineral Deposits

10.6.49 The assessment for the GSP substation is the same as set out in the operation assessment for the underground cables. Therefore, there is likely to be **negligible** impact on mineral deposits, which would result in a **neutral** effect that is **not significant**.

Historical and Current Land Use (Contaminated Land)

10.6.50 Potential effects during the operational phase would be associated with routine maintenance and checks or accidental release of contaminants which would be appropriately managed through National Grid operational processes. Therefore, there is likely to be a **negligible** magnitude and a **neutral** effect on maintenance workers (**high** sensitivity), which would be **not significant**.

Summary of Construction Effects

10.6.51 The construction phase of the project carries risks of opening potential pathways for contamination to groundwater receptors and construction workers, and creating new groundwater flow pathways and flow regimes. However, with the implementation of the good practice measures in Appendix 4.1: Outline CoCP, the effects are expected to be **not significant** in relation to geology and hydrogeology during construction of the project.

Summary of Operational Effects

10.6.52 There are **no significant effects** expected in relation to geology and hydrogeology during operation of the project.

10.7 Sensitivity Testing

Flexibility in Construction Programme

10.7.1 This chapter considers the base construction programme described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be no new or different likely significant effects to those identified in the baseline scenario assessed in Section 10.6.

Flexibility in Design

10.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD. This sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

10.8 Proposed Mitigation

10.8.1 The preliminary assessment has concluded that there are no likely significant effects in relation to geology and hydrogeology during construction or operation. Therefore, no mitigation measures have been identified beyond the good practice measures set out in Appendix 4.1: Outline CoCP.

10.9 Residual Significant Effects (With Mitigation)

10.9.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to geology and hydrogeology during construction and operation.

10.10 Conclusion

10.10.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to geology and hydrogeology during construction or operation. As such, the requirements of the NPS EN-1 are likely to be met.

11. AGRICULTURE AND SOILS

11.1 Introduction

- 11.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on agriculture and soils. Agriculture and soil receptors include BMV land (as defined by the ALC system) and land holdings in agricultural use.
- 11.1.2 During both construction and operation, the project could affect agriculture and soils due to land being taken out of agricultural production either temporarily during construction or in terms of the land required permanently for the operation of the project. This can affect land holdings through introducing potential fragmentation, biosecurity risks and impacts on any land under agri-environmental, woodland or forestry schemes. There could also be disturbance to soils, either through direct stripping of the soil resource to enable construction works or through surface activity (for example compaction from vehicle movement across the surface), which can affect soil quality.
- 11.1.3 This chapter has links with other chapters, in particular, Chapter 7: Biodiversity, which assesses the effects on habitats; Chapter 9: Water Environment which assesses the effects on land drainage; and Chapter 10: Geology and Hydrogeology which assesses the effects on land quality (including potential contaminated land).
- 11.1.4 This chapter is supported by the following figures:
- Figure 11.1: Soils Mapping;
 - Figure 11.2: Provisional Agricultural Land Classification Mapping; and
 - Figure 11.3: Agri-Environment and Forestry Schemes.

11.2 Regulatory and Planning Policy Context

National Policy Statement

- 11.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on agriculture and soils. These aspects have therefore been considered within this PEI Report.
- 11.2.2 Paragraph 5.10.8 of NPS EN-1 states that *'Applicants should seek to minimise impacts on the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality (grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations. Applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed'*.
- 11.2.3 Paragraph 5.10.15 of NP EN-1 states that the Planning Inspectorate should *'ensure that applicants do not site their scheme on the best and most versatile agricultural land without justification. It should give little weight to the loss of poorer quality agricultural land (in grades 3b, 4 and 5), except in areas (such as uplands) where particular agricultural practices may themselves contribute to the quality and character of the environment or the local economy'*.
- 11.2.4 NPS EN-1 is supported by NPS EN-5 (DECC, 2011b), with paragraph 1.7.5, which states that, in relation to a presumption that electricity lines should be put underground, *'effects*

on soil, water, ecology and archaeology are likely to be negative, at least in the short term, requiring significant mitigation, but there is uncertainty around long term effects depending on the specific location and sensitivity of the receiving environment'. This is reiterated in paragraph 2.8.9.

Other Relevant Policy

- 11.2.5 Appendix 2.1: Local Planning Policy lists the local policy potentially relevant to agriculture and soils. The Babergh and Mid Suffolk Joint Local Plan (2020) Policy SP09, seeks development to support and enhance geodiversity, which includes soils.

11.3 Scoping Opinion

- 11.3.1 This chapter provides preliminary environmental information on the likely significant effects of the project on agriculture and soils. The scope of the assessment for agriculture and soils has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.
- 11.3.2 Table 11.1 summarises the scope of the assessment that will be presented in the ES. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 11.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction and Operation			
Land use	Effects of EMFs	Scoped out	(ID 4.6.6) The Planning Inspectorate agrees that this matter can be scoped out of the ES.
Landowners	Economic impacts on landowners	Scoped out	(ID 4.6.7) The Inspectorate believes that there is insufficient evidence to scope out these matters at this stage. The ES should identify where fragmentation would affect the viability of agricultural land holdings during construction and operation and include an assessment where significant effects are likely to occur (scoped in).
Soil resources	Impacts on soil quality and associated ecosystem services	Scoped out	(ID 4.6.8) The Planning Inspectorate does not consider that there is sufficient information on the methods of working at this stage to conclude that significant effects will not occur (scoped in).
Construction			
BMV agricultural	Temporary disturbance to soils and loss	Scoped out	(ID 4.6.1) Given the lack of baseline information available in terms of quantity of BMV agricultural land that would be affected and the nature and

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
land and soils	of BMV agricultural land		location of the project, the Inspectorate does not agree that these matters can be scoped out of the assessment (scoped in).
Agricultural operations	Impacts to agricultural operations	Scoped out	(ID 4.6.4) The Planning Inspectorate agrees that this matter can be scoped out of the ES.

Operation

BMV agricultural land and soils	Permanent disturbance to soils and loss of agricultural land	Scoping out (conditionally)	(ID 4.6.2) The Applicant proposes to scope out permanent losses of soils and agricultural land during operation where site surveys identify that the land is not classified as BMV agricultural land. The Planning Inspectorate consider the approach acceptable. The assessment should consider effects on BMV agricultural land and soils as separate assessments (scoped out conditionally subject to site survey results).
BMV agricultural land and soils	Effects on agricultural land and soils associated with operational maintenance	Scoped out	(ID 4.6.3) The Inspectorate agrees that this matter can be scoped out of the assessment.
Agricultural operations	Impacts to agricultural activities during the operational phase	Scoped out	(ID 4.6.5) The Inspectorate considers that there is potential for significant changes to agricultural practices as a result of the project, including to the established fruit farming industry within the study area. This includes consideration of any beneficial effects as a result of removal of the 132kV overhead line. The Inspectorate does not agree that these matters can be scoped out of the assessment (scoped in).

11.3.3 Table 11.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 11.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.6.9) In addition to the National Soil Resources Institute data, the ES should also be informed by the Met Office UK Climate Projections (UKCP18) in order that forecasts of long-term changing climatic conditions can be taken into account.	UKCP18 will be reviewed to provide an overview of likely climate change scenarios. A qualitative assessment of the potential implications for agriculture and soils will be set out.

Matter Raised in the Scoping Opinion	Project Response
The ES should include a description of the good practice measures that would be in place to control maintenance effects.	Any maintenance activities affecting soil would be subject to standard good practice soil measures defined in National Grid processes.
(ID 4.6.9) The Inspectorate notes that there is no reference to potential effects on agricultural land, soils or agricultural businesses of the proposed removal of the 132kV overhead line, nor evidence to show whether, for example, this land would be returned to agricultural production. The Inspectorate considers that the potential effects associated with removal of the current 132kV route should be addressed within the ES.	Agricultural businesses currently operate beneath the existing 132kV overhead line, and it is assumed that these would continue once the existing 132kV overhead line is removed. However, this will be confirmed within the ES.

Project Engagement

- 11.3.4 National Grid has held a number of meetings with relevant organisations, including Natural England. These discussions are summarised in Chapter 3: Scoping Opinion and Consultation and have included the potential need to undertake ALC surveys to inform the impact assessment on BMV land.

11.4 Approach and Methods

- 11.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on agriculture and soils. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Sources

- 11.4.2 The baseline description has been informed by a desk study which has drawn on the following key information sources:
- OS mapping and aerial photography to establish land use and settlement patterns;
 - Soilscape mapping showing the distribution of main soil types using the Land Information System website (Cranfield University/Defra, 2021) (see Figure 11.1);
 - Provisional ALC mapping from the MAGIC website (Defra, 2021c) (see Figure 11.2);
 - Climatic data and Land Information System Soil Site Report, purchased from the National Soil Resources Institute (2021a-d);
 - Extent of agri-environmental and Forestry schemes from the MAGIC website (Defra, 2021c) (see Figure 11.3);
 - Information gathered from discussions with landowner/land managers.

Site Survey

- 11.4.3 The desk study will be supported by detailed ALC surveys of the GSP substation and the CSE compounds, where permanent loss of agricultural land is anticipated. These surveys will be undertaken in accordance with the published guidelines (Ministry of Agriculture, Fisheries and Food, 1988) once the crops have been harvested.

Study Area

- 11.4.4 The study area for soils and ALC comprises the land which would be directly affected by the project (through disturbance or temporary covering of the soils). This will be based on the draft Order Limits and is shown on Figures 11.1 to 11.3.
- 11.4.5 In relation to the farm businesses, the study area comprises the agricultural land which is likely to be directly affected by the project (through, for example, disturbance, temporary covering of the ground or access restrictions) and will be extended where required to provide context to the businesses affected. The extent of this will be confirmed during the landowner/land manager interviews.

Assessment Methodology

- 11.4.6 Published guidance relating to soils and land grade (as defined by the ALC system) is limited and therefore the approach is based on technical knowledge and previous experience. This takes account of highways guidance as set out in the DMRB LA 109 (Highways England *et al.*, 2019b). This guidance relates to soils and land grade and promotes assessment that is proportionate to the scale and nature of the project and the likely effects on soils.
- 11.4.7 Appendix 5.1: Assessment Criteria contains the value (sensitivity) and magnitude tables that form the basis of the assessment in this chapter. Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the EIA Regulations 2017, are effects of moderate or greater significance.

Preliminary Assessment Key Parameters and Assumptions

- 11.4.8 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.
- 11.4.9 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.
- 11.4.10 For the preliminary assessment, it is assumed that all areas temporarily disturbed during construction would be reinstated and the existing land use resumed. The exception being the CSE compounds and the GSP substation, which will become National Grid assets with a compound and surrounding fencing and also the proposed Environmental Areas where biodiversity net gain is proposed. The CSE compound and GSP substation areas are the only locations where a change of land use has been assumed at this stage. The Environmental Areas would be assessed in the ES when further details are available about the proposals and extent of land use change.

Further Assessment Within the ES

- 11.4.11 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. The ES will include the results of

the site surveys and will also consider any effects on agriculture and soils associated with mitigation planting or areas identified for BNG, when specific locations and proposals will be available.

11.5 Existing Baseline

Soils

11.5.1 A range of soil types is present within the study area (Figure 11.1). The variation is in part a reflection of the underlying geology, both the solid geology and overlying drift deposits (see Chapter 10: Geology and Hydrogeology for details).

11.5.2 Five main soil associations (representing a group of soil series (soil types) which are typically found occurring together in the landscape) have been identified within the study area (National Soil Resources Institute, 2021a-d):

- Hornbeam 3: deep fine loamy over clayey and clayey soils with slowly permeable subsoils and slight seasonal waterlogging. Some slowly permeable seasonally waterlogged fine loamy over clayey soils. Calcareous subsoils in places. The major land use on this association is defined as cereals and other arable crops.
- Beccles 3: slowly permeable seasonally waterlogged fine loamy over clayey soils and similar soils with only slight seasonal waterlogging. The major land use on this association is defined as winter cereals with some short-term grassland.
- Hanslope: slowly permeable calcareous clayey soils. The major land use on this association is defined as winter cereals with some other arable crops and some grassland.
- Ludford: deep well drained fine loamy, coarse loamy and sandy soils, locally flinty and in places over gravel. The major land use on this association is defined as cereals, sugar beet and other arable crops with some fruit and horticultural crops.
- Thames: stoneless mainly calcareous clayey soils affected by groundwater. The major land use on this association is defined as permanent grassland with some cereal crops.

Agricultural Land Classification

11.5.3 Provisional ALC mapping (Figure 11.2) shows that the study area comprises a mix of grade 2 and 3 land, with potentially small areas of grade 4 land. This mapping, at a scale of 1:250,000, does not distinguish between grades 3a and 3b but provides an indication of the likely land classification. There is no detailed ALC mapping available for the study area. A small area of detailed mapping lies just outside the study area to the southeast of Polstead Heath, where land in grades 2 and 3a has been confirmed.

11.5.4 Climatic data interpolated for a point within the study area (TL 9854,3993) are presented in Table 11.3.

Table 11.3: Climatic data

Parameter	Data
Altitude (m)	60
Average annual rainfall AAR (mm)	597

Parameter	Data
Accumulated temperature AT0 (day degrees)	1397
Moisture deficit for wheat (mm)	117
Moisture deficit for potatoes (mm)	112
Field Capacity Days (FCD)	107

- 11.5.5 Climate does not impose an overall limitation on ALC grade in relation to the criteria set out in the ALC Guidelines (Ministry of Agriculture, Fisheries and Food, 1988). Climate does, however, have an important influence on the interactive limitations of soil wetness and soil droughtiness, which is the balance between rainfall and water losses from the soil. The site has both relatively low rainfall and a long growing season, acting to decrease the severity of any potential soil wetness limitation, but increasing the severity of any potential soil droughtiness limitation.
- 11.5.6 Overall, there are approximately 716ha of agricultural land within the study area. Of this approximately 291ha is mapped (Provisional mapping) as grade 2 and approximately 380ha is mapped as grade 3. At least a proportion of the grade 3 land will be grade 3a which, along with the grade 2 land, is considered to be BMV land.

Land Use

- 11.5.7 The land use is principally arable, with small woodland blocks and some pasture, often associated with river corridors. There are areas of land within entry level plus higher level agri-environment schemes within the study area (Defra, 2021c), in particular south of Hadleigh, south of Boxford and west of the River Stour (Figure 11.3). There are also woodland areas within the English Woodland Grant Scheme or for which there are felling licences in place (Figure 11.3).

Future Baseline

- 11.5.8 The baseline in relation to soils and ALC grades is unlikely to change from that described over the timescales considered in the assessment. The UK Climate Projections (Met Office, 2021) provide an assessment of likely climate change trends for the 21st century, with potential changes including wetter winters and drier summers (with higher intensity rainfall), that could affect soil conditions, land grade and farming practices. However, these are unlikely to manifest as noticeable changes in land grade or land management over the time period of the construction phase.
- 11.5.9 There could potentially be changes to land management practices and business approaches across the landowners/land managers. The current Dedham Vale AONB and Stour Valley Project Management Plan 2016-2021 (Dedham Vale AONB and Stour Valley Project, 2016b) seeks to ensure that the AONB and Stour Valley remains an example of the finest landscape in the country. In achieving this, the Management Plan will limit future land use changes.

11.6 Likely Significant Effects (Without Mitigation)

- 11.6.1 This section sets out the likely significant effects of the project on agriculture and soils. It assumes that the relevant good practice measures in Appendix 4.1: Outline CoCP are in place before assessing the effects.

11.6.2 The following aspects have been scoped out of the assessment: impacts to agricultural operations during construction and operation (see ID 4.6.4 in Table 11.1), soil (see ID 4.6.3 in Table 11.1) and ALC (see ID 4.6.3 in Table 11.1). These are not included in the following assessment.

Embedded and Good Practice Measures

11.6.3 The temporary nature of many construction activities and the subsequent restoration of the land is likely to result in the avoidance of long-term impacts on agricultural and soil receptors. In addition, Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to agriculture and soils. These include measures to protect the quality of soils when they are stripped, stockpiled and restored and measures to reduce the disruption to agricultural activities, for example AS01 and AS02.

Construction

Practices Common to Overhead Line and Underground Cables

Agricultural Land Classification

11.6.4 During construction, there would be temporary impacts on BMV land falling into grades 2 and 3a. Whilst available mapping does not split grade 3 into grades 3a and 3b, taking a worst-case scenario would indicate that up to 600ha of BMV land could be temporarily affected.

11.6.5 As set out in the soils assessment above, the good practice measures set out within the Outline CoCP would reduce the effects on soils, and by the end of construction, all land required temporarily would be reinstated. Consequently, the impact on BMV land (a receptor of **high** sensitivity) required temporarily during construction is assessed as of **negligible** magnitude and a **minor** to **neutral** effect. This would be **not significant**.

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Soils

11.6.6 There would be disturbance to soils, from access track construction where hard standing does not already exist to facilitate overhead line installation/removal. Soil disturbance will also occur due to the excavation and soil stripping of working areas for CSE compound and pylon construction. These impacts on soils have the potential adversely affect the ecosystem services the soils provide. For example, soil compaction due to the movement of plant across the soil surface, or the poor restoration of disturbed soils resulting in mixing of the soil horizons and compaction, could reduce the infiltration rate of rainfall and result in an increase in surface runoff and consequent erosion and flood risk.

11.6.7 The good practice measures set out within the Outline CoCP for soil handling, storage and reinstatement, will reduce the detrimental effects on soil function, and will mean that the reinstated soils are able to provide their associated ecosystem services. With these measures in place, there would be a **small** magnitude impacts on soils (a receptor with varying sensitivities depending on their specific characteristics and functions, ranging from **low** to **high**), which is assessed as a **minor** effect and **not significant**.

Underground Cables

Soils

11.6.8 There would be temporary disturbance to soils associated with the working area and cable trench excavation. These impacts on soils could adversely affect the ecosystem

services the soils provide. For example, soil compaction due to the movement of plant across the soil surface, or the poor restoration of disturbed soils resulting in compaction, could reduce the infiltration rate of rainfall and result in an increase in surface runoff and consequent erosion and flood risk.

- 11.6.9 All land required would be reinstated at the end of construction. The good practice measures set out within the Outline CoCP for soil handling, storage and reinstatement mean that the soils would continue to be capable of providing many of the ecosystem services. A cross-section of the working width will be included within the ES to demonstrate the typical layout of the working area, including the separation of soil horizons whilst stockpiling. With these measures in place, there would be a **small** magnitude impact on soils (a receptor with varying sensitivities depending on their specific characteristics and functions, ranging from **low** to **high**), which is assessed as a **minor** effect and **not significant**.

Agricultural Land Classification

- 11.6.10 There would be temporary disturbance to land, which is likely to include some BMV land, associated with the working width and cable trench excavation. All land required would be reinstated at the end of construction. The good practice measures set out within Appendix 4.1: Outline CoCP mean that the soils would continue to be capable of providing many of the ecosystem services.
- 11.6.11 By the end of construction, all land required temporarily would be reinstated. Consequently, the impact on BMV land (a receptor of **high** sensitivity) required temporarily is assessed as of **negligible** magnitude and a **minor** to **neutral** effect. This would be **not significant**.

GSP Substation

Soils

- 11.6.12 There would be disturbance to soils associated with the construction of the GSP substation. These impacts on soils could adversely affect the ecosystem services the soils provide. For example, soil compaction due to the movement of plant across the soil surface, or the poor restoration of disturbed soils resulting in compaction, could reduce the infiltration rate of rainfall and result in an increase in surface runoff and consequent erosion and flood risk.
- 11.6.13 The GSP footprint totals an area of 1.3ha, and the soil would not be replaced in this location. These soil materials would be reused in landscaping areas around the GSP substation in line with the good practice measures set out within Appendix 4.1: Outline CoCP, such that they would continue to be capable of providing many of the ecosystem services.
- 11.6.14 Therefore, with these measures in place, there would be a **small** magnitude impact on soils (a receptor with varying sensitivities depending on their specific characteristics and functions, ranging from **low** to **high**), which is assessed as a **minor** effect and **not significant**.

Agricultural Land Classification

- 11.6.15 During construction there would be a potential impact on BMV land. This will be assessed in the ES based on detailed ALC surveys.

Operation

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Soils

- 11.6.16 The CSE compound footprints total an area of 1.5ha, and the soil would not be replaced in these locations. The soil would be reused in landscaping areas around the CSE compounds in line with the good practice measures in Appendix 4.1: Outline CoCP, such that they would continue to be capable of providing many of the ecosystem services.
- 11.6.17 The footprint of new 400kV pylons would be very small. Where the 132kV pylons are removed, this land would be returned to the surrounding land use, which in the majority of locations will be agricultural production.
- 11.6.18 With these measures in place, there would be a **negligible** magnitude impact on soils (a receptor with varying sensitivities depending on their specific characteristics and functions, ranging from **low** to **high**), which is assessed as a **minor to neutral** effect and **not significant**.

Agricultural Land Classification

- 11.6.19 There is the potential for impacts on BMV land associated with the permanent footprint of the CSE compounds. This will be fully assessed in the ES based on detailed ALC surveys.

Land use

- 11.6.20 During operation, there would be limited effects on agricultural operations. Whilst the new 400kV pylon locations would not necessarily match locations of existing 132kV pylons, there will be no increase in potential restrictions on agricultural operations.
- 11.6.21 Limited areas of agricultural land would be lost permanently, and this will be dealt with through compensation agreements (which lies outside of the EIA process). Any maintenance or repair works required which would result in disturbance to agricultural operations would be undertaken in accordance with good practice soil handling methods and National Grid standards. Therefore, there are **no likely significant effects** on agricultural landholdings during operation, and this aspect is scoped out of the ES.
- 11.6.22 The majority of any financial consequences on individual landowners and farmers will be temporary, as most of the land will be reinstated by the end of the construction phase, and any claims regarding compensation will be addressed outside of the EIA process. As such, potential economic effects on individual landowners and farmers are scoped out of the ES.

Underground Cables

Land use

- 11.6.23 During operation, there would be limited effects on agricultural operations. Limited areas of agricultural land would be lost permanently and there is the potential for restrictions to activities immediately over or next to buried cables; however, these will be dealt with through compensation agreements (which lies outside of the EIA process). One of the more sensitive agricultural operations are the fruit farms, but the cable alignment avoids any disturbance to these.
- 11.6.24 Any maintenance or repair works required which would result in disturbance to agricultural operations would be undertaken in accordance with good practice soil handling methods. Therefore, there are no likely significant effects on agricultural landholdings during operation, and this aspect is scoped out of the ES.

11.6.25 The majority of any financial consequences on individual landowners and farmers will be temporary, as most of the land will be reinstated by the end of the construction phase, and any claims regarding compensation will be addressed outside of the EIA process. As such, potential economic effects on individual landowners and farmers are scoped out of the ES.

GSP Substation

Agricultural Land Classification

11.6.26 During operation, there is the potential for impacts on BMV land due to the footprint of the GSP substation. The potential impacts on BMV land will be fully assessed in the ES based on detailed ALC surveys. The good practice measures set out within Appendix 4.1: Outline CoCP would reduce the effects on soils and they would remain reusable within the project.

Land use

11.6.27 During operation, there would be limited effects on agricultural operations. Limited areas of agricultural land would be lost permanently; however, this will be dealt with through compensation agreements (which lies outside of the EIA process). Any maintenance or repair works required which would result in disturbance to agricultural operations would be undertaken in accordance with good practice soil handling methods. Therefore, there are no likely significant effects on agricultural landholdings during operation, and this aspect is scoped out of the ES.

11.6.28 The majority of any financial consequences on individual landowners and farmers will be temporary, as most of the land will be reinstated by the end of the construction phase, and any claims regarding compensation will be addressed outside of the EIA process. As such, potential economic effects on individual landowners and farmers are scoped out of the ES.

Summary of Construction Effects

11.6.29 During construction, the project could impact the quality of the soils and therefore impact soil functions and the ecosystem services these drive. This includes the soils which support BMV land classifications.

11.6.30 The majority of soils disturbed will be reinstated at the end of the construction phase, and the good practice measures set out within Appendix 4.1: Outline CoCP and the good practice soil management measures set out within the CEMP will reduce detrimental effects on soil function. The overall effect of construction of the project on agriculture and soils has therefore been assessed as **not significant**.

Summary of Operational Effects

11.6.31 The operational phase of the project could impact the quality of the soils and therefore impact soil functions and the ecosystem services these drive. This includes the soils which support BMV land classifications. The impacts on BMV land will be quantified in the ES, following the completion of ALC surveys.

11.7 Sensitivity Testing

Flexibility in Construction Programme

- 11.7.1 This chapter assumes the base construction programme described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be no new or different likely significant effects to those identified in the baseline scenario assessed in Section 11.6.

Flexibility in Design

- 11.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD. This sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

11.8 Proposed Mitigation

- 11.8.1 The preliminary assessment has concluded that there are unlikely to be significant effects in relation to agriculture and soils during construction and operation. Therefore, no mitigation measures have been identified beyond the good practice measures set out in Appendix 4.1: Outline CoCP.
- 11.8.2 Potential impacts in relation to the permanent loss of BMV land will be quantified within the ES following site surveys. Where possible, through the design process, impacts will be reduced through layout optimisation to limit the overlap with BMV land.

11.9 Residual Significant Effects (With Mitigation)

- 11.9.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to agriculture and soils during construction or operation. The potential for significant effects on BMV land will be fully quantified within the ES, following the site surveys.

11.10 Conclusion

- 11.10.1 It is concluded that this project is likely to achieve compliance with the NPS requirements, subject to the final assessment of potential impacts on BMV land. Paragraphs 5.10.8 and 5.10.15 of NPS EN-1 require impacts on BMV land to be minimised. The temporary nature of the majority of the construction activities and the reinstatement of soils means that potential impacts on BMV land and soil function would be reduced. The extent of any residual effect on BMV land will be quantified in the ES and will include details of where the design has been adjusted to reduce the overlap with BMV land.

12. TRAFFIC AND TRANSPORT

12.1 Introduction

- 12.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on traffic and transport. The receptors considered within this chapter comprise people and businesses along construction routes and users of PRoW, such as walkers, cyclists, and horse riders (WCH).
- 12.1.2 Construction of the project would result in an increase in vehicles on roads, including construction workers commuting to the site and the delivery of materials to and from the site. In addition, the project may require temporary traffic management measures or localised road closures, where the project would cross the existing road network. These measures could affect existing traffic movements on the road network during construction and generate indirect effects, such as severance to services or changes to bus routes and timetables. The project would also result in temporary closures and diversions of PRoW.
- 12.1.3 There is limited potential for the project to generate adverse effects on transport networks during operation, as traffic generated during this phase would be limited (see Chapter 4: Project Description). Therefore, operational effects are scoped out of the assessment (see Section 12.3 for further details).
- 12.1.4 This chapter has links to other topics, including Chapter 6: Landscape and Visual and Chapter 7: Biodiversity, which assess the potential impacts of vegetation loss along potential construction access routes. It also has links with Chapter 13: Air Quality and Chapter 14: Noise and Vibration, which assess the potential impacts of construction vehicles on sensitive receptors. In addition, a Transport Assessment will be submitted with the application for development consent.
- 12.1.5 This chapter is supported by the following figures:
- Figure 6.6: Visual Receptors and Viewpoints, which shows the National Cycle Network (NCN);
 - Figure 8.1: Designated Heritage Assets and Protected Lanes;
 - Figure 12.1: Access Point Locations and Routing; and
 - Figure 12.2: Estimated Peak Construction Traffic Flows (based on current project assumptions – peak month November 2024).

12.2 Regulatory and Planning Policy Context

National Policy Statement

- 12.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on Traffic and Transport which has been considered within this chapter. NPS EN-1 is supported by the NPS EN-5, which does not contain any specific policy relating to traffic and transport.
- 12.2.2 Paragraph 5.13.6 of NPS EN-1 states, '*A new energy NSIP may give rise to substantial impacts on the surrounding transport infrastructure and the IPC should therefore ensure that the applicant has sought to mitigate these impacts, including during the construction*

phase of the development. In addition, paragraph 5.10.24 states, ‘*The IPC should expect applicants to take appropriate mitigation measures to address adverse effects on coastal access, National Trails and other rights of way. Where this is not the case the IPC should consider what appropriate mitigation requirements might be attached to any grant of development consent*’.

Other Relevant Policy

- 12.2.3 Appendix 2.1: Local Planning Policy lists the local policy potentially relevant to traffic and transport. This includes Braintree District Council Local Plan (2017) Policy LPP 46, which protects the features of protected lanes.
- 12.2.4 In addition, the Essex and Suffolk Local Transport Plans (Essex County Council, 2011 and Suffolk County Council, 2011) set out how the councils will work with operators to identify appropriate routes for heavy good vehicles (HGV) to reduce any adverse impacts on amenity, the environment and the structural integrity of the highway. a new road hierarchy was introduced in 2013, creating a strategic County Route network The Essex Local Transport Plan states that HGVs will be encouraged to use Priority 1 roads and, where not possible, Priority 2 roads will be used. Priority 1 roads comprise the strategic road network (SRN) and inter-urban county roads, and Priority 2 roads comprise those that distribute traffic between the local road network and Priority 1 roads. The Suffolk Local Transport Plan sets out that freight is a key issue within the county and that Suffolk County Council encourages a modal shift to more sustainable methods of transporting freight.

12.3 Scoping Opinion

- 12.3.1 The scope of the assessment for traffic and transport has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.
- 12.3.2 Table 12.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion (Planning Inspectorate, 2021a). The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 12.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction			
Strategic road network (SRN)	Construction traffic impacts on the SRN	Scoped out	(ID 4.7.1) The Inspectorate considers that, given the nature of the project, it is not likely that the increase in traffic flows comparative to the existing baseline would result in significant effects (scoped out). The Scoping Report has not presented any

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
			information to support this (see project response in Table 12.2).
PRoW	Construction impacts on PRoW in the study area	Scoped out	(ID 4.7.2) Limited information is presented in the Scoping Report as to the location of closures and diversions, the value of these routes and their usage by receptors. Given the nature of the study area and the presence of PRoW within it, the Inspectorate considers that there is potential for likely significant effects to users of PRoW in terms of journey length and severance. This matter should therefore be scoped in to the ES.
Highways	Temporary road restrictions and traffic management measures during construction	Scoped out	(ID 4.7.4) The Inspectorate agrees that if the relevant screening criteria are not met following confirmation of the construction access routes then the impact of this matter in terms of air quality can be scoped out .

Operation

Highways	Traffic and transport matters during operation	Scoped out	(ID 4.7.3) The Inspectorate agrees that due to the likely low number of staff / visits required to maintain the proposed GSP substation and the limited maintenance activity required for other components of the project, this matter can be scoped out of the ES.
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12.3.3 As noted in Table 12.1, all matters relating to traffic and transport during operation are scoped out of the assessment. Therefore, no operational assessment is presented in Section 12.6.

12.3.4 Table 12.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 12.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.7.1) The Scoping Report has not presented any information regarding the expected daily traffic flows. The ES should consider impacts arising from construction traffic on the SRN where these are likely to give rise to significant effects.	Preliminary data relating to estimated traffic flows and construction routes is presented in Section 12.6. The final assumed traffic numbers will be presented within the ES.
(ID 4.7.1) The Inspectorate notes that reference is made to the Highways England project to widen the A12 between junction 19 and junction 25. The	The A12 Chelmsford to A120 Widening Scheme has been included in the long list of other developments (Appendix 15.3), and the A12

Matter Raised in the Scoping Opinion	Project Response
<p>Inspectorate considers that there is potential for cumulative significant effects arising from the project as a result of increased traffic flows and redistribution of traffic across the highway network. An assessment of the cumulative effects should be presented in the ES.</p>	<p>Chelmsford to A120 Widening Scheme has been progressed to the shortlist for further assessment (Appendix 15.4).</p>
<p>(ID 4.7.5) The Inspectorate notes that traffic and transport is also relevant to the assessments of air quality and noise and vibration; the ES should confirm how the traffic flow data used in these assessments has been derived from the traffic and transport assessment, or if not how it has been prepared.</p>	<p>Confirmation of the conversion of the traffic movements to Annual Average Daily Traffic (AADT) and Annual Average Weekday Traffic (AAWT) flows is set out in Chapter 13: Air Quality and Chapter 14: Noise and Vibration.</p>
<p>(ID 4.7.6) The ES should include a figure to illustrate the extent of the study area used as the basis for the assessment.</p>	<p>An indicative list of the highways included within the study area has been set out in Section 12.4 of this chapter. Additionally, Figure 12.1 shows the preliminary construction traffic routes assumed in the PEI Report. Once 2021 baseline traffic surveys have been collected, and the study area confirmed, a figure showing the highways included within the study area will be included within the ES.</p>
<p>(ID 4.7.7) The ES should include in the description of the existing baseline any data gathered in respect of the frequency of use of WCH routes and their condition and/or use of community land and assets identified within the study area.</p>	<p>A high-level assessment of the potential impacts on PRoW is included in Section 12.6. PRoW surveys have been carried out during September and October 2021. The results of these will inform the baseline presented in the ES, including include user type and frequency and an assessment of the condition of the PRoW.</p>
<p>(ID 4.7.8) The Inspectorate notes that a trenchless crossing is proposed beneath the existing Sudbury Branch Railway Line to reduce impacts on rail users. It is not clear from the Scoping Report as to whether there would be any disruption to rail services during construction of the crossing. This should be confirmed and, where significant effects are likely, this should form part of the assessment in the ES.</p>	<p>The method for crossing the Sudbury Branch Railway Line is being discussed with Network Rail. It is currently assumed that the railway would remain open during construction (see Chapter 4: Project Description). The agreed methodology will be presented in the ES, along with any significant effects based on the agreed approach.</p>
<p>(ID 4.7.9) The AIL should include consideration of potential cumulative effects on the road network with other committed developments, as well as impacts on bridges, culverts and SRN junctions.</p>	<p>The AIL Access Report (as part of the ES) will consider the impacts on bridges, culverts and SRN junctions. Chapter 15: Cumulative Effects sets out how the cumulative effects of traffic from other construction projects will be assessed within the ES.</p>

Matter Raised in the Scoping Opinion	Project Response
(ID 4.7.10) The ES should explain the methodology by which the project engineering team has derived the vehicle requirement and staff resource profiles used as the basis for traffic forecasts.	The methodology and assumptions used to derive the projected vehicle and staff movements is set out in Section 12.4.
(ID 4.7.11) The Inspectorate notes that it is proposed to define impact magnitude for road network performance by reference to withdrawn guidance (DMRB Volume 3, Section 3, Part 8). The ES should explain why it is appropriate to use withdrawn guidance or use an alternative methodology. It is considered that traffic flow increases of less than 30% can be significant in some cases, for example on the minor arm of a problem junction operating close to design capacity. Therefore, junctions and/or routes should not be excluded from further assessment in the ES on that basis unless this position is agreed with relevant consultation bodies, including Highways England and local highway authorities.	<p>The thresholds in the Scoping Report relate to the ES only and relate to the temporary impacts of construction traffic.</p> <p>A Transport Assessment will accompany the ES and will follow the relevant MHCLG guidance. The Transport Assessment will cover highways network capacity impacts and will use more stringent thresholds based on relevant guidance that focuses on changes in peak hour traffic flow to determine the project impacts on links/junctions/road capacity.</p> <p>For the ES, it is noted that an increase of below 30% on a constrained junction could cause an impact. The PEI Report has considered the effects of change in daily flows dependent on the sensitivity of type of road (related to the usage of the road.) Therefore, the significance is not solely determined based on the percentage change of traffic. A qualitative review of each route will be assessed on a case-by-case situation so that individual impacts are appropriately assessed.</p>

Project Engagement

- 12.3.5 National Grid has held a number of meetings with relevant organisations including Suffolk County Council and Essex County Council, as summarised in Chapter 3: Scoping Opinion and Consultation. This has included discussing the need to produce a Transport Assessment and the commitment to submit an Outline CTMP as part of the application for development consent. The councils also indicated some roads that may be unsuitable for construction traffic, which is being considered as part of the confirmation of construction routes.
- 12.3.6 A meeting was also held with National Highways (formerly Highways England) on 22 October 2021, where it was presented that the preliminary traffic numbers suggest that there would be no significant effects on the SRN. An agreement in principle had been reached between National Highways and National Grid regarding construction routes for the AIL movements.

12.4 Approach and Methodology

- 12.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on traffic and transport. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Collection

- 12.4.2 The preliminary baseline assessment has been informed by a desk study which has drawn on the following information sources:
- Historic traffic count data (Department for Transport (DfT), 2019a; 2019b);
 - Information on the road network (OS, 2021a; 2021c; Google, 2021);
 - Bus routes and frequencies (Suffolk County Council, 2021a; Essex County Council, 2021a);
 - Existing PRow routes (Suffolk County Council, 2021a; Essex County Council, 2021a);
 - Existing NCN routes (Sustrans, 2021);
 - Protected lanes in Essex (Essex County Council, 2013; 2015a); and
 - Information on quiet lanes in Suffolk (East Suffolk Council, 2021) and in Essex (Essex County Council, 2015b).
- 12.4.3 To date, the COVID-19 pandemic has prevented collection of up-to-date baseline traffic data. Traffic flows and volumes have been affected by the pandemic (including travel restrictions and behavioural changes), and any data collected within the past 18 months would not provide an accurate reflection of the baseline conditions within the study area. It is anticipated that baseline surveys will be undertaken in early 2022, and this data will be used to inform the baseline presented within the ES.
- 12.4.4 In lieu of any 2021 highways traffic data, 12-hour, 2013 traffic counts have been growthed to 2021 levels using Trip End Model Presentation Program (TEMPro) growth factors for Braintree, Babergh and Mid Suffolk. TEMPro software allows detailed analysis of future pre-processed trip-end, journey mileage, car ownership and population/workforce planning data from the National Trip End Model.
- 12.4.5 PRow surveys are being undertaken to determine the usage of key PRow within the draft Order Limits on the underground cable sections, where the PRow are likely to be affected for a longer duration than the overhead line sections. Surveys of the key affected PRow are being carried out for between the hours of 08:00 and 18:00 during both the weekday and weekend for each affected route. The survey results will inform the baseline description within the ES.

Study Area

- 12.4.6 The study area for the traffic and transport assessment includes all roads that are part of the public highway and meet the following criteria:
- identified as construction access routes for the project, or likely to be used by construction workers travelling to and from construction sites; or
 - likely to be significantly affected by temporary road restrictions and traffic management measures required to construct the project.
- 12.4.7 Roads affected are expected to be located within the area bound by the A120 (Braintree to Marks Tey), the A12 (Marks Tey to Copdock), the A1214 and A1071 (on the outskirts of Ipswich), the A14 (Copdock to Needham Market), the B1078 (Needham Market to Bildeston), the B1115 (Bildeston to Monks Eleigh), the A1141/Bridge Street Road (Monks Eleigh to Bridge Street), the A134 (Bridge Street to Sudbury), and the A131 (Sudbury to

Braintree). This has been used as the indicative study area for this PEI Report in order to describe the key baseline features.

- 12.4.8 Potential construction traffic routes have been identified and are shown in Figure 12.1. These routes will form the basis for the study area. However, it should be noted that, once analysis on the staff routing has been undertaken, the study area could potentially alter. Therefore, the final study area will be set out within the ES.
- 12.4.9 The study area also includes all PRow within the draft Order Limits.

Assessment Methodology

- 12.4.10 The scope and method of assessment have been developed using qualitative professional judgement, supported by the traffic and transport assessment that was undertaken before the project was paused in 2013. It also draws on benchmarks from other similar projects developed more recently.

Construction Vehicle Methodology

- 12.4.11 National Grid has estimated the potential monthly construction vehicle numbers based on knowledge of previous projects. These were broken down into the three key areas of work: overhead line (including removal of the existing 132kV overhead line); underground cables and GSP substation. The vehicular movements are broken down into three categories;

- Light Goods Vehicles (LGV);
- HGV (OGV1 class): two axles, over 3.5 tonnes and up to 7.5 tonnes gross weight; and
- HGV (OGV2 class): two or more axles, over 7.5 tonnes gross weight.

Core Scenario Methodology

- 12.4.12 Based on the daily data, a 'core scenario' has been developed which has been used to determine the significance of effects of the construction traffic. The core scenario uses the peak month of construction traffic, which is November 2024. Following this, the three months prior to (August 2024 to October 2024) and after (December 2024 to February 2025) the peak construction month have been analysed to determine whether there are any routes which exceed the core scenario. Where a month preceding or following the peak of November 2024 is higher, the higher figure has been used within the core scenario. This will allow for any programme slippage, as a precautionary approach.
- 12.4.13 As daily traffic can vary, a contingency of 12.5% has been applied to allow for daily variations in traffic. Furthermore, any individual peaks on particular access points or routes will be assessed individually so that any other network peaks are not overlooked.

Construction Vehicle Routing

- 12.4.14 A number of access points to the working area have been proposed, as shown on Figure 12.1. The construction routes have been identified using basic principles, for example assuming trips would be as direct as reasonably practicable between identified access points and the nearest junction on the SRN.
- 12.4.15 Initial consultation with the highway authorities at Essex and Suffolk County Councils highlighted the following constraints on the routing, which have been avoided and do not form part of the construction access routes:

- Potential constraints on the use of the B1113 via the A14 Claydon Interchange and the B1070 via Holton St. Mary; and
- Narrow carriageways on sections of the road network around Hintlesham, for example Pigeon's Lane.

12.4.16 In lieu of any 2021 highways traffic data, 12-hour, 2013 traffic counts have been growthed to 2021 levels using TEMPro growth factors. This assessment uses the 2021 growthed traffic counts in order to assess worst-case impacts. If the future baseline year (2024) were used for the assessment, then the baseline traffic would be higher and the percentage impact of the construction traffic lower than in the 2021 scenario.

Construction Staff Forecasts

12.4.17 A forecast of peak daily construction worker traffic volumes to each construction access point has been generated from staff resourcing profiles. Data on staff origins, mode share and routing is not available at this time and has not been considered within this PEI Report. Assumptions will be made regarding staff resourcing profiles as part of the ES and analysed as part of that assessment.

Criteria for Assessment

12.4.18 The assessment has considered the effects on transport users based on a categorisation of sensitivity to changes in traffic flow and change in journey length and severance. The criteria used to determine the value and sensitivity of receptors specific for traffic and transport are based on DMRB LA 112 (Highways England *et al.*, 2020e) and are presented in Appendix 5.1: Assessment Criteria. The magnitude of impact on affected roads is based on the forecast change in baseline traffic flow (see Appendix 5.1: Assessment Criteria for magnitude levels).

12.4.19 Significance is derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the EIA Regulations 2017, are effects of moderate or greater significance.

Preliminary Assessment Key Parameters and Assumptions

12.4.20 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.

12.4.21 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.

12.4.22 The construction vehicle estimates are based on the following assumptions:

- The material quantities for the haul route are based on measurements from the location where the haul route meets the public highway to the working area, using existing non-public highway tracks if available.
- Section E: Dedham Vale AONB and Section G: Stour Valley would be constructed at the same time.

- The trenchless crossing at the River Stour would use water brought to site in tankers.
- Topsoil would be stripped for the whole underground cable section when the haul routes are constructed.
- Cable drums would be stored off site and transported in small batches to the project.
- Ongoing survey works are not included within the estimates and would be carried out in advance of construction. These would be typically low frequency and use small numbers of LGVs.
- The GSP substation traffic estimates include installation of plant and temporary overhead line diversions.
- Traffic forecasts for a few elements of the project have yet to be defined and considered. This could result in a small percentage increase. As a precaution, the traffic estimates assume a 12.5% risk uplift to cover small unknown increases in construction traffic at this stage.

12.4.23 Monthly construction traffic figures (one way) have been converted into daily construction vehicles by assuming that there is an average of 4.3 weeks per month and that construction activity occurs seven days per week.

12.4.24 For the purposes of the assessment in the PEI Report, it is assumed that the core working hours for construction would be:

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

12.4.25 The traffic and transport assessment assumed that there will be a 30-minute start-up/run-down period either side of the site opening and closing.

12.4.26 The construction staffing estimates have assumed the following:

- Two underground cable teams will be working at the same time on each section (i.e. Section E: Dedham Vale AONB and Section G: Stour Valley), so there will be a total of four teams working at the same time; and
- Multiple teams will complete the bellmouths for the works at the start of the project.

Further Assessment Within the ES

12.4.27 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. In addition to the assumptions noted above, the following additional information will be included within the ES and Transport Assessment:

- Results of ongoing studies looking at access points and construction routes in discussion with relevant consultees, e.g. the Highways Authorities and the emergency services. There is also additional work being carried out to understand the benefit of having a haul route along the whole of each of the underground sections (Section E: Dedham Vale AONB and Section G: Stour Valley) to avoid HGVs using intervening access points.
- The future baseline will be assessed and will consider the impacts of other local developments. The impacts of the project will be considered against a future baseline (2024). The future baseline is also considered in Section 12.5 of this chapter.

- The census 'Travel to Work' dataset for workers within the construction industry in Suffolk and Essex will be used to estimate construction staff mode share, and to distribute construction staff car trips to appropriate origins and destinations. Vehicle trips will then be manually assigned to the road network between construction site access points and origins/destinations using Google Maps to identify the most direct/quickest logical routes.
- An AIL Access Report is currently being prepared, to assess the suitability of the highway network and to agree the proposed AIL route with the Highway Authorities. The outputs of this study (including 3D modelling and swept pass analysis) will inform any alterations required to the existing highway network and the timing of the AIL movements. The results of the study will be considered in the ES.
- An updated assessment will be made of the likely changes during construction in journey length for WCH and severance that would occur on the public highway due to the project. The overall impact on severance on each route will be reviewed qualitatively based on factors including the length of time over which the impact is expected to occur, the character of the impacted route, its width, and the availability and spacing of dedicated crossing facilities.

12.4.28 National Grid is currently considering the use of Suffolk County Council's and Essex County Council's permit schemes for approval for any required road works due to the project.

12.5 Existing Baseline

Road Network

- 12.5.1 The A120, the A12 and the A14 are all part of the SRN, managed by National Highways, and provide strategic connections between the study area and the rest of the east of England and beyond. Of the other roads near the project, the A1071 is the primary east–west route running parallel and to the north of the project. This connects with the A134, which travels north–south to the east of Assington, as well as the A131, which also runs north–south, to the west of Twinstead.
- 12.5.2 The remainder of the study area comprises B-roads and lanes providing access to towns, villages and individual properties and farms. The study area also includes some protected lanes and quiet lanes that are covered by local planning policy. These include some of the smaller roads that lie to the south of Sudbury. Protected lanes are shown on Figure 8.1.
- 12.5.3 Physical constraints and the sensitivity of receptors next to the highway network in the study area have been identified based on the updated survey data. The physical constraints and receptor sensitivities have been considered when determining construction access routes, the selection of which avoids the potential for significant effects as far as is reasonably practicable. Further details of road restrictions will be available in the AIL Access Report which will accompany the ES.

Public Transport

Buses

- 12.5.4 Suffolk and Essex bus services currently operating in the study area are summarised in Table 12.3. Bus services shown cross the study area on an average weekday, and weekend services and seasonal/school bus services are excluded.

Table 12.3: Bus services (Suffolk County Council, 2021; Essex County Council, 2021a)

Bus Service	Operator	Route	Typical Daytime Frequencies (Monday – Saturday)
Suffolk Bus Services			
84 / 784	Chambers	Sudbury - Leavenheath - Nayland - Colchester	Hourly
91	Beestons, Ipswich Buses	Ipswich - Hadleigh - Sudbury	Hourly
93 / 94	Ipswich Buses	Ipswich - Capel St Mary - East Bergholt - Colchester	Every two hours
111 / 111A	Mulleys	Hitcham - Bildeston - Somersham - Ipswich	Four services daily in both directions
120	Hadleigh CT	Whatfield - Elmsett - Sproughton - Ipswich	Once on Thursdays in both directions
379	Chambers	Bury St Edmunds - Bildeston - Hadleigh	Once on Wednesdays in both directions
461 / 462	Hadleigh CT / Chambers	Hadleigh - Great Bricett / Hitcham - Stowmarket	Once a day, hours vary from time of day depending on day of the week
750, 753, 754	Chambers	Colchester - Sudbury - Bury St Edmunds	Five times an hour
F315	A Demand Responsive Transport (DaRT) operates between Sudbury - Gestingthorpe - Pebmarsh - Great Maplestead – Halstead		
Essex Bus Services			
9	Stephensons of Essex	Blake End - Great Notley	Hourly
42B	First	Braintree - Galleywood	Four times an hour
70	First	Chelmsford - Colchester	Hourly
89	Hedingham	Braintree - Great Yeldham	Hourly
89X	Chambers	Braintree - Sudbury	Once a day
SB28	Braintree Community Transport	Braintree - Stisted	Once on Wednesdays in both directions
DaRT3	A Demand Responsive Transport (DaRT) operates in the North East Braintree area.		

Rail

- 12.5.5 The Great Eastern Main Line between London and Norwich lies approximately 10km to the south of the study area, and broadly follows the same alignment as the A12. It includes stations at Ipswich, Manningtree, Colchester and Marks Tey.
- 12.5.6 The Sudbury Branch Railway Line is a single-track railway branch line connecting to the Great Eastern Main Line that runs through the western part of the study area from Marks

Tey to the terminating station at Sudbury (with stations in between at Bures and Chappel and Wakes Colne). Current service provision on the Sudbury Branch Railway Line consists of one train per hour in each direction during the day on a typical weekday. This receptor is considered to be of **high** value, as it is used mainly for tourism and recreation but is also likely to be used for commuting.

Walking, Cycling and Horse-Riding (WCH) Routes

- 12.5.7 The study area includes two routes on the NCN, which include both on-road and off-road sections (Figure 6.6). NCN 1 is 1,264 miles in length running indirectly between the south of England and Scotland. It passes the study area broadly in an east-west direction using unclassified roads between Hadleigh and Ipswich, crossing the study area at the Hadleigh Railway Walk. NCN 13 runs 136 miles from London to Fakenham. This crosses the draft Order Limits in a north–south direction to the north of Lamarsh using unclassified roads.
- 12.5.8 There are numerous other PRoW (footpaths, bridleways and byways) in the area, and horse-riding is a popular leisure activity around Bramford, Hintlesham, Shelley, Layham and Twinstead.
- 12.5.9 The 2013 PRoW survey data has been used for this preliminary assessment while the data from updated PRoW User Surveys is being analysed. The surveys were undertaken during June and August 2013, and each location was surveyed constantly on one day between 08:00 and 18:00. The location of user surveys was agreed with relevant organisations at a meeting on 24 April 2013. The data indicated that in 2013 there were less than 40 WCH on any of the PRoW surveyed. The only exception to this was the Hadleigh Railway PRoW, where there were a total of 100 users per day in both directions.
- 12.5.10 The sensitivity of the receptors is anticipated to range from **low** to **medium**. The sensitivity of the receptor is based on the type of PRoW; in this case the PRoW affected by the project are recreational routes and do not form any part of a network to access community assets.

Future Baseline

- 12.5.11 In the absence of the project, the future transport baseline in the study area is not expected to change significantly from the current baseline (2021). It will include forecasted traffic growth to 2024, the anticipated peak year of construction. It is likely that there will be some increases in baseline traffic flows and WCH activity due to new development in certain areas (along with corresponding localised improvements to the network), but the general character of the study area and the transport network that serves it is not expected to change.
- 12.5.12 Initial consultation with the Highway Authorities at Essex and Suffolk County Councils has highlighted several development sites, including Wolsey Grange and the Valley Ridge winter sports resort (formerly known as ‘SnOasis’), for consideration, although it was noted that the latter is not presently a committed development.
- 12.5.13 In addition, National Highways is developing a project to widen the A12 between junction 19 (Chelmsford) and junction 25 (A120 interchange, Marks Tey). Construction is currently anticipated to start in 2023/24 and be completed in 2027/28 (Highways England, 2021a). National Highways is also considering improvements to the A120 (between Braintree and the A12 at Marks Tey) (Highways England, 2021b) and, based on consultation with Suffolk County Council, the A12/A14 Copdock Interchange outside Ipswich. However, no improvements are considered to be committed at this stage.

12.5.14 A review of committed development (defined in line with DfT Transport Analysis Guidance (DfT, 2019c)) will be undertaken to update the future baseline prior to the assessment presented in the ES and Transport Assessment.

12.6 Likely Significant Effects (Without Mitigation)

12.6.1 This section sets out the likely significant effects of the project on traffic and transport. It assumes that the relevant good practice measures in Appendix 4.1: Outline CoCP are in place before assessing the effects. Operational effects on traffic and transport have been scoped out (see ID 4.7.3 in Table 12.1).

Embedded and Good Practice Measures

12.6.2 The Outline CoCP in Appendix 4.1 contains a list of good practice measures relevant to traffic and transport. These include the commitment to produce a CTMP (GG03 and TT01), the need for the main works contractor to implement a monitoring and reporting system to check compliance with the measures set out in the CTMP (TT02) and a commitment to close access to PRoW for short periods and providing signage for any diversions (TT03).

12.6.3 An Outline CTMP will be issued with the application for development consent and will provide a framework guiding the subsequent development of a final CTMP before the start of construction. The development of an Outline CTMP before the application will aid engagement with statutory consultees on proposed construction traffic management measures that may be included in the final CTMP.

Construction

Practices Common to Overhead Line and Underground Cables

Changes in Traffic Flow

12.6.4 Construction traffic forecasts indicate that the peak of construction would be in November 2024, with a monthly peak of 17,858 construction vehicles (two way) and a daily peak of 594 construction vehicles (two way). These construction vehicles would be split across 60 access points on the highway network. This is shown on Figure 12.2.

12.6.5 Routes where there is predicted to be an increase of construction traffic of more than 5% above the baseline are shown in Table 12.4. It should be noted that baseline traffic data is currently not available for all of the routes within the study area at this time (for example, baseline data is currently unavailable for the A12 and the A120). As set out in the methodology, it is proposed that additional baseline traffic data be collected for the ES.

12.6.6 A preliminary indication of the sensitivity of receptor and magnitude of impacts is set out in Table 12.4. This is based on the criteria set out in Appendix 5.1. The sensitivity of receptors is based on where there are land uses such as schools and nursing homes along the route. The magnitude of impacts is based on the percentage change of traffic from the baseline.

12.6.7 Millwood Road is predicted to experience the highest impact as a result of the construction traffic, with a 48% increase over the baseline. However, this is due to the low baseline flow. The impact of the construction traffic results in approximately an additional 11 two-way vehicles per hour on Millwood Road, or just over one additional vehicle every 10 minutes.

Table 12.4: Preliminary Percentage Change in Traffic on Key Routes (Based on the Peak Month of November 2024)

Road	Road Description	Baseline Total Daily Vehicles (2021)	Baseline Daily HGV (2021)	Predicted Construction Traffic Total Daily Vehicles	Predicted HGV Total Daily Vehicles	Predicted Total Daily Vehicle % Change from Baseline	Magnitude of Impacts	Sensitivity of Receptor	Significance of Effects
Brock Hill	Brock Hill from junction with Sudbury Road to Church End Road junction with Meadow Lane	965	73	183	146	19%	Negligible	Low	Neutral
Bures Road	Whole length of the road	396	56	39	27	10%	Negligible	Low	Neutral
Heath Road	From the junction with Straight Road to minor unnamed residential junction	379	17	131	105	35%	Small	Low	Minor/neutral
Stackwood Road	To the junction with Straight Road	423	47	143	113	34%	Small	Low	Minor/neutral
Millwood Road	From the junction with Straight Road to the junction with Stoke Road	177	8	84	66	48%	Small	Low	Minor/neutral
A1071	From the junction with Duke Street/Wilderness Hill to the junction with The Street/Church Hill	8,446	972	508	376	6%	Negligible	Very high	Minor

- 12.6.8 It should be noted that the change in traffic may also affect severance of WCH who may be impacted by increases in traffic, and this will be assessed in the ES.
- 12.6.9 Although baseline data is unavailable for the SRN, the total construction traffic associated with the project using the A12 is expected to be a maximum of 317 two-way daily vehicles. On the A12 near the project, recent historic traffic flows have exceeded 50,000 vehicles per day (DfT, 2019a; 2019b). Therefore, there is likely to be a **negligible** magnitude as there is less than a 1% increase in traffic as a result of the project.
- 12.6.10 Overall, in terms of change in traffic and severance for users, the significance of effects on the highways network is **neutral** or **minor** and therefore **not significant**.
- 12.6.11 The predicted construction traffic data shows that the peak month for staff activity on the site will be in June 2027 where there will be a daily total of nearly 700 staff. At this stage, the staff routing and mode share is unknown and will be developed as details emerge as part of the ES.
- 12.6.12 Agreement in Principle has been secured from National Highways for the proposed routing of AIL from for Tilbury Docks, which would be the preferred port of delivery for the transformers to the GSP substation. These would be transported under Special Type General Order regulations. Discussions are ongoing with National Highways but are likely to involve a route along the A1089, A13, M25, M11, A120 and A131. Discussions are also ongoing with Essex County Council in respect to structural clearance on the A131 Town Bridge, in Halstead.
- 12.6.13 The AIL Access Report as part of the ES will include any alterations required to the highway network and the timing of the AIL movements. However, any impacts would be **small/negligible** in magnitude given the temporary nature and measures in the Appendix 4.1: Outline CoCP. Therefore, it is anticipated that effects on the highways network associated with AIL movements will be **not significant**.
- 12.6.14 The good practice measures within the Outline CoCP would spread the construction traffic demand over the total working day, and the temporary impact on the identified highway network would be of **small/negligible** magnitude. Therefore, it is considered that there would be **neutral/minor** effects on the highway network which are **not significant**.

Journey Length and Severance for PRow

- 12.6.15 National Grid has identified a number of PRow that would be affected by construction of the project. Where the draft Order Limits cross a PRow, the PRow may require temporary closure. It should be noted that Hadleigh Railway Walk would have scaffolding or tunnelling and will remain open at all times for PRow users.
- 12.6.16 As noted in Chapter 4: Project Description, discussions with PRow officers are ongoing to resolve and agree the preferred method for managing, diverting or suspending the public right to use the respective PRow (temporary closure). It is assumed that there will be greater flexibility in the overhead line sections compared to the underground cable sections, to keep any temporary closures short in duration and to allow diversions of the PRow around the working area. The ES will present an assessment of each PRow within the draft Order Limits.
- 12.6.17 The 2013 survey data suggests that there are a low number of users and, in some cases, no WCH on the majority of the PRow surveyed. Therefore, the magnitude of impacts is likely to be **no change** to **small**. The level of significance for journey length and severance is therefore anticipated to be **neutral/minor** and therefore **not significant**.

Where there is an increase in traffic on an access route, the sensitivity will be determined by the level of total traffic on the route, which will be assessed as part of the ES.

Underground Cables

Journey Length and Severance for Railway Users

- 12.6.18 National Grid is discussing the construction method at the Sudbury Branch Railway Line with Network Rail. The current assumption is that the railway would not be closed during installation of the underground cables, but there may be some changes to service. Further details will be set out within the ES.
- 12.6.19 The railway is a local branch line, terminating at Sudbury, and services are hourly during weekdays. This receptor is considered to be of **high** value. The options to not change the timetable or to implement minor changes to the timetable are likely to have a **no change to negligible** impact magnitude, which would result in a **neutral/minor** effect that is **not significant**.

Summary of Construction Effects

- 12.6.20 The preliminary assessment undertaken at the PEI Report stage suggests that, with the application of good practice measures within the Outline CoCP, the effects on traffic and transport would be **not significant**. The updated traffic flows and construction data will be reviewed during the ES as part of the final assessment presented at application.

12.7 Sensitivity Testing

Flexibility in Construction Programme

- 12.7.1 This chapter assumes the base construction programme described in Chapter 4: Project Description. Sensitivity testing considering alternative project phasing, such as a later construction start date (three-month delay), has shown that there would be no new or likely significant effects to those identified in the core scenario assessed in Section 12.6. To consider the most probable impacts of construction as set out in Section 12.4, a window of six months has been allowed for during the construction programme to ensure that the highest level of activity within the peak month and within the three months each side of the peak has been included within the assessment.

Flexibility in Design

- 12.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD. This sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

12.8 Proposed Mitigation

- 12.8.1 The preliminary assessment has concluded that there are no likely significant effects in relation to traffic and transport during construction or operation. Therefore, no mitigation measures have been identified beyond the good practice measures set out in Appendix 4.1: Outline CoCP.

12.9 Residual Significant Effects (With Mitigation)

12.9.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to traffic and transport during construction or operation.

12.10 Conclusion

12.10.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to traffic and transport during construction and operation. As such, the requirements of the NPS EN-1 are likely to be met.

13. AIR QUALITY

13.1 Introduction

- 13.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on air quality receptors. The receptors considered within this chapter comprise human receptors, particularly residential and community receptors close to the draft Order Limits. The chapter has links with Chapter 7: Biodiversity, which assesses the effects of dust and emissions on ecological receptors.
- 13.1.2 During the construction phase, construction machinery and vehicles could generate dust and fine particulate matter, particularly through earthwork and soil stripping activities. Machinery and vehicles would also emit exhaust emissions through the combustion of fossil fuels.
- 13.1.3 There is limited potential for the project to generate dust and emissions during the operational phase, due to the limited activities associated with inspection and maintenance. This has been scoped out of the assessment (see Section 13.3 for further details).
- 13.1.4 This chapter also has links with Chapter 12: Traffic and Transport, which provides the baseline information used to assess the impacts of road traffic on air quality.
- 13.1.5 This chapter is supported by the following figure:
- Figure 13.1: Air Quality Baseline.

13.2 Regulatory and Planning Policy Context

National Policy Statement

- 13.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects on air quality which have been considered within this chapter.
- 13.2.2 Paragraph 5.2.7 of NPS EN-1 states that the ES should describe ‘*any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project*’. NPS EN-5 makes no specific reference to air quality.

Other Relevant Policy

- 13.2.3 Appendix 2.1: Local Planning Policy, lists the local policy potentially relevant to air quality. The Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP17 requires developments to be environmentally sustainable and appropriately mitigated against adverse environmental impacts and should consider issues such as air quality. Braintree District Council Local Plan (2017) Policy LPP 73 states that proposals should prevent unacceptable risks from all pollution, including emissions and air quality.

13.3 Scoping Opinion

- 13.3.1 The scope of the assessment for air quality has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State,

following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.

13.3.2 Table 13.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 13.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction			
Human receptors	Construction dust	Scoped out	(ID 4.8.1) Given the low risk in respect of construction dust on human health receptors and based on the measures set out within the Outline CoCP, the Planning Inspectorate agrees that this matter can be scoped out of the ES.
Amenity receptors	Construction dust	Not applicable	(ID 4.8.1) The Planning Inspectorate does not consider that sufficient information has been provided within the Scoping Report to confirm that the effect of construction dust on amenity receptors can be scoped out of the ES. Further information should be provided In the ES to support this conclusion (scoped in).
Ecological receptors	Construction dust	Scoped out (conditionally)	(ID 4.2.9) On the basis of the good practice measures in the Outline CoCP and any further mitigation identified through preparation of a dust risk assessment (which will be appended to the ES), the Inspectorate considers that this matter can be scoped out of the ES. This was conditioned on a review of the likely effects once construction logistics are more fully defined.
Human health	Construction generators	Scoped out	(ID 4.8.2) Limited information has been provided about the use of generators and other non-road mobile machinery or the likely emissions. Therefore, this should be scoped in to the ES.
Human health	Construction traffic emission	Scoped out (conditionally)	(ID 4.8.3) The Planning Inspectorate agrees to scope out this aspect if the predicted numbers of construction traffic movements generated by the project do not exceed the relevant indicative threshold presented in the IAQM guidance. The Inspectorate notes that when applying the screening criteria to any affected roads in an Air Quality Management Area (AQMA), the lower

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
			traffic volume threshold for AQMAs should be applied accordingly.
Human health	Existing traffic diverted by temporary construction measures	Scoped out	(ID 4.8.4) The Planning Inspectorate agrees that this aspect can be scoped out on the basis such measures would not be in place for any longer than four weeks and that the existing low vehicle flows on potentially affected roads mean that the screening criteria for air quality assessment would not be met.
Operation			
Human health	Operational vehicle emissions	Scoped out	(ID 4.8.5) The Planning Inspectorate agrees that operational vehicle emissions can be scoped out of the ES on the basis of low traffic flows during operation.

- 13.3.3 As noted in Table 13.1, air quality effects associated with construction traffic were scoped out of the assessment, assuming that traffic movements generated by the project do not exceed the relevant indicative threshold presented in the Institute of Air Quality Management (IAQM) guidance (2017). The preliminary assessment presented in Section 13.6 presents the current assumed traffic numbers used to support this. The ES will provide an update based on the final assumed traffic numbers to confirm whether this aspect can be scoped out.
- 13.3.4 As noted in Table 13.1, all matters relating to air quality during operation are scoped out of the assessment. Therefore, no operational assessment is presented in Section 13.6.
- 13.3.5 Table 13.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 13.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.8.6) The final study area used for the assessment should be shown on a figure within the ES. This should include identification of any AQMAs within the study area.	The preliminary assessment study areas are shown in Figure 13.1. Final study area figures will be produced for the ES.
(ID 4.8.7) A list of potential human receptors within the study area is presented at paragraph 13.4.11 of the Scoping Report. This should be reviewed and updated as the project boundary and construction routes are finalised. Relevant ecological receptors within the study area should also be identified and it should be explained whether these receptors are sensitive to dust deposition. This could be through cross reference to Chapter 7: biodiversity.	The list of human receptors will be reviewed and updated as the design of the project and draft Order Limits are developed, and when construction routes are finalised. In the preliminary assessment, human receptor numbers with respect to the assessment of construction site dust are presented in Table 13.4. Ecological receptors are identified in Table 13.5. Their sensitivity to dust deposition is assessed in Chapter 7: Biodiversity.

Matter Raised in the Scoping Opinion	Project Response
(ID 4.8.8) The ES should confirm the source of construction traffic flow data used in the assessment and that this has been calculated by reference to an appropriate methodology.	The source of construction traffic flow data and calculation methodology is described in Chapter 12: Traffic and Transport.

Project Engagement

- 13.3.6 National Grid has held a number of meetings with relevant organisations including Natural England, Babergh and Mid Suffolk District Council and Braintree District Council. as summarised in Chapter 3: Scoping Opinion and Consultation.
- 13.3.7 With specific reference to air quality, an initial meeting was held with Babergh and Mid Suffolk District Council and Braintree District Council on 4 March 2021. The proposed scope of assessment work was discussed with regards to air quality. At this meeting, National Grid proposed scoping out operational emissions, the risk of fugitive construction dust, temporary diverted traffic emissions and temporary emissions from construction generators. No specific comments were raised by consultees during the meeting.

13.4 Approach and Methods

- 13.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential effects on air quality. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Sources

- 13.4.2 The preliminary assessment has been informed by a desk study which has drawn on the following information sources:
- Defra Background Air Quality Archive (2018-base year) (Defra, 2021b);
 - Defra AQMA dataset (Defra, 2021a);
 - Local Air Quality Management Reports (Braintree District Council, 2020);
 - Local Air Quality Management Reports (Babergh and Mid Suffolk District Councils, 2021);
 - Baseline data on ecological designated sites collected as part of Chapter 7: Biodiversity; and
 - OS AddressBase Plus dataset (OS, 2021b).

Study Area

- 13.4.3 Different study areas are needed to assess the impacts of fugitive dust emissions from construction and to assess the emissions from vehicles using public highways.

Dust

- 13.4.4 The study area for fugitive dust emissions from construction is defined by the screening criteria from the IAQM Construction Dust Guidance (IAQM, 2016). Areas are scoped into the assessment where there is:

- a human receptor within the draft Order Limits plus a 350m area surrounding, or within 50m of the proposed routes used by construction traffic on the public highway up to 500m from the site entrance; or
- an ecological designated site within the draft Order Limits plus a 50m area surrounding, or within 50m of the proposed routes used by construction traffic on the public highway up to 500m from the site entrance.

Construction Traffic

13.4.5 Routes for construction traffic on the public highway from Figure 12.2 are considered as part of the preliminary assessment for vehicle emissions. An Affected Road Network (ARN) is defined according to the IAQM Planning Guidance (IAQM, 2017) predicted change in traffic volume criteria, which are:

- a change in light duty vehicles of 100 AADT within or adjacent to an AQMA or 500 AADT elsewhere; and/or
- a change in heavy duty vehicles >3.5 tonnes of 25 AADT within or adjacent to an AQMA or 100 AADT elsewhere.

13.4.6 The study area is taken to be within 200m of the ARN (based on DMRB LA 105 Air Quality (Highways England *et al.*, 2019c)) as beyond this distance emitted pollutants are generally accepted to have dispersed to match background concentrations. In areas where the above criteria are met, ecological and human receptors within 200m of the road within the ARN are scoped into the assessment.

Assessment Methodology

13.4.7 As noted in Appendix 5.1: Assessment Criteria, all air quality receptors are treated equally, with sensitivity being identified as locations representative of exposure to the averaging periods of relevant air quality objectives/critical loads. The magnitude of an impact is based on the change in pollutant concentration resulting from the project as a percentage of the Air Quality Assessment Level (see Appendix 5.1: Assessment Criteria for details).

13.4.8 Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the EIA Regulations 2017, are effects of moderate or greater significance.

Dust

13.4.9 The assessment of dust impacts is based on the IAQM Construction Dust Guidance (IAQM, 2016). The method requires the definition of the value (sensitivity) and magnitude of impact to provide an overall assessment of dust risk on human health, amenity (dust soiling) and ecology. The assessment of risk is used to determine whether additional mitigation is likely to be required to mitigate the effect.

Generator Use

13.4.10 The assessment of the impacts of emissions from generator use related to local power generation is based on the IAQM Air Quality for Planning guidance (IAQM, 2017) and professional judgement. The IAQM guidance provides an indicative threshold for NO_x emissions from single or combined sources, below which the impact of the emissions are unlikely to give rise to any significant effects impacts.

Construction Traffic

13.4.11 The assessment of the impacts of emissions from construction traffic is based on the IAQM Air Quality for Planning guidance (IAQM, 2017). This provides screening criteria indicating the thresholds above which an assessment may be necessary. There are thresholds for the daily flows of light duty vehicles and heavy duty vehicles (>3.5t), which vary depending on whether AQMA are present or not. Where the criteria are met, an assessment is generally considered necessary to determine the concentrations of pollutants in ambient air at human or ecological receptors adjacent to the ARN.

Preliminary Assessment Key Parameters and Assumptions

13.4.12 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.

13.4.13 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.

13.4.14 Construction traffic data and the assumption on which this is based is provided in Chapter 12: Traffic and Transport. Further air quality specific assumptions are listed below:

- Any qualitative assessment of traffic-related air quality impacts is made on the basis of the changes in traffic flows described as neutral or minor and not significant in Table 12.4 of Chapter 12: Traffic and Transport.
- The assessment of the construction traffic impact on the local road network in Chapter 12: Traffic and Transport is not based on the use of regional transport modelling. Therefore, any assumptions on air quality impacts made in this chapter are based on professional judgement and not modelled data.
- The preliminary assessment of construction dust risk is based on current construction information. Where information is required for the assessment that is not yet available, reasonable assumptions have been made.

13.4.15 For the purposes of the preliminary assessment for generator use, the following assumptions have been used based on current project designs and proposed machinery:

- The main construction compound would be connected to mains electricity. It is assumed that all remaining areas would be powered by diesel generators.
- Construction works at the CSE compounds would be powered by a 60kVA generator to power site cabins, lighting and welfare facilities.
- There would be mobile welfare units at multiple locations along the works to support the local site teams. These would be powered by 3–5kVA generators.
- There would be portable generators for powering specific tools, such as drilling.
- The trenchless crossing is assumed to have a 10kVA generator to power welfare facilities.

- The trenchless crossing assumed a horizontal directional drilling method, and the drill rigs are assumed to be powered by diesel engines. The drill rigs would have a compressor (assumed to be powered off the drill rig diesel engine) to help with the drilling process.

Further Assessment Within the ES

13.4.16 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. This may include updated machinery details based on the final designs.

13.5 Existing Baseline

Background Pollutant Concentrations

13.5.1 Background pollutant concentrations have been obtained from the Defra Background Air Quality Archive (Defra, 2021b) for the peak construction year of 2025 from the 2018-base year dataset. The key pollutants of concern are:

- oxides of nitrogen (NO_x) - mixture of gases that are composed of nitrogen and oxygen with the potential to impact human and ecological health;
- nitrogen dioxide (NO₂) – an oxide of nitrogen with the potential to impact human health;
- particulate matter (PM₁₀) – fine particles with the potential to impact human health; and
- particulate matter (PM_{2.5}) – ultra-fine particles with the potential to impact human health.

13.5.2 The average, maximum and minimum concentrations for each project section are shown in Table 13.3.

Table 13.3: Background Air Pollutant Concentrations

Section	NO _x (µg/m ³)			NO ₂ (µg/m ³)			PM ₁₀ (µg/m ³)			PM _{2.5} (µg/m ³)		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
AB Bramford Substation/ Hintlesham	8.2	9.8	7.7	6.4	7.6	6.1	14.4	15.6	13.1	8.4	8.8	8.1
C Brett Valley	7.8	8.1	7.6	6.1	6.4	6.0	14.0	14.5	13.5	8.3	8.5	8.2
D Polstead	7.7	7.9	7.5	6.0	6.2	5.9	14.4	15.4	13.4	8.4	8.8	8.2
E Dedham Vale AONB	7.7	8.0	7.6	6.1	6.3	6.0	14.3	15.4	13.2	8.5	8.8	8.2
F Leavenheath/ Assington	7.6	8.0	7.5	6.0	6.3	5.9	14.5	15.2	13.2	8.5	8.7	8.2
G Stour Valley	7.6	7.7	7.5	6.0	6.0	5.9	14.6	15.6	13.5	8.5	8.8	8.2
H GSP Substation	7.5	7.7	7.2	5.9	6.1	5.7	14.8	15.6	14.1	8.6	8.7	8.4
UK annual mean ambient air quality		30*			40			40			25	

Section	NO _x (µg/m ³)			NO ₂ (µg/m ³)			PM ₁₀ (µg/m ³)			PM _{2.5} (µg/m ³)		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
objective for the protection of human health (µg/m ³)												
*Relevant to the protection of vegetation and ecosystems												

13.5.3 Against the UK limit values for the concentrations of pollutants in ambient air, all of the concentrations shown in Table 13.3 are below 50% of the limit values, suggesting substantial headroom before an exceedance might occur. With reference to the World Health Organisation (WHO) limits for NO₂, PM₁₀ and PM_{2.5} (WHO, 2021), background concentrations of NO₂ are up to 76% of the suggested limit of 10µg/m³, concentrations of PM₁₀ are up to 104% of the limit suggested limit of 15µg/m³, and PM_{2.5} concentrations are up to 176% of the suggested limit of 5µg/m³.

Human Receptors

13.5.4 Table 13.4 shows the cumulative receptor numbers in bands in relation to each of the project sections. Receptors have been classified according to the classifications field in the OS AddressBase Plus dataset. Residential receptors include houses and farms, or any location that people may be present during the day and sleeping over-night. Community receptors may include village halls or scout huts. Commercial properties include offices and businesses. Some receptors may include multiple and different records, such as a residential home with a commercial office, or a farm with a residential farmhouse and numerous commercial farm buildings attached.

13.5.5 The receptors relating to ‘trackout’ are those which could be impacted by material tracked from the construction site to the public road network during construction.

Table 13.3: Cumulative Banded Receptors per Section

Receptor Type	Distance from the Draft Order Limits					
	0–20m	0–50m	0–100m	0–200m	0–350m	Trackout
Section AB Bramford Substation/Hintlesham						
Residential	15	47	86	137	249	64
Community	0	0	0	0	3	3
Commercial	6	15	16	25	38	3
Total	21	62	102	162	290	70
Section C Brett Valley						
Residential	1	2	6	60	142	49
Community	0	0	0	0	0	1
Commercial	1	1	1	2	6	0
Total	2	3	7	62	148	50
Section D Polstead						
Residential	0	7	16	33	88	58

Receptor Type	Distance from the Draft Order Limits					Trackout
	0–20m	0–50m	0–100m	0–200m	0–350m	
Community	0	0	0	0	0	0
Commercial	1	1	1	3	4	0
Total	1	8	17	36	92	58
Section E Dedham Valley						
Residential	0	3	9	23	47	20
Community	0	0	0	0	0	0
Commercial	0	0	1	2	4	1
Total	0	3	10	25	51	21
Section F Leavenheath/Assington						
Residential	4	10	26	70	195	94
Community	0	1	1	2	2	1
Commercial	0	1	2	2	18	8
Total	4	12	29	74	215	103
Section G Stour Valley						
Residential	10	27	54	118	194	35
Community	0	2	3	4	7	3
Commercial	2	3	6	13	15	3
Total	12	32	63	135	216	41
Section H GSP Substation						
Residential	1	6	12	30	91	27
Community	0	0	0	1	2	2
Commercial	3	4	4	5	10	5
Total	4	10	16	36	103	34

Ecological Receptors

13.5.6 The nearest ecological receptors are shown in Table 13.5 along with the nearest project section and the distance to the draft Order Limits.

Table 13.4: Ecological Receptors

Site Name	Distance To draft Order Limits (m)
Section AB Bramford Substation/Hintlesham	
Hintlesham Woods SSSI	0 (within draft Order Limits)
Tom's/Broad oak Wood CWS	1
Valley Farm Meadow CWS	0 (within draft Order Limits)
Bullen Wood CWS	0 (adjacent to draft Order Limits)

Site Name	Distance To draft Order Limits (m)
Round Wood and Elms Grove CWS	0 (within draft Order Limits)
Section C Brett Valley	
Railway Walk, Hadleigh LNR	0 (within draft Order Limits)
Hadleigh Railway Walk CWS	0 (within draft Order Limits)
Section D Polstead	
Millfield Wood CWS	0 (adjacent to draft Order Limits)
Valley Farm Wood CWS	0 (within draft Order Limits)
Layham Pit Woodland and Meadow CWS	0 (within draft Order Limits)
Roadside Nature Reserve 202	95
Layham Grove CWS	215
Section E Dedham Valley	
Broom Hill Wood CWS	0 (adjacent to draft Order Limits)
Bushy Park Wood CWS	0 (adjacent to draft Order Limits)
The Dollops CWS	0 (within draft Order Limits)
King Harry's Grove CWS	181
Section F Leavenheath/Assington	
Arger Fen SSSI	0 (adjacent to draft Order Limits)
Section G Stour Valley	
Alphamstone Complex LWS	0 (within draft Order Limits)
Alphamstone Meadows LWS	10
Loshes Meadow Complex (part Essex Wildlife Trust Reserve) LWS	0 (within draft Order Limits)
Moat Farm/Burnt House Marsh LWS	0 (within draft Order Limits)
Daws Hall LWS	4
Twinstead Marsh LWS	0 (within draft Order Limits)
Ansell's Grove/Ash Ground LWS	0 (within draft Order Limits)
Pebmarsh House LWS	0 (adjacent to draft Order Limits)
Section H GSP Substation	
Waldegrave Wood LWS	0 (adjacent to draft Order Limits)
Butler's Wood LWS	0 (adjacent to draft Order Limits)

Future Baseline

13.5.7 Background concentrations of air pollutants NO₂, PM₁₀ and PM_{2.5} are expected to reduce over time in response to national and local policies designed to reduce air emissions outlined in the government's Clean Air Strategy (Defra, 2019). The rate of reduction is

expected to be greater for NO₂ than fine particles because of specific policies targeting the reduction of road traffic emissions.

13.6 Likely Significant Effects (Without Mitigation)

- 13.6.1 This section sets out the likely significant effects of the project on air quality. It assumes that the good practice measures in Appendix 4.1: Outline CoCP are in place before assessing the effects. As noted within ID 4.8.5 of the Scoping Opinion (Planning Inspectorate, 2021a), operational effects on air quality are scoped out of the assessment.

Embedded and Good Practice Measures

- 13.6.2 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to air quality, including a commitment to produce a CEMP (GG03). The dust risk assessment will be appended to the Outline CEMP submitted with the application for development consent.

Construction

Practices Common to Overhead Line and Underground Cables

Dust

- 13.6.3 Whilst the Scoping Opinion (Planning Inspectorate, 2021a) agreed that the effects of construction dust on human health could be scoped out of the ES on the basis of low background concentrations, it did not agree that there was sufficient information to scope out the construction dust effects on amenity receptors and ecological receptors. As the assessment of amenity receptors is necessarily intertwined with the assessment of human health to provide an overall risk of dust impacts, the preliminary results of the dust risk assessment for both aspects have been considered as part of the preliminary results presented within this chapter.
- 13.6.4 A preliminary IAQM construction dust risk assessment has been undertaken for the project. This considered the potential working areas, the soil parent material (using BGS data), the scale of earth works and the typical construction activities. The assessment also considered the sensitivity of receptors based on the various tables set out in the IAQM dust risk assessment guidance (IAQM, 2014). It split the construction activities into demolition, earthworks, construction and trackout. Professional judgement was used in the application of the IAQM dust risk assessment guidance (IAQM, 2014).
- 13.6.5 The assessed construction dust impacts range from a negligible risk of dust impacts up to a high risk of dust impacts, with high risk of dust particularly associated with dust soiling from earthworks. However, with the good practice measures from the Outline CoCP are in place, the risk of dust impacts and their effects are expected to be **not significant**. The full dust risk assessment will be appended to the Outline CEMP provided at application.

Generator Use

- 13.6.6 Emissions to air can be generated from the use of diesel-powered non-road mobile machinery and diesel-powered generators related to construction activities. The use of construction non-road mobile machinery is unlikely to result in significant effects on local air quality according to the guidance from Local Air Quality Management – Technical Guidance (TG16) (Defra, 2021e). Non-road mobile machinery and plant are required to meet European Stage V emission standards. It is expected that any diesel generating equipment used would meet the minimum Stage V engine type requirements.

13.6.7 There are a number of residential properties within 350m of the draft Order Limits at the proposed trenchless crossing beneath the River Stour. Emissions from the use of diesel-powered generators for activities such as those directly powering equipment for the trenchless crossing may be perceptible at nearby receptors. However, these emissions are unlikely to exceed the 1-hour limit value for NO₂ of 200µg/m³, especially given the low background concentrations of NO₂ in the area. Whilst no exposure to fossil fuel based air pollutants can be considered safe, the fact that the limit value is highly unlikely to be exceeded means any effects can be considered **not significant**.

Construction Traffic

13.6.8 Effects relating to construction traffic were provisionally scoped out of the assessment on the basis that the vehicle numbers would be low. Further work has been undertaken as part of the traffic assessment to confirm this assumption (see Chapter 12: Traffic and Transport for details). It is currently anticipated that there would be no construction traffic through the centre of Sudbury, where there is an AQMA. Based on a preliminary highways impact assessment, it is anticipated that the impacts of the construction traffic would be **not significant**, and it is not anticipated that baseline traffic would be rerouted as a result of the change in traffic on the construction routes.

13.6.9 The preliminary assessment of the construction traffic routes has shown that any changes in local air quality due to construction traffic volumes would be **not significant** based on the changes in traffic flows detailed in Table 12.4 of Chapter 12: Traffic and Transport. This will be reviewed as part of the updated traffic data provided at the EIA stage, and the results of the assessment will be presented within the ES.

Summary of Construction Effects

13.6.10 The construction phase of the project carries risks of generating dust and creating emissions (both through generator use and construction traffic) that could affect human and ecological receptors. The preliminary assessment undertaken at this PEI Report stage suggests that, with the application of good practice measures within the Outline CoCP, the effects would be **not significant**. The updated traffic flows and construction data will be reviewed during the ES as part of the final assessment presented at application.

13.7 Sensitivity Testing

Flexibility in Construction Programme

13.7.1 This chapter assumes the base construction schedule described in Chapter 4: Project Description for the purposes of the assessment. The preliminary construction dust risk assessment includes provision for construction activities to take place during the summer, when the potential for fugitive dust is at its highest. Therefore, alternative project phasing, such as a later construction start date, would have no new or different likely significant effects to those identified in the baseline scenario assessed.

Flexibility in Design

13.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD.

- 13.7.3 The IAQM dust risk assessment is based on the draft Order Limits. Any sensitivity testing considering alternative pylon locations would not alter the number of receptors assessed within the construction dust risk assessment. As such, this sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.
- 13.7.4 The screening of transport emissions from construction traffic has been undertaken using the IAQM criteria and has shown that only those routes potentially affecting the Sudbury AQMA meet the screening criteria for a dispersion modelling assessment. The preliminary traffic assessment found no significant impacts on traffic flows, and also that no construction related traffic is expected to travel along the A131 through Sudbury. Given the limited scope for changes in construction routes and the neutral or minor effects identified in Chapter 12: Traffic and Transport, it is unlikely that any new or different significant effects would occur.
- 13.7.5 Due to the construction traffic flows and screening criteria applied to routes not affecting the Sudbury AQMA, any variations in construction traffic volumes on these routes are unlikely to result in significant effects to roadside receptors at these locations.

13.8 Proposed Mitigation

- 13.8.1 The preliminary assessment has concluded that there are no likely significant effects in relation to air quality receptors during construction or operation. Therefore, no mitigation measures have been identified beyond the good practice measures set out in Appendix 4.1: Outline CoCP.

13.9 Residual Significant Effects (With Mitigation)

- 13.9.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to air quality receptors during construction or operation.

13.10 Conclusion

- 13.10.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to air quality during construction and operation. As such, the requirements of the NPS EN-1 are likely to be met.

14. NOISE AND VIBRATION

14.1 Introduction

- 14.1.1 This chapter details the preliminary environmental assessment of the likely significant effects of the project on noise and vibration sensitive receptors (NSR). The receptors considered within this chapter comprise human receptors, particularly residential and community receptors, close to the draft Order Limits. The chapter has links with Chapter 7: Biodiversity, which assesses the effects of noise and vibration on ecological receptors.
- 14.1.2 Noise is generated during construction through the use of machinery, particularly certain equipment such as that used for trenchless crossings (drilling), piling foundations and generators to power construction machinery. Noise may also be generated due to increased traffic on the road network.
- 14.1.3 Operational noise can be experienced from overhead lines (crackle associated with corona discharge) or due to equipment such as at the GSP substation. However, the embedded measures in Table 4.1 of Chapter 4: Project Description will reduce the level of operational noise such that it is not significant. Operational noise from overhead lines and the GSP substation is therefore scoped out of further assessment. The underground cables and CSE compound would not generate noise during operation and are similarly scoped out of further assessment. Further details regarding the Planning Inspectorate's acceptance of both aspects being scoped out can be found in Section 14.3.
- 14.1.4 This chapter has links to other chapters, in particular Chapter 7: Biodiversity, which considers noise effects on ecological receptors; Chapter 8: Historic Environment, which considers noise effects in relation to setting of historical assets; and Chapter 12: Traffic and Transport, which provides the baseline information used to inform the noise assessment relating to construction traffic.
- 14.1.5 This chapter is supported by the following appendix and figures:
- Appendix 14.1: Initial Construction Noise and Vibration Data;
 - Figure 14.1: Noise Baseline and Potential Effects; and
 - Figure 12.1: Access Point Locations and Routing.

14.2 Regulatory and Planning Policy Context

National Policy Statement

- 14.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b). NPS EN-1 states that energy projects could have adverse effects from noise and vibration which has been considered within this chapter.
- 14.2.2 Paragraph 5.11.4 of NPS EN-1 states, '*Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:*
- *A description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;*

- Identification of noise sensitive premises and noise sensitive areas that may be affected;
- The characteristics of the existing noise environment;
- A prediction of how the noise environment will change with the proposed development;
- In the shorter term such as during the construction period;
- In the longer term during the operating life of the infrastructure;
- At particular times of the day, evening and night as appropriate;
- An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and
- Measures to be employed in mitigating noise.’

Other Relevant Policy

14.2.3 Appendix 2.1: Local Planning Policy lists the local policy potentially relevant to noise and vibration. The Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP17 and Braintree District Council Local Plan (2017) Policy LPP 73 both require developments to be environmentally sustainable and appropriately mitigated against adverse environmental impacts, such as noise.

14.3 Scoping Opinion

14.3.1 The scope of the assessment for noise and vibration has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees.

14.3.2 Table 14.1 summarises the scope of the assessment. This table includes the references (for example ID 4.6.1) to the relevant paragraph response from the Planning Inspectorate in the Scoping Opinion. The boxes shaded in grey are the matters that have been scoped out of the assessment following the feedback from the Planning Inspectorate.

Table 14.1: Summary of Aspects Scoped In/Out Based on Scoping Opinion

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
Construction			
Noise sensitive receptors	Survey of existing road traffic noise	Scoped out	(ID 4.9.5) The Inspectorate agrees that survey of existing road traffic noise on construction routes may be scoped out of the ES on the basis that construction traffic noise will be determined through calculation in line with Calculation of Road Traffic Noise (CRTN) (1988).
Noise and vibration sensitive receptors	Likely significant effects during construction	Scoped in	(ID 4.9.8) The Inspectorate notes that this matter is scoped in to the ES in particular in relation to potential for construction noise hotspots. The assessment should consider activity that would give rise to likely

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
			significant effects to identified NSRs, including cutting of old pylons and breaking out of piled foundations, where relevant.
Vibration sensitive receptors	Construction traffic vibration	Scoped out	(ID 4.9.1) The Scoping Report states that vibration levels are expected to be very low and mitigation would be included within the Outline CEMP. On that basis, the Inspectorate agrees that further assessment of this matter can be scoped out of the ES. The calculations referenced at paragraph 14.6.10 of the Scoping Report will be appended to the ES, as requested in the Scoping Opinion.
Vibration sensitive receptors	Baseline vibration study	Scoped out	(ID 4.9.6) The Inspectorate agrees that a baseline vibration study may be scoped out of the ES on the basis that construction vibration baseline will be assumed as negligible or zero due to absence of construction work prior to commencement.

Operation

Noise sensitive receptors	Operational noise from the GSP substation, overhead line, CSEC and underground cables	Scoped out	(ID 4.9.2) On the basis that the conductor bundle and pylon fittings used within the project conform to the Technical Specification and Type Registration process and therefore would result in no audible noise generation on the proposed new and modified overhead line, the Inspectorate agrees that this matter can be scoped out of the ES. On the basis that the CSE compounds and sections of underground cable would not generate noise during operation, the Inspectorate agrees that this matter can be scoped out of the ES. The Inspectorate agrees that on the basis of the design measures to be incorporated into the project and the distance of the nearest NSR from the location of the GSP substation (circa 300m), it is unlikely that significant effects from operational noise would arise from the GSP substation. On that basis, the Inspectorate agrees that operational noise relating to human receptors can be scoped out of the ES.
Ecological receptors	Operational noise from the GSP substation	Scoped out	(ID 4.9.2) As noise impacts from the proposed GSP substation have not yet been fully quantified and given the proximity of potential ecological receptors to this location, consideration of noise impacts on ecological receptors should be scoped in to the ES.
Noise sensitive receptors	Operational noise associated with	Scoped out	(ID 4.9.4) On the basis that operational maintenance activities would be infrequent and localised and that

Receptor	Proposed Matter	Conclusion in the Scoping Report (May 2021)	Response in the Scoping Opinion (June 2021)
	maintenance activities		traffic flows would be low, the Inspectorate agrees that this matter can be scoped out of the ES.
Noise sensitive receptors	Operational noise associated with maintenance activities	Scoped out	(ID 4.9.4) The ES should consider the potential that more substantial activity is required as part of maintenance, e.g. replacement of components of the project, which would be more akin to the impacts described during the construction stage. The ES should include an assessment of where significant effects would be likely (scoped in).
Vibration sensitive receptors	Operational vibration	Scoped out	(ID 4.9.3) On the basis that the proposed GSP substation is located more than 100m from the nearest receptor (circa 300m), the Inspectorate agrees that vibration effects on human receptors can be scoped out of the ES.
Ecological receptors	Operational vibration from the GSP substation	Scoped out	(ID 4.9.3) The Inspectorate does not consider that sufficient evidence has been provided within the Scoping Report to conclude that there would be no operational vibration impact to ecological receptors from the proposed GSP substation. This matter should be scoped in to the ES.

- 14.3.3 Although not explicitly stated in Table 14.1, construction traffic noise on the public highway is scoped in to the ES and is assessed in Section 14.6 of this chapter.
- 14.3.4 As noted in Table 14.1, an assessment of impacts resulting from operational noise from the GSP substation, overhead line, CSE compound and underground cables is scoped out of the ES and is not considered in this PEI Report.
- 14.3.5 As also noted in Table 14.1, for human receptors operational vibration from the GSP substation is scoped out of the ES and is not considered in this chapter. Any effects of operational vibration would be negligible, and the use of standard good practice techniques (e.g. vibration isolation pads) would prevent transmission of groundbourne vibration from the transformers. Groundborne vibration has never been raised as a significant issue or resulted in any complaints at any operational National Grid sites.
- 14.3.6 With regards to noise from overhead lines, the proposed overhead line system is a 'triple Araucaria' conductor bundle on a lattice pylon (see Table 4.1: Embedded Measures), which is regarded as practically quiet. Operational noise from the overhead line is therefore expected to be not significant at nearby NSRs under any weather conditions and is not considered further in this chapter. Additional information to evidence this will be provided in an appendix as part of the ES.
- 14.3.7 The design criterion applicable to the project for the GSP substation noise is lower than that which would be significant in EIA terms. As such, noise from the operation of the GSP substation would be not significant and is not considered further in this chapter. Additional information will be provided in an appendix as part of the ES to inform potential impacts on biodiversity, which are considered in Chapter 7: Biodiversity of this PEI Report.

14.3.8 Table 14.2 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 14.2: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(ID 4.9.7) The assessment should demonstrate that CRTN is an appropriate assessment method for the nature of the road network and the baseline traffic flows.	The use of basic noise levels, calculated in accordance with CRTN, to assess construction traffic noise impacts is advocated by DMRB LA 111 (Highways England <i>et al.</i> , 2020d).
(ID 4.9.8) The ES should include appropriate figures to illustrate the study area adopted for construction traffic and vibration impacts, and associated receptors within the defined study area. This should include non-residential NSRs such as ecological receptors, areas used for leisure activities and sites of historic or cultural importance.	Proposed construction traffic routes are shown in Figure 12.1. An initial assessment of noise impacts from construction traffic on these routes is provided in this PEI Report, and will be updated as part of the ES. Figure 14.1 shows locations of residential and non-residential NSR, except for ecological receptors which are assessed in Chapter 7: Biodiversity. The ES will also include figures illustrating the study areas and the locations of residential and non-residential NSRs.
(ID 4.9.9) The Inspectorate notes that it is proposed to use desk based information and survey data undertaken prior to 2013 for the purposes of establishing the baseline for the assessment of construction noise impact (excluding construction traffic). The ES should explain why the historic data is still appropriate, including a description of any change(s) to the study area in terms of new receptors or noise sources that may have affected the noise baseline in the intervening period and why the data remains valid.	<p>Initial construction noise impacts will be assessed based on the guidance of BS 5228-1 and DMRB LA 111, as described in Section 14.7 of the Scoping Report. The guidance sets the construction noise significant observed adverse effect level (SOAEL) relative to the ambient noise level, subject to lower thresholds, as shown in Table 14.2 of the Scoping Report. Baseline noise surveys could therefore only serve to raise the SOAEL above these lower thresholds. The use of the lower SOAEL thresholds therefore represents worst-case assessment criteria for construction noise.</p> <p>The use of raised SOAEL values above the lower thresholds is usually only required in urban areas and areas close to the main transport routes where the increased ambient noise levels would mask construction noise (i.e. higher construction noise levels are required for impacts to be significant in such environments).</p> <p>Given the rural nature of the study area, ambient noise levels are relatively low, as corroborated Defra strategic noise mapping, as well as noise surveys previously conducted in the area. Therefore, baseline noise surveys are not required to inform the assessment of construction noise impacts, and the use of the lower SOAEL thresholds is appropriate.</p>
(ID 4.9.10) The Inspectorate notes that the ES should also assess likely significant effects from noise and vibration to ecological receptors,	Chapter 7: Biodiversity considers the likely effects from noise and vibration on ecological receptors. Chapter 8: Historic Environment considers the likely effects from

Matter Raised in the Scoping Opinion	Project Response
historic buildings and other non-residential NSR, such as leisure activities and sites of historic or cultural importance.	noise and vibration on heritage assets. Chapter 6: Landscape and Visual considers the likely effects from noise and vibration on leisure activities (amenity).
(ID 4.9.4) The ES should consider the potential that more substantial activity is required as part of maintenance, e.g. replacement of components, which would be more akin to the impacts described during the construction stage. The ES should include an assessment of where significant effects would be likely.	Noise from substantial activities required for maintenance are considered in Section 14.6. Such works could cause an effect similar to that predicted for construction. Such works will also be considered as part of the ES.

Project Engagement

- 14.3.9 National Grid has held a number of meetings with relevant organisations including Natural England, Babergh and Mid Suffolk District Council and Braintree District Council, as summarised in Chapter 3: Scoping Opinion and Consultation.
- 14.3.10 With specific reference to air quality, an initial meeting was held with Babergh and Mid Suffolk District Council and Braintree District Council on 4 March 2021. The proposed scope of assessment work was discussed with regards to noise and vibration. At this meeting, National Grid proposed not undertaking further noise surveys, due to the assumed very low background levels. National Grid also proposed scoping out vibration during construction (except at piling locations) and operational noise. No specific comments were raised by consultees during the meeting, and scoping out of these aspects was subsequently confirmed through the Scoping Opinion (Planning Inspectorate, 2021a).

14.4 Approach and Methods

- 14.4.1 This section describes the methodology used to establish the baseline and the approach used to consider and assess the significance of potential effects from noise and vibration at nearby NSRs. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Data Sources

- 14.4.2 The preliminary assessment has been informed by a desk study which has drawn on the following key information sources:
- Defra strategic noise mapping (Defra, 2017);
 - OS AddressBase Plus data (OS, 2021b); and
 - 2012 National Grid noise survey data.

Study Areas

- 14.4.3 This section describes the study areas for the various assessments of noise and vibration effects. Residential and non-residential NSRs have been identified within 1km of the draft Order Limits and are shown on Figure 14.1.

Construction Noise

- 14.4.4 The study area for construction noise impacts considers NSRs within 300m of the construction locations associated with the project, excluding construction traffic on the public highway which is assessed separately (see below). This is based on guidance in British Standard (BS) 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (BS 5228-1) (British Standards Institution, 2014a), which states that caution is needed when making construction noise predictions beyond 300m due to meteorological effects, particularly when a soft ground correction factor has been applied. A 300m study area is also advocated by DMRB LA 111 (Highways England *et al.*, 2020d).

Construction Traffic Noise

- 14.4.5 Noise from construction traffic on the existing road network has been assessed for each applicable road. Proposed construction traffic routes are shown in Figure 12.1. The assessment principally considers the change in basic noise level at 10m from the road, calculated in line with the methodology described in CRTN (Department of Transport and Welsh Office, 1988), with a subsequent assessment of the impacts on NSRs within 50m of routes where potential significant effects are identified.

Construction Vibration

- 14.4.6 The proposed study area for construction vibration impacts, based on guidance from BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration' (BS 5228-2) (British Standards Institution, 2014b) and DMRB LA 111 (Highways England *et al.*, 2020d), is 100m from the closest construction activity with the potential to generate vibration impacts at NSRs.

Assessment Methodology

- 14.4.7 The value (sensitivity) of residential receptors is embedded in various noise and vibration assessment criteria. Appendix 5.1: Assessment Criteria contains the sensitivity of non-residential NSRs and magnitude tables that form the basis of the assessment relevant to this chapter.
- 14.4.8 Significance has been derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects in the context of the EIA Regulations 2017 are effects assessed to be of moderate or greater significance.

Construction Noise

- 14.4.9 Construction noise impacts have been assessed in accordance with BS 5228-1 (British Standards Institution, 2014a) and with the guidance of DMRB LA 111 (Highways England *et al.*, 2020d).
- 14.4.10 Construction noise levels were calculated at NSRs within the 300m study area in accordance with the methodology described in Annex F of BS 5228-1. The predicted construction noise levels at NSRs were compared against the lower noise thresholds (Category A) as detailed in Section E.3.2 of BS 5228-1. The Category A construction noise thresholds are suitable for quiet rural locations.
- 14.4.11 The significance of construction noise effects is determined based on exceedance of the SOAEL threshold noise level and the duration of exceedance.

Construction Traffic Noise

- 14.4.12 Noise from construction traffic on the public highway has been calculated in accordance with CRTN and assessed against the criteria detailed in DMRB LA 111 (Highways England *et al.*, 2020d). The basic noise level from roads within the construction traffic study area (10m from the road) have been calculated in accordance with CRTN for the do-nothing and do-something scenarios in the construction year. The calculated basic noise level values were compared to determine the magnitude of the impact.
- 14.4.13 The significance of construction traffic noise effects has been determined based on the magnitude of the change in noise level and the duration of exceedance.

Construction Vibration

- 14.4.14 Construction vibration levels were calculated and assessed in accordance with the methodologies described in BS 5228-2 (British Standards Institution, 2014b).
- 14.4.15 Vibration levels from construction activities at NSRs have been predicted in accordance with the methodology described in Annex E of BS 5228-2.
- 14.4.16 The predicted vibration levels at nearby NSRs will be compared against threshold values, as provided by BS 5228-2, to determine potential significant adverse effects including annoyance on people within buildings and potential building damage.

Preliminary Assessment Key Parameters and Assumptions

- 14.4.17 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.
- 14.4.18 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.

Construction Noise and Vibration

- 14.4.19 The assessment assumes the core working hours set out in Chapter 4: Project Description, which are as follows:
- 07:00–19:00 Mondays to Fridays; and
 - 08:00–17:00 on Saturdays, Sundays and Bank Holidays.
- 14.4.20 Chapter 4: Project Description also explains that some specific activities may need to take place outside of the core working periods. However, construction work at night would only occur on rare occasions and would be likely to last for only a short duration, not exceeding the temporal criteria, at any one location. The assessment therefore focuses on the core weekday working hours.
- 14.4.21 As stated in Chapter 4: Project Description, percussive piling may be required at some pylon locations and for the foundations of the CSE compounds and GSP substation, subject to the ground conditions. The preliminary assessment set out in this PEI Report assumes that piling is required at all pylon locations and at the CSE compounds and GSP substation. Further details on the need for piling and specific locations will be set out within the ES.

14.4.22 Appendix 14.1: Initial Construction Noise and Vibration Data presents the current project assumptions with regards to machinery that would be used and the anticipated noise levels associated with these that have been used within the preliminary assessment. These are considered to be likely machinery types given experience of constructing similar projects. Any changes to proposed machinery assumptions will be presented within the ES and the noise assessment updated accordingly.

Construction Traffic Noise

14.4.23 Construction traffic data and the assumption on which this is based is provided in Chapter 12: Traffic and Transport. Further traffic noise specific assumptions are as follows:

- Any qualitative assessment of traffic related noise impacts is made on the basis of the changes in traffic flows described in Table 12.4 of Chapter 12: Traffic and Transport.
- The assessment of the construction traffic impact on the local road network in Chapter 12: Traffic and Transport is not based on the use of regional transport modelling. Therefore, any assumptions on noise impacts made in this chapter are based on professional judgement and not modelled data.

Further Assessment Within the ES

14.4.24 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. This may include updated machinery details based on the final designs.

14.5 Existing Baseline

14.5.1 NSRs near the project are predominantly isolated dwellings. There are, however, settlements at Burstall, Hintlesham, Hadleigh, Layham, Polstead Heath, Polstead, Hagmore Green, Leavenheath, Assington, Lamarsh, Alphamstone, Henry Street, Great Henny, Twinstead, Twinstead Green and Wickham St Paul, within approximately 1km of the draft Order Limits. Residential and non-residential NSRs are shown on Figure 14.1.

14.5.2 Existing ambient and background noise levels in the draft Order Limits are generally low during both daytime and night-time periods, with higher noise levels expected close to existing roads, particularly the A1071, A134 and A131. This is corroborated by Defra (2017) strategic noise mapping and survey data collected by National Grid in 2012.

Construction Noise

14.5.3 Construction noise impacts are assessed against threshold values, following the guidance of Annex E.3.2 of BS 5228-1, which are set relative to the ambient noise level, subject to lower thresholds. Given the rural setting of the project, the ambient noise levels are expected to be low, and the lower thresholds will apply.

Construction Traffic Noise

14.5.4 There are several Noise Important Areas (NIAs) on the existing public highway along routes which may be used for construction traffic associated with the project. NIAs are determined via strategic noise maps and highlight the residential areas experiencing the highest 1% of noise levels from road and rail sources in England. These are generally away from the draft Order Limits but may be applicable when identifying potential

construction traffic impacts. The NIAs near the draft Order Limits and potential construction traffic routes are shown on Figure 14.1 and are as follows:

- NIA_11345 – A1072 southeast of Burstall;
- NIA_11346 – A1071 in Hintlesham;
- NIA_11347 – A1071 northwest of Hintlesham;
- NIA_12012, NI_12013 and NI_12014 – A134 in Newton; and
- NIA_12016 – A131 southwest of Twinstead Green.

Construction Vibration

- 14.5.5 Construction vibration impacts are assessed against threshold values as defined by BS 5228-2. It is assumed that there are no notable extraneous sources of vibration affecting NSRs and that existing vibration levels are negligible.

Future Baseline

- 14.5.6 The future baseline is not expected to materially change in the reasonably foreseeable future with regards to noise and vibration.

14.6 Likely Significant Effects (Without Mitigation)

- 14.6.1 This section sets out the likely significant noise and vibration effects of the project on NSRs during the construction phase. It assumes that the relevant embedded measures in Table 4.1 and the good practice measures in Appendix 4.1: Outline CoCP are in place before assessing the effects.
- 14.6.2 Chapter 4: Project Description also explains that some activities may need to take place outside of the core working periods. The assessment of effects is based on a combination of construction noise level and the duration of the activities. Construction work at night would only occur on rare occasions during exceptional circumstances and would be likely to last for only a short duration, not exceeding the temporal criteria, at any one location. The assessment therefore focuses on the core weekday working hours.
- 14.6.3 The predicted construction noise levels will depend on the number and type of plant items and equipment operating at any one time and on their precise location relative to the NSRs. Therefore, a receiver will experience a range of values representing “minimum” and “maximum” construction noise emissions depending on:
- the size of the work site;
 - the location of the dominant noise generating plant within the work site, relative to receivers (i.e. if the plant item of interest were as close as possible to or further away from the receiver of interest); and
 - the likelihood of the various items of plant operating simultaneously.
- 14.6.4 Initial construction noise and vibration calculations, including SOAEL threshold distances for each activity, are provided in Appendix 14.1. Areas where the noise and vibration SOAELs are potentially exceeded, and whether they are short-term or long-term activities, are shown in Figure 14.1.

Embedded and Good Practice Measures

- 14.6.5 Embedded measures relating to the noise assessment include a noise enclosure around the transformers at the GSP substation and that the designs assume triple Araucaria conductors on standard lattice pylons, which would both reduce operational noise.
- 14.6.6 Appendix 4.1: Outline CoCP contains a list of relevant good practice measures relating to noise and vibration including locating equipment away from sensitive receptors where practicable (GG10) and plant vehicles conforming to relevant applicable standards and turning machinery off when not in use (GG12).
- 14.6.7 In addition, the main works contractor would be required to follow good construction practices (referred to as best practicable means; BPM) as outlined in BS 5228-1 and BS 5228-2 to control noise and vibration respectively. BS 5228-1 and BS 5228-2 have Approved Code of Practice status (in England) under the powers conferred by Sections 71(1)(b), (2) and (3) of the Control of Pollution Act 1974, as enacted under the Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015 (Defra, 2015). Compliance with the good practice noise and vibration requirements stated therein became a statutory obligation under the Act.
- 14.6.8 BPM measures will be identified within the CEMP and may include housing continuous noisy plant in acoustic enclosures, siting semi-static equipment as far as reasonably practicable away from occupied buildings, and fitting equipment with suitable enclosures or screening.

Construction Noise

Practices Common to Overhead Line and Underground Cables

Noise Associated with Construction Compounds

- 14.6.9 Construction works associated with the setup of construction compounds are expected to be general site clearance, ground compaction and installing temporary site buildings. Based on the calculations provided in Appendix 14.1, the SOAEL is expected to be exceeded at NSRs within approximately 55m and 70m of works for noise and vibration, respectively. However, these activities are expected to be for a short duration and below the temporal requirement for significance. Noise and vibration due to construction of construction compounds would be below the respective SOAELs, and therefore a **negligible to small** magnitude impact, and/or below the temporal requirement for significance, at all NSRs.
- 14.6.10 During construction, noise at the construction compounds is expected to comprise the use of generators and plant movement, such as telehandlers, for the storage of materials. Based on the calculations provided in Appendix 14.1, the construction noise SOAEL is expected to be exceeded within approximately 27m of construction compounds.
- 14.6.11 There are no dwellings within 25m of proposed construction compound locations. However, a small proportion of the garden of Lamarsh Hall (on Henny Road, Lamarsh), falls within 25m of a proposed satellite compound. A large proportion of the garden lies beyond 25m with screening of the satellite compound provided by existing buildings. BPM, including screening, will be employed to reduce noise impacts at this location. The impacts on this NSR are therefore considered to be **not significant**.
- 14.6.12 Noise from the operation of construction compounds during the construction phase would be below the SOAEL, and a **negligible to small** magnitude impact at all other NSRs.

Vibration Associated with Construction Compounds

14.6.13 No buildings or structures are expected to experience levels of vibration, from compaction activities that may be required as part of the construction or use of construction compounds, at which cosmetic damage is likely due to the distance between works and buildings being greater than 2m. Noise and vibration from the construction of the construction compounds would therefore be **not significant** at all NSRs.

Noise Associated with Temporary Haul Routes

14.6.14 The main noise sources associated with haul route construction are expected to be from dozers, excavators, dumpers and rollers, with vibration generated during compaction of the hardcore on those requiring a stone road. Based on the calculations provided in Appendix 14.1, the SOAEL is expected to be exceeded at NSRs within approximately 70m and 18m of works for noise and vibration, respectively, but these activities are expected to short in duration. As such, during the construction of the temporary haul routes, the magnitude of noise and vibration impact would range from **negligible to small**, and/or are expected to be below the temporal requirement for significance, at all NSRs.

14.6.15 Temporary haul routes located close to NSRs are likely to be those used for the decommissioning of pylons, and their use would therefore be expected to be for a relatively short duration and with relatively few vehicle movements. Main haul routes, particularly those required for the underground cabling, are located away from NSRs.

14.6.16 Noise associated with the temporary haul routes during the construction phase would be below the SOAEL, and therefore a **negligible to small** magnitude impact, and/or are expected to be below the temporal requirement for significance, at all NSRs. Therefore, noise from the temporary haul routes during the construction phase would be **not significant** at all NSRs.

Vibration Associated with Temporary Haul Routes

14.6.17 No buildings or structures are expected to experience levels of vibration, from compaction activities which may be required as part of the construction of temporary haul routes, at which cosmetic damage is likely due to the distance between works and buildings being greater than 2m. Noise and vibration from the temporary haul routes would therefore be **not significant** at all NSRs.

Construction Traffic Noise

14.6.18 An initial assessment of construction traffic noise is provided in Appendix 14.1: Initial Construction Noise and Vibration Data. The assessment indicates that construction traffic noise is a **negligible** magnitude on all proposed routes with the exception of two routes CR 08 (Heath Road) and CR 10 (Millwood Road, south of Straight Road) both in Polstead Heath, where a **small** magnitude impact is expected. As such, construction traffic noise is assessed to be **not significant** along all proposed routes.

Overhead Line (including CSE Compounds and Removal of the Overhead Line)

Noise and Vibration associated with Construction

14.6.19 The main source of noise and vibration during the construction of the overhead line is expected to be from piling activities associated with the pylon foundations. Based on the calculations provided in Appendix 14.1: Initial Construction Noise and Vibration Data, the SOAEL is expected to be exceeded at NSRs within approximately 100m and 70m of these works for noise and vibration respectively.

- 14.6.20 There are no NSRs within 100m of proposed pylon locations. Additionally, pylon construction, and the associated piling, is expected to be a relatively short-duration activity at any one location given the linear nature of the works. As such, during the construction of the overhead line, CSE compounds and the removal of the 132kV overhead line, noise and vibration at NSR would be below the respective SOAELs, and a **negligible to small** magnitude of impact, and/or are expected to be below the temporal requirement for a significant effect, at all NSRs.
- 14.6.21 Additionally, no buildings or structures are expected to experience levels of vibration, from piling activities associated with pylon construction, at which cosmetic damage is likely due to the distance between indicative pylon locations and buildings being greater than 10m.
- 14.6.22 Noise and vibration effects from the construction of the overhead line, CSE compounds and the removal of the existing 132KV overhead line would therefore be **not significant** at all NSRs.

Underground Cables

Noise and Vibration associated with Construction

- 14.6.23 The main source of noise during the construction of underground cables is expected to be from trench backfilling and proposed horizontal directional drilling. Based on the calculations provided in Appendix 14.1: Initial Construction Noise and Vibration Data, the SOAEL is expected to be exceeded at NSRs within approximately 50m of these works.
- 14.6.24 There are no NSRs within 50m of proposed underground cables. Additionally, underground cable construction is expected to be a relatively short-duration activity at any one location given the linear nature of the works. As such, during the construction of the underground cables, including horizontal directional drilling, noise and vibration would be below the respective SOAELs, and a **negligible to small** magnitude impact, and/or are expected to be below the temporal requirement for a significant effect, at all NSRs.
- 14.6.25 Additionally, no buildings or structures are expected to experience levels of vibration, from compaction activities associated with ground reinstatement, at which cosmetic damage is likely due to the distance between works and buildings being greater than 2m.
- 14.6.26 Noise and vibration from the construction of the underground cables would therefore be **not significant** at all NSRs.

GSP Substation

Noise and Vibration associated with Construction

- 14.6.27 The main source of noise and vibration during the construction of the GSP substation is expected to be from piling activities. Based on the calculations provided in Appendix 14.1: Initial Construction Noise and Vibration Data, the SOAEL is expected to be exceeded at NSRs within approximately 100m and 70m of these works for noise and vibration, respectively. There are no NSRs within 100m of proposed GSP substation. As such, during the construction of the GSP substation, noise and vibration would be below the respective SOAELs, and a **negligible to small** magnitude impact, and/or below the temporal requirement for significance, at all NSRs.
- 14.6.28 Additionally, no buildings or structures are expected to experience levels of vibration, due to either piling or compaction activities associated with the construction of the GSP substation, at which cosmetic damage is likely due to the distance between works and buildings being greater than 10m.

14.6.29 Noise and vibration from the construction of the GSP substation would therefore be **not significant** at all NSRs.

Summary of Construction Effects

14.6.30 During the construction phase, no significant adverse effects are expected due to either noise or vibration.

Operational Noise

Noise During Substantial Maintenance Activities

14.6.31 Regular and routine maintenance activities are not expected to cause significant adverse effects at nearby NSRs and are scoped out of further assessment. However, substantial maintenance activities, such as overhead line reconductoring, may periodically and infrequently be required during the life of the project. Such activities are likely to generate noise and/or vibration levels similar to that as during construction. Similarly, such works would be required to apply best practice measures to reduce noise and vibration levels and they would be **not significant**. On this basis, no further assessment of noise and vibration impacts from substantial maintenance activities has been carried out.

14.7 Sensitivity Testing

Flexibility in Construction Programme

14.7.1 This chapter assumes the base construction schedule described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has shown that there would be no new likely significant effects from noise and vibration compared to the scenario assessed in Section 14.6.

Flexibility in Design

14.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD.

14.7.3 Alternative locations for pylon position are unlikely to change the preliminary assessment presented in this chapter in relation to construction noise and vibration impacts at NSRs. This is due to construction of pylons being a short duration activity where the temporal requirement for significance is unlikely to be exceeded at any individual NSR. This sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

14.8 Proposed Mitigation

14.8.1 The preliminary assessment has concluded that there are no likely significant effects in relation to noise and vibration during construction or operation. Therefore, additional mitigation, beyond embedded measures, the good practice measures set out in Appendix 4.1: Outline CoCP and BPM, is not required.

14.9 Residual Significant Effects (With Mitigation)

14.9.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to noise and vibration during construction or operation.

14.10 Conclusion

14.10.1 The preliminary assessment has concluded that there are no likely significant residual effects in relation to noise and vibration during construction and operation. As such, the requirements of the NPS EN-1 are likely to be met.

15. CUMULATIVE EFFECTS

15.1 Introduction

15.1.1 This chapter details the preliminary cumulative effects assessment (CEA) for the project. Cumulative effects occur when impacts caused by present and reasonably foreseeable activities combine to create an increased level of effect. A single environmental impact resulting from a development may not be significant on its own but can become significant when combined with other developments or other environmental impacts.

15.1.2 Cumulative effects are the result of multiple actions on environmental receptors or resources. Two categories of cumulative effects are considered: 'intra-project' and 'inter-project' effects (IEMA, 2011):

- **Intra-project effects** (also referred to as 'interrelationships between topics' in Advice Note 17 (Planning Inspectorate, 2019)) occur when a resource, receptor or group of receptors are potentially affected by more than one source of direct environmental impact resulting from the same development (IEMA, 2011). For example, a community may be affected by noise and dust impacts resulting from the construction phase activities of a single development.
- **Inter-project effects** (also referred to as 'cumulative effects' in Advice Note 17 (Planning Inspectorate, 2019)) occur when a resource, receptor or group of receptors are potentially affected by more than one development at the same time (IEMA, 2011). For example, the construction traffic effects of a development in isolation may not be significant, but when combined with the construction traffic effects of another development (using the same geographical area at the same time) may result in significant cumulative effects on the surrounding highways network.

15.1.3 This chapter has links with all environmental chapters as it considers the interrelationships between aspects.

15.1.4 This chapter is supported by the following appendices and figures:

- Appendix 15.1: Cumulative Effects Supporting Information;
- Appendix 15.2: Intra-Project Cumulative Effects Matrix;
- Appendix 15.3: Long List of Other Developments;
- Appendix 15.4: Shortlist of Other Developments;
- Appendix 15.5: Preliminary Assessment of Shortlist Proposed Developments;
- Figure 15.1: Cumulative Effects Long List of Proposed Developments; and
- Figure 15.2: Indicative Approach to Bramford Substation for East Anglia GREEN.

15.2 Regulatory and Planning Policy Context

National Policy Statement

15.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1 (DECC, 2011a). This is supported by NPS EN-5 (DECC, 2011b).

15.2.2 Paragraph 4.1.3 in NPS EN-1 states, '*In considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the IPC should take into*

account ... its potential adverse impacts, including any long term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts’.

- 15.2.3 Paragraph 4.2.5 of NPS EN-1 states, ‘When considering cumulative effects, the ES should provide information on how the effects of the applicant’s proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence)’.

Other Relevant Policy

- 15.2.4 Appendix 2.1: Local Planning Policy lists the local policy potentially relevant to the project. There are no specific policies relating to cumulative effects.

15.3 Scoping Opinion

- 15.3.1 The scope of the assessment for cumulative effects has been informed by the Scoping Opinion provided by the Planning Inspectorate (2021b) on behalf of the Secretary of State, following the submission of the Scoping Report (National Grid, 2021b). The scope has also been informed through engagement with relevant consultees. No matters were proposed to be scoped out of the CEA in the Scoping Report and this was acknowledged by the Planning Inspectorate (ID 4.14.1).
- 15.3.2 Table 15.1 outlines the additional points from the Scoping Opinion and how these have been or will be addressed on the project.

Table 15.1: Other Matters from the Scoping Opinion

Matter Raised in the Scoping Opinion	Project Response
(Paragraph 2.3.6) The Inspectorate notes that it is proposed to undertake works to the existing Bramford substation under permitted development rights; these works would not form part of any DCO application. The Inspectorate considers that where there is potential for likely significant cumulative effects, these works should be included on the long list and taken forward to Stage 2.	The proposed ancillary works at Bramford substation have been incorporated into the long list of other developments (Appendix 15.3) and will be considered in the ES.
(ID 4.14.2) The assessment of cumulative effects should be based on a robust ZOI for environmental receptors. The ES should provide further justification for selection of the geographical zone for environmental impacts and identify the receptors to be included within the assessment. It is considered that the ZOI should be further informed by an understanding of receptors and potential impact pathways, rather than application of a distanced based zone, and this should be explained within the ES.	The PEI Report provides further justification for the ZOI for the different receptors. The assessment presented within the ES will be based on an understanding of potential impact pathways, which is explained within this chapter.
(ID 4.14.3) Given the number and scale of large scale infrastructure projects in the wider 50km study area, and the potential overlap in construction programmes, the Inspectorate considers that there is potential for likely significant cumulative effects arising from NSIP in the wider 50km study area, for example in relation to construction traffic. The overlap with identified NSIPs	NSIPs identified within 50km of the project have been included in the long list of other developments (Appendix 15.3) and, where deemed to have a significant effect, progressed to the shortlist for further assessment (appendix 15.4).

Matter Raised in the Scoping Opinion	Project Response
<p>should therefore be considered as part of the assessment, including Sizewell C.</p>	
<p>(ID 4.14.4) The Inspectorate notes that it is proposed to use professional judgement to determine the significance of cumulative effects for both inter project and intra project effects. Where relevant to the aspect and sufficient information is available in respect of identified committed developments, the Inspectorate considers that quantitative modelling may also be used to inform the assessment.</p>	<p>Professional judgement has been used to inform the CEA in this PEI Report. As the effects, such as traffic, are generally confined to construction and are limited in numbers, quantitative modelling has not been undertaken as this was considered disproportional to the scale of effect. Modelling cumulative ZTVs is unlikely to be possible due to the limited information available about proposed developments in the area. Therefore, a qualitative assessment will form the basis of the ES. However, the position will be kept under review as part of the preparation of the application, should the relevant details required for a ZTV be available.</p>
<p>(ID 4.14.5) The Inspectorate notes that it is not proposed to take forward the potential widening of the A12 between junctions 19 and 25 to the shortlist of developments, on the basis that it is outside of the defined 10km ZOI. The Inspectorate considers that there is potential for significant cumulative effects arising from combination of these developments, for example noise and air quality impacts from redistributed traffic. The A12 project should therefore be included on the shortlist.</p>	<p>The A12 Chelmsford to A120 Widening Scheme has been included in the long list of other developments (Appendix 15.3), and the A12 Chelmsford to A120 Widening Scheme has been progressed to the shortlist for further assessment (Appendix 15.4).</p>
<p>(ID 4.14.6) The Inspectorate notes that the long list of developments for the CEA is provisional and will be kept under review. This should include the status of development; where a development is expected to be completed before construction of the project and effects are fully determined, effects arising should be considered as part of the baseline. The ES should distinguish between projects forming part of the baseline and those in the CEA.</p>	<p>The long list of developments has been updated for the PEI Report (Appendix 15.3) and will be further reviewed and updated for the ES. The long list will be fixed two months before the application is submitted to allow time for the assessment to be finalised. The long list presented within the ES will clarify which projects form part of the future baseline and those in the CEA.</p>
<p>(ID 4.14.7) The Inspectorate considers that an assessment of the intra and inter project cumulative effects on amenity in terms of socio-economic and tourism receptors should be provided in the ES where significant effects are likely.</p>	<p>The CEA will consider potential significant effects on amenity in terms of socio-economic and tourism receptors.</p>

Project Engagement

- 15.3.3 National Grid has held quarterly meetings with the local planning authorities, in which emerging developments that are potentially relevant to the long list have been identified,

and where relevant, these have been discussed. The proposed method for the CEA and the long list has been issued to the local planning authorities for comment.

15.4 Approach and Methods

15.4.1 This section describes the methodology used to establish the baseline and the approach to consider and assess the significance of potential intra-project and inter-project cumulative effects. It outlines what methods have been used for the preliminary assessment presented within this PEI Report and also what would be undertaken as part of the ES.

Baseline Data Sources

15.4.2 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:

- A review of planning applications from the local planning authority websites within the study area (including the Planning Inspectorate's Programme of Projects, local planning authority planning portals, and local development plans);
- A review of the Network Options Assessment (National Grid, 2021d) and engagement with other National Grid teams about potential proposed developments within the study area; and
- A review of the receptors and likely effects identified within each of the environmental chapters in this PEI Report.

Study Area

Intra-Project Cumulative Effects

15.4.3 The intra-project cumulative effects study area is the same as that presented within each of the preceding environmental chapters for each aspect.

Inter-Project Cumulative Effects

15.4.4 Following feedback received from the Scoping Opinion, a study area of 50km has been used to identify NSIPs which could result in likely significant effects in combination with the project.

15.4.5 The Scoping Boundary buffer plus a 10km buffer (see the Scoping Report (National Grid, 2021b)) has been used as the planning review study area to gather data on major planning applications and allocations that could be relevant to the CEA. A buffer of 10km has been chosen based on the observations set out in Chapter 6: Landscape and Visual, where the maximum distance over which visual effects would be experienced would be 5km. A 10km study area allows for the cumulative effects to be considered with another proposed development that potentially includes pylons or other tall structures. A distance of 10km was also considered to be a reasonable distance for consideration of traffic effects from the project, given the rural nature of the road network and the likely roads that would be affected by construction traffic (see Chapter 12: Traffic and Transport for further details).

15.4.6 This 10km study area excludes significant urban areas, including the Ipswich Borough Council boundary (2.8km from the draft Order Limits at its closest point), and south of the A12 within the Colchester Borough Council boundary (7.3km from the draft Order Limits at its closest point). This was considered reasonable as existing development, including the A12 and the A14, would be likely to obscure views of the overhead line from these

locations at this distance. A distance of 10km was also chosen as a suitable study area as it encompasses the connections to the SRN (the A12 and the A14), which are likely to form the extent of the ARN (see Chapter 12: Traffic and Transport for details).

- 15.4.7 Consideration may be given in the ES to some major planning applications that lie beyond 10km, where professional judgement considers that there could be a likely significant effect. Discussions will be held with the local planning authorities to identify major planning applications outside of the 10km study area that require consideration in the CEA presented within the ES.

Zone of Influence (ZOI)

- 15.4.8 The ZOI is the defined geographic area within which potential environmental receptors are located. The preliminary assessment has been based on pathways between receptors and potential impacts and effects. In addition to this, a maximum ZOI has been developed for each environmental aspect using professional judgement, a reasonable worst case and knowledge of effects experienced on similar developments. This maximum ZOI has been used to determine the developments which are taken forward to the shortlist for assessment and to help focus the assessment to those proposed developments that are more likely to result in significant inter-project effects in combination with the project. These maximum ZOIs are listed in Table 15.2.

Table 15.2: Zone of Influence for Environmental Aspects

Environmental Topic	Maximum ZOI for each Aspect
Landscape/visual and setting of other assets such as for heritage (to be later defined by the ZTV); traffic and transport (to be later defined by the ARN).	10km*
Biodiversity; socio-economics, recreation and tourism.	1km
Surface water; hydrogeology; noise and vibration.	0.5km
Contaminated land; air quality; trees and arboricultural features.	<0.25km

*Note: The urban areas of Ipswich and areas to the south of the A12 have been excluded from the 10km ZOI.

- 15.4.9 For the assessment of landscape and visual impacts and the setting of heritage assets, a study area of 10km has currently been assumed for the initial ZOI. This is based on a 5km study area for landscape and visual, beyond which the project is likely to be barely perceptible and unlikely to give rise to significant effects (see Chapter 6: Landscape and Visual for further details). A 10km ZOI allows for the cumulative effects to be considered with another proposed development that potentially includes pylons or other tall structures.
- 15.4.10 The ZOI will be refined as the project moves forward to take into account the ZTV of the project, which will provide a more accurate reflection of the visibility of the project in relation to other developments. It will also be informed by the proposed construction routes. Draft construction routes are presented in Chapter 12: Traffic and Transport, which indicates that most of the construction traffic is likely to be routed on roads to the south and east of the project, as construction traffic seeks to join the A12 and the A14. No HGV are expected to travel through the centres of Sudbury, Hadleigh or villages to the north of the A1071. The A12 and A14 are expected to form the extent of the ARN

(see Chapter 12: Traffic and Transport for details). Only proposed developments within the ARN and the immediate surrounds will be considered as part of the CEA for traffic and transport.

- 15.4.11 The Transport Assessment will use typical growth factors for development provided by the DfT (e.g. TEMPro). This will be used to collate information for traffic growth from most proposed developments. The assumptions behind the DfT data will be reviewed to identify which major developments are already factored into their growth calculations. To avoid double-counting, these will not be reassessed in the CEA for the traffic and transport assessment. The approach to cumulative effects for traffic and transport and the list of proposed developments identified to supplement the DfT data will be agreed as part of the Transport Assessment Scoping Report, in discussion with the Highway Authorities and National Highways (previously Highways England).
- 15.4.12 The remaining aspects have a maximum ZOI of 1km or less based on the potential for likely significant effects from the project and its interactions with other proposed developments. In the context of this project, it is unlikely that committed developments further away than 1km could contribute to significant cumulative effects, due to the area over which effects would be dispersed.

Assessment Methodology

Intra-project cumulative effects

- 15.4.13 There is no standard approach to the assessment of intra-project effects. The matrix approach is useful as a tool as it can visually represent relationships between project impacts and environmental components. For example, protected lanes could have effects identified within the landscape, ecological, cultural heritage, and traffic and transport assessments.
- 15.4.14 Representative groups and/or individual receptors, such as people, a watercourse, a group of listed buildings or protected species, have been identified for each aspect. These represent the receptors that are most sensitive to impact interactions as described in the relevant environmental chapters. These are presented in Appendix 15.2: Intra-Project Cumulative Effects Matrix.
- 15.4.15 Key project activities have been identified for the construction phase and are grouped into the following categories:
- Effects due to construction machinery and vehicles (e.g. general construction activities, set up of site compound, increase in traffic during construction);
 - Effects due to land-take of temporary works (e.g. vegetation removal, light spill from construction areas, materials storage, installation of haul roads); and
 - People, services and goods (e.g. construction staff living and working within the area, materials being purchased for the project, and waste generated by the project).
- 15.4.16 Key project activities have been identified for the operational phase and are grouped into the following categories:
- Normal operational activities (including inspection visits); and
 - Maintenance activities (such as refurbishment).
- 15.4.17 Where the same receptor is identified in more than one chapter, this may indicate a spatial overlap of effects. Potential spatial overlaps of effects are then checked for a temporal

overlap of effects. Where both a spatial and temporal overlap exists, this would indicate a potential intra-project cumulative effect. The next step is to identify whether the effects are already assessed within other assessment chapters, to avoid double counting of effects. This initial screening is indicated in the matrix in Appendix 15.2, by shading the boxes in different colours. Where screening highlights effects not covered by the previous assessment chapters, this would indicate a potential intra-project cumulative effect that requires further assessment. This screening will be undertaken again as part of the EIA process when the assessments have been completed for each topic chapter, and the findings will be reported in the ES.

15.4.18 Potential intra-project cumulative effects identified will be taken forward to a more detailed assessment within the EIA. This will draw on the experience of different technical specialists to determine the likely cumulative effect on the receptor as a whole, and whether the combined effect is likely to be significant. If likely significant cumulative effects are identified, appropriate mitigation measures will be outlined, and any residual effects will be described within the ES cumulative effects chapter.

Inter-project cumulative effects

15.4.19 The methodology of the inter-project CEA is structured using the staged assessment approach detailed in Advice Note 17 (Planning Inspectorate, 2019). In summary, this involves identifying a long list of '*other reasonably foreseeable development*' that could interact with the project (Stage 1A and 1B). These are screened at Stage 2, against spatial and temporal thresholds to see if they should progress to Stage 3. Environmental information is then gathered for each of the shortlisted developments at Stage 3, and these developments are assessed to identify whether there are likely significant effects with the project (Stage 4). These stages are explained in more detail below.

15.4.20 Stages 1A, 1B and 2 have been completed for this PEI Report. Stages 3 and 4 will be undertaken as part of the EIA and presented in the cumulative effects chapter of the ES. In addition, as part of the PEI Report, a preliminary assessment has been undertaken to provide consultees with additional information regarding the potential for likely significant cumulative effects. This is presented in Appendix 15.2 for the intra-project cumulative effects and 15.5 for the inter-project cumulative effects.

Stage 1A: Identify Zone of Influence (ZOI)

15.4.21 The ZOIs are listed in Table 15.2.

Stage 1B: Identify Long List of Other Developments

15.4.22 A preliminary long list of other developments was presented in the Scoping Report. This was reviewed in July 2021 during preparation of the PEI Report to identify any new or changed status planning applications submitted since the preliminary long list was produced. It also incorporated additional projects based on feedback from the Planning Inspectorate and local planning authorities through the Scoping Opinion. The long list of other developments for the PEI Report is identified in Appendix 15.3 and the proposed developments are shown on Figure 15.1.

15.4.23 The following development types were included in the long list:

- NSIPs listed on the Planning Inspectorate's Programme of Projects;
- Major developments (as defined under the Town and Country Planning (Development Management Procedure) (England) Order 2015, as amended; and
- Sites allocated in relevant Local Development Plans.

- 15.4.24 Major developments are defined as development involving any one or more of the following:
- The winning and working of minerals or the use of land for mineral-working deposits;
 - Waste development;
 - The provision of dwelling houses where:
 - The number of dwelling houses to be provided is 10 or more; or
 - The development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within subparagraph (c)(i);
 - The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
 - Development carried out on a site having an area of 1 hectare or more.
- 15.4.25 Minor planning applications have been excluded from the assessment, as these relate to developments of small scale and local importance. These developments are highly unlikely to give rise to significant cumulative environmental effects over and above the project in isolation.
- 15.4.26 The CEA will also consider other National Grid projects where these meet the spatial and temporal parameters of the CEA and there are sufficient details available in order to assess the potential cumulative effects. This includes projects known at that time that may require (but have not yet submitted) an application for development consent or planning permission and also permitted development projects, such as those proposed at Bramford Substation. Where the parameters are met, these projects have been added into the long list of developments for further consideration.
- 15.4.27 The CEA will, as part of the above, include projects from the 2021 Network Options Assessment (NOA) (National Grid, 2021d) that lie within the 10km study area for the project. Projects that are recommended to ‘proceed’ in the NOA or have subsequently proceeded, will be considered within the CEA where these meet the spatial and temporal parameters. The ES will take into account the 2022 version of the NOA.
- 15.4.28 The following NOA projects have been incorporated into the long list and will be considered further in the EIA: a new offshore high voltage direct current (HVDC) link between Suffolk and Kent (known as SEA Link) and reconductoring works to uprate the circuits on the existing lines; Bramford to Braintree to Rayleigh Main circuit (BPRE and BBRE) and Bramford to Norwich double circuit (NBRE).
- 15.4.29 In addition, National Grid is progressing a range of reinforcements to the electricity transmission network in East Anglia, including the provision of secure connections to the network as part of responding to significant growth in, primarily, offshore wind generation and interconnector connections. The work aims to ensure that there is sufficient capacity to allow the transmission network to be operated in an economic and efficient manner. The East Anglia GREEN project (identified as ATNC/ AENC in the NOA), responds to planned new connections into the National Transmission System both in the north of East Anglia and into a proposed connection node substation.
- 15.4.30 Routing and substation siting options identification and appraisal is currently being undertaken, informed by National Grid’s statutory and licence obligations, the relevant NPS (EN-1 and EN-5) and National Grid’s ‘Approach to Options Appraisal’. This

assessment will give thorough consideration to a range of technical, socio-economic, environmental, cost, and programme issues. Engagement with key prescribed stakeholders has commenced and will continue in early 2022. A non-statutory consultation is proposed to be held in late spring 2022 on a preferred route corridor and substation site.

- 15.4.31 For the purposes of this preliminary cumulative effects assessment, it is currently assumed that East Anglia GREEN would comprise a new 400kV double circuit connection from Norwich Main Substation to Bramford Substation, and a new 400kV double circuit connection from Bramford Substation to Tilbury Substation via a new connection substation in Tendring District. An indicative corridor showing the proposed East Anglia GREEN approach to Bramford Substation is shown on Figure 15.2. This would be subject to the above mentioned ongoing work and consultation. Other assumptions are provided in paragraph 15.4.54 and 15.4.55 below.
- 15.4.32 National Grid is also engaging with Anglian Water regarding a proposed 80km strategic water pipeline between Bury St Edmunds and Colchester that may interact with the project. The construction programme for the pipeline has not yet been confirmed, but the new water pipeline network is expected to be constructed by 2025. The proposed development has been incorporated into the long list and will be considered further in the EIA.
- 15.4.33 A search period of 10 years preceding (2014) the planned start of construction (2024) was chosen to take into consideration submitted or approved planning applications that may have a temporal overlap with the project.
- 15.4.34 Advice Note 17 (Planning Inspectorate, 2019) identifies three tiers of development based on where they are in the planning process and recognises that the amount of information available to inform the assessment varies according to which tier the development fits in to. Tier 1 developments are the most certain, with a high level of publicly available information, while Tier 3 developments are the least certain, with limited publicly available information to inform assessments. Details of the three tiers are provided in Table 15.3, and the relevant tier is referenced in Appendix 15.3: Long List of Other Developments. National Grid projects that are being implemented under permitted development powers would be assigned a tier based on availability of information and the stage that the project is at.
- 15.4.35 The ZOIs were used to identify the aspects that could have cumulative effects with the other developments identified. This has been used to screen the long list to identify whether projects should proceed to Stage 2.
- 15.4.36 The long list will continue to change as new planning applications or applications for development consent are submitted, approved, rejected or withdrawn. Additional developments will be added to the long list as they get submitted to the planning portals, with an intended cut-off date two months before the project's application being submitted to enable the assessment to be concluded.
- 15.4.37 Rejected and withdrawn planning applications have not been progressed to Stage 2 on the assumption that planning approval would not be pursued further. However, any successful appeals or new planning applications brought forward will be assessed in the CEA where applicable.

Table 15.3: Criteria Used to Determine the Tier of Development for the Inter-Project CEA

Tier	Development Status
1	<p>Projects under construction.</p> <hr/> <p>Permitted application(s), whether under the Planning Act 2008 or other regimes, but not yet implemented.</p> <hr/> <p>Submitted application(s), whether under the Planning Act 2008 or other regimes, but not yet determined.</p>
2	<p>Projects on the Planning Inspectorate’s Programme of Projects or in the local planning authorities’ portal where a Scoping Report has been submitted.</p>
3	<p>Projects on the Planning Inspectorate’s Programme of Projects or in local planning authorities’ portal where a Scoping Report has not been submitted.</p> <hr/> <p>Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals would be limited.</p> <hr/> <p>Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.</p>

Decreasing level of available data
↓

15.4.38 Allocations within Local Development Plans and other plans and programmes have not been progressed to Stage 2 because, as Tier 3 developments, the amount of information available and the resulting certainty around the assessment of cumulative effects is likely to be limited. It is expected that future developers bringing forward proposed development in line with those allocations would carry out their own assessment of cumulative effects.

15.4.39 The Stage 1 preliminary long list of other developments (Appendix 15.3) identified 468 records of NSIPs, planning applications, relevant development plan allocations, and other known developments. The information was captured in a template based on Matrix 1 of Appendix 1 from Advice Note 17 (Planning Inspectorate, 2019) as a basis. The current long list is presented in Appendix 15.3 and the locations of the proposed developments are shown on Figure 15.1.

15.4.40 Screening of the preliminary long list and a review of consultation responses in the Scoping Opinion resulted in 88 NSIPs, planning applications and other known developments being taken forward to Stage 2 shortlisting.

Stage 2: Identify Shortlist of Other Developments

15.4.41 As set out in Advice Note 17 (Planning Inspectorate, 2019), following Stage 1, threshold criteria should be applied to the long list to establish a shortlist of other developments in the next stage of the assessment that is proportionate. Professional judgement has been used when applying the threshold criteria to identify the shortlisted projects that would be taken forward to Stage 3 and 4:

- **Temporal scope:** Other development within the ZOI with overlapping construction phases based on the base construction programme presented in Chapter 4: Project Description (2024–2028) and operational phases (2028–2068) were scoped into the

assessment. As a precaution at the PEI stage, a sensitivity text has been applied to the construction window of projects starting in 2022 to 2030, to consider potential acceleration or delays to proposed development construction schedules.

- **Scale and nature of development:** Development identified as Schedule 1 and 2 developments in the Infrastructure Planning (EIA) Regulations 2017 and the Town and Country Planning (EIA) Regulations 2017 were considered further.
- **Sensitivity of the receiving environment:** Where there are potential source-pathway-receptor linkages between the project and other developments, cumulative effects were considered further. Other developments with no clear source-pathway-receptor linkage were scoped out of the assessment.

15.4.42 Following the application of thresholds during Stage 2, a total of 36 proposed developments have been identified that could lead to potential cumulative effects with the project. These will be taken forward to Stages 3 and 4 of the CEA. The shortlist of other developments produced for the PEI Report is presented in Appendix 15.4.

Stage 3: Information Gathering

15.4.43 Stage 3 will be undertaken during the EIA and will be presented within the ES. It will include a review of available environmental assessment information (for example, ES or Scoping Reports) for each of the shortlisted other developments. This will identify potential receptors and environmental effects arising from the proposed other developments. Design information, planning documentation, location plans, and proposed construction, operation and decommissioning programmes will also be reviewed, where available. This information will be gathered from sources including local planning authority planning portals, the Planning Inspectorate's website, and through engagement with local authorities.

15.4.44 Details from the information gathering exercise will be tabulated in the ES in a format similar to that in Matrix 2 provided in Appendix 2 of Advice Note 17 (Planning Inspectorate, 2019).

Stage 4: Assessment

15.4.45 The assessment will be undertaken by a competent EIA practitioner in collaboration with environmental specialists to describe and evaluate the likely significant inter-project cumulative effects arising from the project. At this PEI stage, the assessment of likely significant effects has been based on professional judgement considering the likely effects that could result if the project was implemented alongside the other proposed developments. At the ES stage, the results of the assessment will be documented and presented in an accessible format similar to that in Matrix 2 provided in Appendix 2 of Advice Note 17 (Planning Inspectorate, 2019).

15.4.46 Significance of effects will be taken from the environmental chapters to inform the significance of cumulative effects with other developments. Effects will be identified as direct, indirect, short-term or long-term, permanent or temporary.

Preliminary Assessment Key Parameters and Assumptions

15.4.47 This section describes the key parameters and assumptions that have been used when undertaking the preliminary assessment presented within this PEI Report. All conclusions and assessments are by their nature preliminary. All assessment work has applied, and continues to apply, a precautionary principle, in that where limited information is available (in terms of the proposals for the project), a realistic worst-case scenario is assessed.

- 15.4.48 The key parameters and assumptions will be reviewed based on the final design and, where required, updated or refined. The ES will present the final key parameters and assumptions used within that assessment, particularly drawing attention to any areas that may have changed from what is presented in this preliminary assessment.
- 15.4.49 The CEA relies on third-party information available on local planning authority planning portals (which can differ between local authorities) or information provided by other third parties. It has been supplemented with information sourced from engagement with the relevant local planning authorities.
- 15.4.50 It is not within the scope of this assessment to assess the individual effects of third-party proposed developments. The amount of information available about third-party developments is varied and, in some instances, may not be adequate for some of the developments to allow for a meaningful cumulative assessment to be undertaken.
- 15.4.51 Planning applications granted before 2014 (10 years before the planned start of construction works for the project) have not been considered. It was considered reasonably likely that developments related to permissions granted before 2014 will have been completed before the project construction works start. Such developments were therefore considered unlikely to give rise to cumulative effects during construction, and operational effects would already form part of the baseline environment.
- 15.4.52 Further limitations at this PEI stage include that the information is preliminary, as the full EIA has not yet been undertaken for the project, and the effects presented in the preceding chapters are based on available information and the use of professional judgement. The likely effects identified could change as new information and further assessment is undertaken, potentially changing the receptors and effects that are carried through to the CEA. The CEA assumes that mitigation identified within the preceding chapters and/or within the EIAs of other proposed developments is included before undertaking the CEA.
- 15.4.53 The assumptions for when the proposed developments would be constructed, and therefore whether there would be any overlap with the project construction works, are taken from the planning portal and assume that consented development could start immediately or could take up to 10 years following consent. It is assumed that the proposed development descriptions presented within planning documents is accurate.
- 15.4.54 As a result of the engagement outlined at paragraph 15.4.2 above, and whilst routing and siting studies are underway, the following assumptions have been made to support the PEI Report for the Bramford to Twinstead project. These assumptions are subject to change and are based on the best available information in October 2021 to allow an initial review of the potential for significant cumulative effects to be undertaken.
- East Anglia GREEN would comprise a new 400kV double circuit connection from Norwich Main Substation to Bramford Substation, and a new 400kV double circuit connection from Bramford Substation to Tilbury Substation via a new connection substation in Tendring District. The siting of the new substation will seek to balance the different effects and costs of connections coming from the points of generation with those for the onward connections to the 400kV transmission network. The ongoing optioneering work for East Anglia GREEN is not currently indicating a tripling of the Bramford to Twinstead route. This assumption is subject to the outcome of the ongoing routing and siting study which is anticipated to conclude in spring 2022;

- The new reinforcement would be 400kV overhead lines, except in nationally designated landscapes where the use of underground cables is assumed. National Grid will consider appropriate mitigation, if necessary, drawing from the outcomes of ongoing assessment, consultation, and options appraisal. This could comprise vegetation planting, rationalisation of lower voltage networks and underground cables. The requirement for such mitigation will be determined throughout the EIA process including the potential for cumulative effects with other projects;
- The new overhead lines would comprise steel lattice pylons of c. 50m in height and c. 360m apart, unless other pylon types are proposed. This assumption was the initial design assumption on the Bramford to Twinstead project and evolved with the engineering design. This same assumption will be applied to East Anglia GREEN; and
- It is currently assumed that the East Anglia GREEN construction period would be between 2027 and 2030, with an anticipated two-year overlap with the construction phase of the Bramford to Twinstead project. However, this will be subject to detailed programming, and National Grid will continue to review the proposed phasing of the construction periods for both schemes and will update assessments accordingly should this change.

15.4.55 The Bramford to Twinstead EIA will consider the latest information available for the East Anglia GREEN and undertake the CEA in accordance with Advice Note 17 (Planning Inspectorate, 2019). Preliminary route optioneering is currently anticipated to be concluded in spring 2022. To the extent possible, all such further information will be taken into account for the purposes of the CEA as presented in the ES

Further Assessment Within the ES

15.4.56 This PEI Report provides preliminary assessment based on the development of the project to date and data gathered at this point. The assumptions and assessment will subsequently be developed and presented in the ES. As noted above, only Stages 1A, 1B and 2 have been completed for this PEI Report. Stages 3 and 4 will be undertaken as part of the EIA and presented in the cumulative effects chapter of the ES.

15.4.57 As noted above, the preliminary assessment presented in this chapter determines whether or not a potential effect is likely to be significant without categorising into defined thresholds. This approach is anticipated to be retained during the ES, given the inherent assumptions and uncertainty that applies to the CEA.

15.5 Existing Baseline

15.5.1 The individual assessment chapters provide a description of the baseline environment for the majority of the aspects considered within the CEA. Health and wellbeing and socio-economics, recreation and tourism were scoped out of requiring a standalone assessment in the Scoping Report (National Grid, 2021b). The Planning Inspectorate (2021b) supported this decision but requested that up-to-date baseline information be provided within the ES for these aspects to inform the assessment of likely significant effects in both the intra-project and inter-project CEA (see Chapter 3: Scoping Opinion and Consultation for more details). The updated baseline information for health and wellbeing and socio-economics, recreation and tourism is presented in Appendix 15.1: Cumulative Effects Supporting Information.

Identification of Receptors

15.5.2 The baseline conditions for each of the environmental aspects, including receptors, have been detailed in the respective chapters and appendices in this PEI Report, as set out in Table 15.4, and are not repeated here.

Table 15.4: Environmental Topics and Their Location Within this PEI Report

Environmental Topics	Chapter Where Covered
Landscape and Visual	Chapter 6
Biodiversity	Chapter 7
Historic Environment	Chapter 8
Water Environment	Chapter 9
Geology and Hydrogeology	Chapter 10
Agriculture and Soils	Chapter 11
Traffic and Transport	Chapter 12
Air Quality	Chapter 13
Noise and Vibration	Chapter 14
Socio-economics, Recreation and Tourism	Appendix 15.1

15.6 Likely Significant Effects

15.6.1 This section sets out the potential for likely significant cumulative effects. It assumes that the relevant embedded measures in Table 4.1 and the good practice measures in Appendix 4.1: Outline CoCP are in place before assessing the potential effects.

Embedded and Good Practice Measures

15.6.2 Relevant embedded and good practice measures are listed within each of the preceding environmental chapters and are not repeated here.

Intra-project Cumulative Effects

15.6.3 The preliminary intra-project cumulative effects matrix in Appendix 15.2, undertaken at this PEI stage, identifies a number of potential impacts from construction phase and operational phase activities that may impact on individual receptors. This is a preliminary assessment based on the initial findings set out within the preceding chapters. Where multiple impacts affect an individual receptor, there is the potential for impacts to combine and adversely affect that receptor.

During Construction

15.6.4 Receptors with the potential to experience intra-project cumulative effects during construction are:

- **Protected Lanes:** an increase in traffic, changes to accesses, and noise and vibration generated by construction activities (e.g. at trenchless crossings) may cumulatively impact on Protected Lanes;

- **Local economy (including the tourist industry):** The local economy may benefit during construction through induced spend by construction workers, and the purchase of materials from local business. The tourist industry may be temporarily affected during construction due to a temporary loss of access to green spaces, temporary road closures and diversions, and PRoW diversions. These individual effects are considered unlikely to be significant individually but may combine to induce a significant effect in combination, including an overall amenity effect on socio-economic and tourism receptors.
- **Local residents:** Local residents may be affected by temporary PRoW diversions, road restrictions, diversions and closures of the public highway, an increase in traffic, and dust, noise and light spill close to construction working areas. These individual effects are considered unlikely to be significant individually but may combine to induce a significant effect in combination. No particular vulnerabilities have been identified within the health of the local population (see baseline review in Appendix 15.1). Therefore, it is not anticipated that there would be effects on health.

During Operation

15.6.5 No potential significant cumulative effects have been identified during operation at this PEI stage.

Summary

15.6.6 The CEA undertaken as part of the EIA for the ES will draw on the updated assessments presented within the environmental chapters, and the matrix in Appendix 15.2 will be updated accordingly. The CEA in the ES will present the results of the updated assessment, including any new or different significant effects identified during the updated CEA.

Inter-project Cumulative Effects

15.6.7 At this stage, 30 proposed developments have been identified to be taken forward to the short list for further assessment, as there is the potential for them to have cumulative effects with the project. These are presented in Appendix 15.4 and include:

- three applications for solar arrays and associated development around Bramford Substation (ID 15, 16 and 31 in Appendix 15.4);
- large scale residential developments of 150+ dwellings in Sproughton, Bramford, Barham, Capel St Mary, Hadleigh, Sudbury, Copdock and Washbrook, and Whitton (ID 40, 47, 63, 81, 94, 108, 109, 137 and 256);
- new and changed employment and industrial estate developments within 1km of the project (ID 21, 22, 26, 28, 32, 34, 35, 125 and 126);
- two NSIPs, including the East Anglia THREE offshore windfarm with an onshore cable route connecting to Bramford Substation (ID 1) and widening of the A12 between junctions 19 and 25 (ID 2);
- the Anglian Water pipeline (long linear development) between Bury St Edmunds and Colchester (ID 461);
- East Anglia GREEN, comprising two power reinforcement projects (long linear developments) between Norwich to Tilbury (AENC and ATNC) (ID 462 and 463); and

- three projects involving upgrading of existing circuits (BPRE, BRRE, NBRE) and the proposed ancillary works at Bramford Substation, which could run concurrently with the project (ID 464, 465, 466 and 467).

15.6.8 A preliminary assessment has been undertaken of each of these proposed developments individually to identify the potential for significant cumulative effects with the Bramford to Twinstead project during construction and operation. This preliminary assessment assumes that the embedded measures and good practice measures within the Outline CoCP are in place and that existing features are reinstated where practicable, for example replanting hedgerows and reinstating the soil profile and land use. This would limit the potential effects of the project and therefore the potential of significant cumulative effects with other proposed developments. The preliminary assessment is presented in Appendix 15.5. This identifies the likely significant effects that have been determined at this PEI stage, based on professional judgement.

15.6.9 At this stage, the preliminary assessment is based on professional judgement and knowledge of similar projects. Further assessment will be undertaken as part of the CEA to review the EIA documents available for each of the proposed developments and to understand the residual effects identified, that could contribute to a cumulative effect with the project. This assessment (stages 3 and 4 of the CEA) will be presented within the ES.

During Construction

15.6.10 The preliminary assessment has identified aspects where there could be the potential for significant cumulative effects between the project and other proposed developments. At this stage, there has not been a review of any ESs produced for the proposed developments, and the list of potential effects is based on a qualitative assessment based on professional judgement and using similar project experience. The list identifies potential effects with the project; this does not mean that there would be significant effects in these areas:

- **Potential for cumulative effects on traffic and transport:** The combination of the project and other proposed developments is likely to increase the amount of traffic on the local road network, particularly to the south and east of the draft Order Limits towards the A12 and A14. The combined vehicle movements could lead to congestion and delays in journey time over and above that assessed within Chapter 12: Traffic and Transport from the project in isolation.
- **Potential for cumulative effects on views and setting:** The combination of the project and other proposed developments could lead to an increase in the number of construction sites visible within the landscape. For example, around Bramford Substation, construction works for other proposed developments could occur at the same time as the project and make the construction area look larger than the project in isolation.
- **Potential for cumulative effects on noise receptors:** The combination of the machinery and equipment used on the project and other proposed developments could lead to an increase in the noise experienced at nearby properties over and above that assessed within Chapter 14: Noise and Vibration from the project in isolation.
- **Potential for cumulative effects on recreational amenity:** The combination of the project and other proposed developments could lead to an increase in the disruption

(traffic, noise and visual intrusion) experienced by people using the local area for recreation and enjoyment.

- **Potential for cumulative effects on available tourist bed spaces:** The combination of the project and other proposed developments could lead to an increase in workers in the area requiring temporary accommodation during construction.

15.6.11 No other likely significant cumulative effects during construction have been identified at this PEI stage; however, detailed assessment of the likely significant inter-project cumulative effects will be undertaken during the EIA, following the assessment methodology outlined in Section 15.4.

During Operation

15.6.12 During operation, the preliminary assessment presented in Appendix 15.5 shows that there may be the potential for significant cumulative effects between the project and other proposed developments as follows:

- **Potential for cumulative effects on landscape, views and setting:** the combination of the project and other proposed developments could lead to an increase in the number of buildings and structures within the landscape, which in turn could increase the 'urbanisation' of views or lead to impacts on the setting of designated landscapes or cultural heritage features.

15.6.13 No other likely significant cumulative effects during operation have been identified at the PEI stage; however, detailed assessment of the likely significant inter-project cumulative effects will be undertaken during the EIA, following the assessment methodology outlined in Section 15.4 and the results will be presented within the ES.

15.7 Sensitivity Testing

Flexibility in Construction Programme

15.7.1 This chapter assumes the base construction programme described in Chapter 4: Project Description for the purposes of the assessment. Sensitivity testing considering alternative project phasing, such as a later construction start date, has been undertaken. Proposed developments that may fall within a two-year window either side of the base construction programme will be considered as part of the CEA presented within the ES.

Flexibility in Design

15.7.2 For preliminary assessment purposes, this chapter has assumed the indicative pylon locations shown on the General Arrangement Plans. It should be noted that these indicative pylon locations are not regarded as fixed and could be subject to change. Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations be taken forward within the proposed LoD. This sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location.

15.8 Proposed Mitigation

Intra-project cumulative effects

15.8.1 Measures to avoid, prevent, reduce or offset any potential significant intra-project cumulative effects will be identified and described in the ES. While the measures

identified for the aspects reported in other chapters of this PEI Report would help to reduce the contribution of the project to cumulative effects, there may be a need for additional mitigation to further mitigate any significant cumulative effects.

Inter-project cumulative effects

- 15.8.2 Measures to avoid, prevent, reduce or offset significant inter-project cumulative effects will be identified and described in the ES. While the measures identified for the aspects reported in other chapters of this PEI Report would help to reduce the contribution of the project to cumulative effects, there may be a need for additional mitigation. This is likely to require collaboration and co-operation with third-party developers to gain a better understanding of the proposed developments, the likely significant effects and the potential need for mitigation.

15.9 Conclusion

- 15.9.1 The CEA will comply with the requirements of NPS EN-1 (paragraph 4.1.3), as the ES will identify the potential for significant cumulative effects. It will also include the proposed measures to avoid, reduce or compensate for cumulative effects. This will include information on how the effects of the project would combine and interact with the effects of other development in accordance with paragraph 4.2.5 of NPS EN-1.

Intra-project Cumulative Effects

- 15.9.2 A preliminary intra-project cumulative effects matrix has been produced for the PEI Report to identify individual receptors or groups of receptors that may be affected by more than one construction phase or operational phase activity. This has provisionally indicated the potential for intra-project cumulative effects on Protected Lanes, the local economy (including the tourist industry) and on local residents. A full assessment of intra-project cumulative effects will be undertaken as part of the EIA and presented within the ES.

Inter-project Cumulative Effects

- 15.9.3 The preliminary long list of other developments presented in the Scoping Report (National Grid, 2021b) has been reviewed and updated to take into account feedback from the Scoping Opinion (Planning Inspectorate, 2021a) and any new applications submitted since the preliminary long list was produced. The long list of other developments has been screened using threshold criteria to produce a shortlist of 30 other developments for further assessment during the EIA. The long list and shortlist will be reviewed and updated during the EIA and presented within the ES. The long list will be fixed two months prior to application submission to allow time to undertake the assessment in the ES.
- 15.9.4 The assessment of inter-project cumulative effects will be undertaken and presented in the cumulative effects chapter of the ES.

16. CONCLUSION

16.1 Introduction

16.1.1 This chapter summarises the likely significant effects that are anticipated from the project at this preliminary stage, the currently proposed mitigation and the likely residual effects following the implementation of mitigation. It also sets out the proposed next steps as the project moves forward.

16.2 Likely Significant Effects

16.2.1 Table 16.1 summarises the potential for likely significant effects during construction, and Table 16.2 summarises the potential for likely significant effects during operation. Where residual effects during construction or operation are anticipated to be significant, these are highlighted in bold text.

Table 16.1: Likely Significant Effects During Construction

Description of Likely Significant Effect (Pre-Mitigation)	Scale and Duration (Pre-Mitigation)	Proposed Mitigation	Residual Effect (Post-Mitigation)
Landscape and Visual			
Underground cables: Loss of landscape features in landscape designations.	Short to medium-term significant effects	Reduce amount of vegetation removal within the draft Order Limits through commitment.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Underground cables: Loss of landscape features affecting landscape character.	Short to medium-term significant effects	Reduce amount of vegetation removal within the draft Order Limits through commitment.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Underground cables: Loss of vegetation changing views.	Short to medium-term significant effects	Undertake additional mitigation planting.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Biodiversity			
All sections: Loss of Lowland broadleaved deciduous woodland	Long-term moderate adverse	Reduce working area where practicable. Otherwise, mitigation planting and enhancement of retained habitats within the site.	Long-term minor adverse

Description of Likely Significant Effect (Pre-Mitigation)	Scale and Duration (Pre-Mitigation)	Proposed Mitigation	Residual Effect (Post-Mitigation)
All sections: Loss of bat roosts and loss of foraging and commuting habitats; and disturbance, including at Little Blackenham Pit SSSI.	Long-term moderate adverse	Provision of bat boxes in retained trees. Mitigation planting (including linking existing habitats) and enhancement of retained habitats within the site.	Long-term minor adverse
All sections: Loss of hazel dormouse nesting and feeding habitat; and fragmentation of woodland habitats	Long-term moderate adverse	Provision of dormouse nest boxes. Mitigation planting (including linking existing habitats) and enhancement of retained habitats within the site.	Long-term minor adverse
Permanent and temporary loss of ancient woodland habitat at Hintlesham Woods SSSI (and impact on interest features).	Long-term moderate adverse	Option 1: Work within the existing maintained easement. Option 2: No mitigation. Detailed working method would be prepared to set out how to reduce effects on ancient woodland soil and surrounding features. Compensation woodland planting and enhancement of retained woodland.	Option 1: Neutral Option 2: Long-term moderate adverse
Overhead lines: Disturbance to breeding birds at Hintlesham Woods SSSI.	Option 1: Short-term moderate adverse Option 2: Neutral	Option 1 and 2: Seasonal restriction on construction works to avoid bird breeding season where practicable.	Option 1: short-term moderate adverse Option 2: Neutral
Overhead lines: Disturbance to bats at Hintlesham Woods SSSI.	Option 1: Neutral Option 2: Long-term moderate adverse	Option 1: Work within the existing maintained easement. Option 2: Provide bat boxes. Additional woodland planting and enhancement of retained habitats within the site.	Option 1: Neutral Option 2: Long-term moderate adverse
Overhead lines: Disturbance to dormouse at Hintlesham Woods SSSI.	Option 1: Neutral Option 2: Long-term moderate adverse	Option 1: Work within the existing maintained easement. Option 2: Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Option 1: Neutral Option 2: Long-term moderate adverse
Overhead line: Damage to ancient woodland habitat	Long-term moderate adverse	Establish 15m exclusion zone around woodland during	Neutral

Description of Likely Significant Effect (Pre-Mitigation)	Scale and Duration (Pre-Mitigation)	Proposed Mitigation	Residual Effect (Post-Mitigation)
at Tom's/Broad oak Wood CWS and AWI site.		design work. Where this is not practicable, identify specific measures when working in 15m exclusion zone to avoid tree roots.	
Overhead line: Temporary habitat loss at Twinstead Marsh LWS.	Short-term moderate adverse	Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Short-term minor adverse
Overhead line: Loss of woodland habitat at Valley Farm Wood CWS.	Long-term moderate adverse	Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Long-term minor adverse
Underground cables: Permanent and temporary habitat loss at GWDTE (Alphamstone Complex LWS and Moats Farm/ Burnt House Marsh LWS).	Long-term moderate adverse	Reduce working area where practicable. Additional woodland planting and enhancement of retained habitats within the site.	Long-term minor adverse
Underground cables: Loss of potential ancient woodland habitat within draft Order Limits.	Long-term moderate adverse	No mitigation. Compensation woodland planting and enhancement of retained woodland.	Long-term moderate adverse
Underground cables: Working within the rootzone of ancient woodland (e.g. Millfield Wood CWS; Broom Hill CWS).	Long-term moderate adverse	Establish 15m exclusion zone around woodland during design work. Where this is not practicable, identify specific measures when working in 15m exclusion zone to avoid tree roots.	Long-term negligible
Historic Environment			
All areas (overhead line, underground cables and GSP substation): Direct impact on non-designated archaeological remains through below ground disturbance.	Long-term minor to major adverse	A programme of archaeological works as outlined in Appendix 8.2: Archaeological Framework Strategy.	Long-term neutral to minor adverse

Description of Likely Significant Effect (Pre-Mitigation)	Scale and Duration (Pre-Mitigation)	Proposed Mitigation	Residual Effect (Post-Mitigation)
Underground cables: Loss of characteristic features of non-designated HLT (including protected lanes) that cannot be replaced <i>in situ</i> .	Long-term neutral to moderate adverse	Where reinstatement of landscape element such as vegetation is not possible, planting in alternative locations would be used to enhance the character of the historic landscape overall.	Long-term neutral to minor adverse
Water Environment – no likely significant effects			
Geology and Hydrogeology – no likely significant effects			
Agriculture and Soils – no likely significant effects			
Traffic and Transport – no likely significant effects			
Air Quality – no likely significant effects			
Noise and Vibration – no likely significant effects			
Cumulative Effects			
Potential for intra-project and inter-project cumulative effects	Potentially significant	Not assessed at PEI Report stage.	Potentially significant

Table 16.2: Likely Significant Effects During Operation

Description of Likely Significant Effect (Pre-Mitigation)	Scale and Duration (Pre-Mitigation)	Proposed Mitigation	Residual Effect (Post-Mitigation)
Landscape and Visual			
Overhead lines: Effects associated with the CSE compounds on landscape designations.	Short to medium-term significant effects	Undertake additional mitigation planting.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Overhead lines: Effects associated with the CSE compounds on landscape character.	Short to medium-term significant effects	Undertake additional mitigation planting.	Short term significant effects (while vegetation establishes) leading to medium term, not significant
Overhead line: Effects of overhead line and CSE compounds on views.	Long-term significant effects	Undertake additional mitigation planting and explore the potential for additional off-site planting by agreement during the assessment.	Long-term significant effects

Description of Likely Significant Effect (Pre-Mitigation)	Scale and Duration (Pre-Mitigation)	Proposed Mitigation	Residual Effect (Post-Mitigation)
Biodiversity – no likely significant effects			
Historic Environment			
Overhead lines: Designated historic buildings (not including conservation areas)	Long-term minor to moderate adverse	Detailed design measures such as protecting and maintaining landscape elements which enhance the setting of historic buildings and the use of appropriate landscape planting for screening.	Long-term neutral to minor adverse
Overhead lines: Non-designated historic landscapes (not including protected lanes)	Long-term neutral to moderate adverse	Detailed design measures such as protecting and maintaining landscape elements and using appropriate landscape planting to enhance the historic landscape and screening.	Long-term neutral to minor adverse
Overhead lines: Non-designated historic landscapes (not including protected lanes)	Long-term neutral to moderate beneficial	Not applicable.	Long-term neutral to moderate beneficial
Water Environment – no likely significant effects			
Geology and Hydrogeology – no likely significant effects			
Agriculture and Soils – no likely significant effects			
Traffic and Transport – no likely significant effects			
Air Quality – no likely significant effects			
Noise and Vibration – no likely significant effects			
Cumulative Effects			
Potential for intra-project and inter-project cumulative effects	Potentially significant	Not assessed at PEI Report stage.	Potentially significant

16.3 Next Steps

- 16.3.1 The PEI Report is published as part of the Statutory Consultation material to provide consultees with a description of the likely significant effects predicted to arise from the project. Following completion of the Statutory Consultation, National Grid will develop its final project proposals, taking into account consultation responses. The final designs and Order Limits will be used to inform the ES, which will be submitted as part of the application for development consent.

- 16.3.2 National Grid will continue to undertake site surveys for the project to get a full understanding of the baseline environment. The results of these surveys will be presented within the ES and will be used to form the basis of the assessment. National Grid will also continue to work with statutory organisations and interested parties about the potential effects, potential mitigation and opportunities to enhance the environment.
- 16.3.3 Due to the complex nature of the EIA, the final ES will be produced in a number of volumes. These are expected to comprise the following:
- Volume 1 Non-Technical Summary: This will summarise the main elements of the project and the significant environmental effects identified through the EIA process. It will be written in plain English for a non-technical audience.
 - Volume 2 Main Text: This will detail the findings of the EIA. This will cover the same chapters as set out within this PEI Report.
 - Volume 3 Figures: This will contain accompanying figures referred to within Volume 2.
 - Volume 4 Appendices: This will contain accompanying reports or documents to support Volume 2.
- 16.3.4 The ES will be supported by a number of documents either as appendices or standalone application documents, including:
- Habitats Regulations Assessment: No Significant Effects Report;
 - FRA;
 - Statement of Statutory Nuisances;
 - Draft licences for protected species supporting the Letters of No Impediment;
 - Final CoCP (subject to potential amendments during Examination);
 - Outline CEMP, including appendices on dust, soil, waste and water management;
 - Outline CTMP;
 - Outline LEMP (including Arboricultural Impact Assessment); and
 - Evidence supporting the scoping out of effects relating to noise and EMF.

ACRONYMS

Acronym	Full Reference
AADT	Annual Average Daily Traffic
AIL	Abnormal indivisible load
ALC	Agricultural Land Classification
AOD	Above ordnance datum
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ARN	Affected Road Network
AWI	Ancient Woodland Inventory
BGS	British Geological Survey
BMV	Best and most versatile
BNG	Biodiversity net gain
BPM	Best practicable means
BS	British Standard
CEA	Cumulative effects assessment
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CoCP	Code of Construction Practice
COR	Connection Options Report
CRTN	Calculation of Road Traffic Noise
CSE	Cable Sealing End
CTMP	Construction Traffic Management Plan
CWS	County Wildlife Site
DCO	Development Consent Order
DECC	Department of Energy and Climate Change (now BEIS)
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EHHER	Essex Historic Environment Record
EIA	Environmental Impact Assessment

Acronym	Full Reference
EMF	Electromagnetic field
EN-1	Overarching National Policy Statement for Energy
EN-5	National Policy Statement for Electricity Networks Infrastructure
EPS	European Protected Species
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
GCN	Great crested newt
GIS	Geographical Information System
GLVIA3	Guidelines for Landscape and Visual Assessment, Version 3
GSP	Grid Supply Point (substation)
GW	Gigawatt (1,000 million Watts)
GWDTE	Groundwater dependent terrestrial ecosystem
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HLT	Historic Landscape Type
HRA	Habitats Regulations Assessment
HSE	Health and Safety Executive
HVDC	High voltage direct current
IAQM	Institute of Air Quality Management
ICNIRP	International Commission on Non-Ionising Radiation Protection
IEMA	Institute of Environmental Management and Assessment
IPC	Infrastructure Planning Commission (functions now performed by the Planning Inspectorate)
IMD	Index of Multiple Deprivation
INNS	Invasive and non-native species
kV	Kilovolt (1,000 Volts)
LCA	Landscape Character Area
LEMP	Landscape and Ecological Management Plan
LLFA	Lead Local Flood Authority

Acronym	Full Reference
LNR	Local Nature Reserve
LOAEL	Lowest observed adverse effect level
LoD	Limits of deviation
LSOA	Lower-layer Super Output Area
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
MAHP	Major Accident Hazard Pipeline
MHCLG	Ministry of Housing, Communities and Local Government
MSA	Mineral Safeguarding Area
MWMP	Materials and Waste Management Plan
NCA	National Character Area
NCN	National Cycle Network
NETS	National Electricity Transmission System
NHLE	National Heritage List for England
NIA	Noise important area
NNR	National Nature Reserve
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NSR	Noise and vibration sensitive receptor
NVC	National Vegetation Classification
OS	Ordnance Survey
PEI Report	Preliminary Environmental Information Report
PM ₁₀	Particulate matter with an aerodynamic diameter equal to or less than 10µm.
PM _{2.5}	Particulate matter with an aerodynamic diameter equal to or less than 2.5µm.
PPV	Peak particle velocity
PRoW	Public Right of Way

Acronym	Full Reference
RBMP	River Basin Management Plan
RNR	Roadside Nature Reserves
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SBIS	Suffolk Biodiversity Information Centre
SHER	Suffolk Historic Environment Record
SLA	Special Landscape Area
SOAEL	Significant observed adverse effect level
SQSS	Security and Quality of Supply Standards
SPA	Special Protection Area
SPZ	Source Protection Zone
SRN	Strategic road network
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TEMPro	Trip End Model Presentation Program
WCH	Walkers, cyclists and horse riders
WFD	Water Framework Directive
WSI	Written Scheme of Investigation
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility
µg/m ³	Micrograms per cubic metre.

GLOSSARY

Term	Description
Abnormal indivisible load	A vehicle that is used to transport very large equipment and has a weight of more than 44,000kg; or an axle load of more than 10,000kg for a single non-driving axle and 11,500kg for a single driving axle; or a width of more than 2.9m; or a rigid length of more than 18.65m
Access points	A location connecting a construction site to the public highway.
Access routes	Public highway used by construction traffic to access a construction site.
Agricultural Land Classification	The system of grading land quality for use in land use planning purposes. This divides farmland into five grades according to the degree of limitation imposed upon land use by the inherent physical characteristics of climate, site, and soils. Grade 1 land is of an excellent quality, whilst grade 5 land has very severe limitations for agricultural use.
Agri-environment scheme	Government programme set up to help farmers manage their land in an environmentally friendly way.
Air Quality Management Area	An area where the air quality has been assessed and the levels of nitrogen dioxide, a pollutant that occurs from vehicle exhaust emissions, exceed the national Air Quality Objective.
Alternating current	The electrical current changes direction in a cycle. Mains electricity is an alternating current.
Ancient woodland	Land that has been continually wooded since at least 1600 in England. Regarded as 'irreplaceable habitat' in national planning guidance. Ancient woodland greater than 2ha is recorded on the Natural England Ancient Woodland Inventory.
Apparent height	The apparent height or angular size of an object is defined as the height that an object would appear at arm's length (61cm) from the viewer and is calculated by considering the known height of an object and distance from that object. For information, for a 50m tall pylon, the apparent height at 10km is 0.31cm, 3km is 1.02cm and 1km is 3.05cm.
Aquifer	Water-bearing rock or sediment below the soil layer.
Archaeological remains	The material remains of human activity from the earliest periods of human evolution to the present. These may be buried traces of human activities, sites visible above ground, or moveable artefacts.
Aspect	A component of a topic considered within the assessment, for example water voles (aspect) covered within biodiversity (topic)
Basic noise level	A reference noise level at 10m from the nearside carriageway, calculated as a function of traffic flow, percentage of HGVs, average speed, road gradient and road surface.
Bedrock geology	Consolidated rock such as chalk.
Bell mouth	A flared vehicular access/egress point connecting a construction site to the public highway, designed to accommodate turning movements by large vehicles.
Best and most versatile land	Grades 1, 2 and 3a under the Agricultural Land Classification system.
Biodiversity	The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems.

Term	Description
Biodiversity Action Plan	A strategy for conserving and enhancing wild species and wildlife habitats in the UK.
Biosecurity	Measures aimed at preventing the spread of harmful organisms (e.g. viruses and bacteria) to crops and livestock in order to reduce the risk of transmission of infectious diseases.
Cable	An insulated conductor designed for underground installation.
Cable sealing end	Structures used to transfer transmission circuits between underground cables and overhead lines.
Community service provider	Services within the community including health centres, education facilities and community facilities (such as village halls).
Conductor	The overhead wire that carries electricity from one place to another. For example, the line between two pylons.
Conservation area	An area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance as defined in Section 69(1)(a) in the Planning (Listed Building and Conservation Areas) Act 1990.
Contaminated land	Land where substances are causing or could cause significant harm to people, property or protected species or could cause significant pollution of surface waters or groundwater.
Corona discharge	An electrical discharge caused by the ionisation of fluid such as air surrounding a conductor carrying a high voltage. It represents a local region where the air (or other fluid) has undergone electrical breakdown and become conductive. A corona occurs at locations where the strength of the electric field (potential gradient) around a conductor exceeds the dielectric strength of the air.
County Wildlife Site	Non-designated areas of land important for their wildlife and nature conservation value.
Disaster	A disaster is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation that meets the definition of a major accident.
Development Consent Order	Introduced by the Planning Act in 2008, a Development Consent Order is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects.
Dewatering	The removal of groundwater (e.g. by pumping) to keep a below-ground works area dry. This can be used during construction of the underground cable sections.
Double circuit	This refers to the arrangement in which a total of six conductors are provided to make two different transmission circuit. Both the circuits in are mounted or run through the same transmission line.
Ecological feature	Habitats, species or ecosystems.
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
Electromagnetic Compatibility	The interaction of electrical equipment with its electromagnetic environment and with other equipment. All equipment that generates, distributes or uses electricity produces Electric and Magnetic Fields (EMF), and EMFs also occur naturally. Electric fields depend on the operating voltage of the equipment producing them and are measured in V/m (volts per metre).

Term	Description
Environmental Impact Assessment	A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making.
Environmental Statement	A document produced in accordance with the Environmental Impact Assessment (EIA) Directive as transposed into UK law by the EIA Regulations 2017 to report the results of an EIA.
European Protected Species	Animals and plants listed under the Habitats Directive and protected under the Conservation of Habitats and Species Regulations 2017, as amended.
Flood Zone 1	Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Flood Zone 2	Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Flood Zone 3	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Fragmentation	Breaking up of, for example, an area of land or habitat resulting in difficulties in accessing or using some or all of that land.
Geographical Information Systems	GIS is a framework for gathering, managing and analysing data. It analyses spatial location data and organises layers of information into visualisations on maps.
Groundwater dependent terrestrial ecosystems	Wetlands which critically rely on groundwater flows and/or chemistries.
Habitats Regulations Assessment	The process by which plans and projects are assessed as to whether they are likely to have a significant effect on a European site either alone or in combination with other plans or projects, under the Conservation of Habitats and Species Regulations 2017, as amended.
Habitat Suitability Index	A technique used for evaluating the suitability of habitats for great crested newt in order to assess the likelihood of their presence or absence.
Habitat Suitability Modelling	A statistical technique that predicts the distribution of a species from environmental variable data and bat occurrence records which can produce heat maps, identifying the most important flight paths and habitat connections for bats. The model identifies which of the environmental variables assessed (such as roads, the presence of woodland, or water) will most affect the distribution of a species.
Heavy duty vehicle	Freight vehicles weighing more than 3500kg or passenger transport with more than 16 seats.
Heavy Goods Vehicle	Goods vehicles weighing more than 3500kg.
Heritage asset	A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Heritage assets include designated heritage assets and assets identified by the local planning authority (including local listing).

Term	Description
Historic buildings	Architectural, designed, or other structures with a significant historical value. These may include structures that have no aesthetic appeal or structures not usually thought of as buildings, such as milestones or bridges.
Historic landscape	The current landscape, whose character is the result of the action and interaction of natural and/or human factors.
Hydromorphology	The physical character and water content of waterbodies.
Index of Multiple Deprivation	The official measure of relative deprivation for small areas in England.
Indicative Alignment	The alignment of the overhead lines and underground cables that was used within the Scoping Report.
Infiltration	Incident rainfall that percolates into the ground, rather than evaporating or running off.
Intervisibility	Intervisibility is defined as the ability to see in a direct line of sight from one position on the earth's surface to another, considering the intervening terrain.
Invasive non-native species	An invasive non-native species is any non-native animal or plant that can spread, causing damage to the environment, the economy, health, and way of life.
$L_{Aeq T}$	The A-weighted L_{eq} sound level measured over a specified period of time.
Land cover	The surface cover of the land, usually expressed in terms of vegetation cover or lack of it. Related to but not the same as land use.
Landform	The shape and form of the land surface resulting from combinations of geology, geomorphology, slope, elevation and physical processes.
Land use	What land is used for, based on broad categories of functional land cover such as urban and industrial use and the different types of agricultural and forestry.
Landscape	An area, as perceived by people, the character of which is the result of the action and integration of natural and/or human factors.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Landscape susceptibility	The ability of the landscape (whether it be the overall character or quality/condition of a particular landscape type or area, or an individual element and/or features, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline situation.
Landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons.
Light Goods Vehicle	Goods vehicle weighing 3500kg or less.
Listed building	A measure of a building's special architectural and historic interest. Listing includes the interior, exterior and the setting of the building. Listed buildings are graded as grade I (highest value), grade II* and grade II.
Local Nature Reserve	Sites dedicated by the local authority under Section 21 of the National Parks and Access to the Countryside Act 1949 for nature conservation which have wildlife or geological features that are of special interest locally.

Term	Description
Local planning authority	The public authority whose duty it is to carry out specific planning functions for a particular area.
Local Wildlife Site	Non-designated areas of land important for their wildlife and nature conservation value.
Long term	This is used to describe an impact of long duration or irreversible. It is assumed to be greater than 15 years post construction.
Lower-layer Super Output Area	A geographic hierarchy designed to improve the reporting of small area statistics in England and Wales.
Lowest observed adverse effect level (LOAEL)	This is the level of noise above which adverse effects on health and quality of life can be detected.
Macroinvertebrate	Any invertebrate organism which can be seen with the naked eye.
Macrophyte	Aquatic plants that grow in or near water.
Magnetic field	A measure of the force experienced by a moving electric charge, due to the motion of other charges.
Magnitude of change	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.
Major accident	A major accident is an event that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (i.e., contractors) to manage. Major accidents can be caused by disasters resulting from both man-made and natural hazards.
Main river	Usually larger rivers and streams that the Environment Agency maintain and improve to manage flood risk.
Medium term	This is used to describe an impact of medium duration or reversible within the medium term, which is assumed to be between five and 15 years post construction.
Mineral reserve	Mineral deposit whose extraction is economically feasible.
Mitigation	The action of reducing the severity and magnitude of change (impact) to the environment. Measures to avoid, reduce, remedy or compensate for significant adverse effects.
National Cycle Network	UK-wide network of signed paths and routes primarily for cycling.
Nationally Significant Infrastructure Project	Major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, as set out in the Planning Act 2008.
National Nature Reserve	Sites that are dedicated by the statutory country conservation agencies, under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981, for nature conservation and which have wildlife or geological features that are of special interest nationally.
National Vegetation Classification	System of classifying natural habitat types in Great Britain according to their vegetation types.

Term	Description
Noise important area	Determined via strategic noise maps and highlight the residential areas experiencing the highest 1% of noise levels from road and rail sources in England.
Non-statutory designated site	A site designated at a local level for its biodiversity and/or geological value. These are not underpinned by legislation.
Ordinary watercourse	Watercourses that are not main rivers, and that Lead Local Flood Authorities, district councils and Internal Drainage Boards maintain.
Outage	A period of interruption to electricity supply.
Overhead line	Conductor (wire) carrying electric current, strung from pylon to pylon.
Peak Particle Velocity	A measurement of vibration level, being the maximum rate of displacement of the vibration propagation medium (such as the ground) for a given event, such as the impact of a piling hammer, at specific locations.
Permitted reserve	A mineral reserve that has planning permission for extraction.
Potential roost feature	Potential roosting features in buildings are features used as bat roosts include (but are not limited to) gaps between stone or brickwork or cracks and splits in trees.
Preferred corridor	A detailed desk-based assessment, supplemented with site visits, has identified route corridors which seek to avoid constraints and also 'opportunity corridors' which use the routes of existing lines (National Grid (2009) Route Corridor Study for Public Consultation).
Preliminary Environmental Information Report	Information that has been compiled by the applicant to support statutory consultation held in advance of submitting an application for development consent. The Preliminary Environmental Information Report should contain information reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development and any associated development.
Priority habitat	Habitats identified as of principal importance in England, in accordance with requirements of the Natural Environment and Rural Communities Act 2006. These are based on the UK Biodiversity Action Plan Priority Habitats.
Priority Hazardous Substance	Substances which are toxic and persistent in the water environment, defined by the Water Framework Directive.
Priority species	Species identified as of principal importance in England, in accordance with requirements of the Natural Environment and Rural Communities Act 2006. These are based on the UK Biodiversity Action Plan Priority Species.
Protected lane	Country lanes and byways of historic and landscape value that make an important contribution to rural character, which have been designated as having 'protected lane' status in development planning policy.
Public Right of Way	A footpath, bridleway or byway accessible to all members of the public.
Pylon	Transmission line supports.
Ramsar site	Sites designated under the Ramsar Convention. The designation covers all aspects of wetland conservation and use, recognising wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the wellbeing of human communities.
Registered park and garden	A park or garden included on Historic England's Register of Historic Parks and Gardens. Sites are graded I, II* or II like listed buildings.

Term	Description
Riparian	Relating to or situated on the banks of a watercourse.
Route Corridor	A defined linear area identified on a map which may be of variable width and whose extent at any point is typically defined by constraints or differentiation from other route corridors.
Scheduled monument	An historic building or site whose heritage interest is nationally important, that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. Covered by the Ancient Monuments and Archaeological Areas Act 1979.
Scoping Boundary	An area around the Indicative Alignment which is used for scoping purposes to define an area within which the final Order Limits are likely to lie. It is based on a buffer of 200m around the Indicative Alignment.
Single circuit CSE compound	A term used to describe the small single circuit sealing end closure at the GSP substation, to differentiate it from the larger CSE compounds used on the main transmission line.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptors to the specific type of change or development proposed and the value related to that receptor.
Setting	The surroundings in which a heritage asset or landscape designation is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.
Severance	The extent to which members of communities or habitats are able (or not able) to move around their community and access services/facilities.
Short term	This is used to describe an impact of short-term duration or reversible within the short term, which is assumed to be up to five years after construction.
Significance	A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Significant observed adverse effect level (SOAEL)	This is the level of noise above which significant adverse effects on health and quality of life occur.
Site of Special Scientific Interest	A statutory designation under the Wildlife and Countryside Act 1981 (as amended), protecting nationally important wildlife sites, habitats and geological sites.
Soil association	Represent a group of soil series (soil types) which are typically found occurring together in the landscape.
Soil compaction	Degradation of soil structure, which can be caused by heavy loading, resulting in a reduction in the voids within the soil.
Soil stockpiles	Mounds of soil created through the storage of soil materials which have been stripped from an area of construction.
Source Protection Zone	A defined area around a drinking water source that carries statutory protection from damaging activities.
Special Area of Conservation	Protected sites designated under the Habitats Directive, representing internationally important, high-quality conservation sites.
Special Protection Area	Site of European importance for bird conservation, designated under the Birds Directive.

Term	Description
Statutory designated site	A site which receives protection by means of legislation in recognition of its biodiversity value.
Subsoil	The layer of soil under the topsoil on the surface of the ground, lacking in the levels of organic matter found in topsoil.
Substation	Substations are used to control the flow of power through the electricity system. They are also used to change (or transform) the voltage from a higher to lower voltage to allow it to be transmitted to local homes and businesses.
Superficial geology	Uncemented sediments, such as alluvium, immediately beneath the soil and above the bedrock.
Tensioning site	A site where the new conductor is fed out from during construction. This also includes a tensioning winch to keep the conductor off the ground.
Topic	A subject area covered within the EIA, for example landscape and visual or biodiversity.
Topsoil	The uppermost layer of soil, usually with the highest concentration of nutrients, organic matter and microorganisms.
Tranquillity	A state of calm and quietude associated with peace, considered to be a significant asset of landscape.
Visualisation	A computer simulation, photomontage or other technique illustrating the predicted appearance of a project to aid engagement with consultees.
Visual receptor	Individuals and/or defined groups of people who could be affected by a project impacting on their views.
Visual susceptibility	The ability of a visual receptor to accommodate a project.
Visual value	The relative value that is attached to different views by society. A view may be valued by different stakeholders for a whole variety of reasons.
Working area	The working area refers to the area of land that is likely to form part of the construction site. This is not the same as the Scoping Boundary, as there may be parts of the Scoping Boundary that lie outside the working area.
Zone of Influence	The defined geographic area within which the project's environmental receptors are located.

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