

Issue number: BT-JAC-020631-550-0002-EIA

Bramford to Twinstead

Scoping Report
May 2021



nationalgrid

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Contents

Contents	ii
1. Introduction	1
1.1 Overview	1
1.2 Need for the Project	1
1.3 Geographical Context	3
1.4 Purpose of this Report	4
1.5 Transboundary Effects	6
2. Regulatory and Planning Policy Context	7
2.1 Introduction	7
2.2 The Infrastructure Planning (EIA) Regulations 2017	7
2.3 Electricity Act 1989	8
2.4 Countryside and Rights of Way Act 2000	8
2.5 National Planning and Energy Policy	8
2.6 Local Planning Policies	11
2.7 National Grid Policy and Guidance	11
3. Main Alternatives Considered	12
3.1 Introduction	12
3.2 National Grid Approach to Options Appraisal	13
3.3 Overview	14
3.4 Strategic Options	15
3.5 Route Corridor Options	16
3.6 Identification of the Preferred Corridor	18
3.7 Alignment Options	18
3.8 Further Work Undertaken After Identifying the Interim Alignment	20
3.9 Distribution Network Options	23
3.10 Current Indicative Alignment and Embedded Measures	24
4. Project Description	26
4.1 Overview of the Project	26
4.2 DCO Terminology and Assumptions	27
4.3 Description of Each Section of the Scoping Boundary	28
4.4 Good Design Principles	31
4.5 Description of Project Components and Construction Methods	33
4.6 Operation and Maintenance	38
4.7 Decommissioning	40
4.8 Embedded Measures	40

5. Environmental Impact Assessment Approach and Method	41
5.1 Introduction	41
5.2 General Approach	41
5.3 Geographical and Temporal Scope	41
5.4 Embedded and Good Practice Measures	43
5.5 Assessment of Effects and Determination of Significance	43
5.6 Mitigation	46
5.7 Residual Effects	46
5.8 Cumulative Effects	46
5.9 Monitoring	46
6. Landscape and Visual	47
6.1 Introduction	47
6.2 Regulatory and Planning Policy Context	47
6.3 Study Area	48
6.4 Existing Baseline	49
6.5 Embedded and Good Practice Measures	60
6.6 Likely Significant Effects	62
6.7 Proposed Assessment Methodology	65
6.8 Ascribing Value/Sensitivity	67
6.9 Conclusion	74
7. Biodiversity	76
7.1 Introduction	76
7.2 Regulatory and Planning Policy Context	76
7.3 Approach and Methods	77
7.4 Study Area	78
7.5 Existing Baseline	79
7.6 Embedded and Good Practice Measures	87
7.7 Likely Significant Effects	89
7.8 Proposed Assessment Methodology	97
7.9 Conclusion	99
8. Historic Environment	102
8.1 Introduction	102
8.2 Regulatory and Planning Policy Context	102
8.3 Study Area	103
8.4 Existing Baseline	103
8.5 Embedded and Good Practice Measures	107
8.6 Likely Significant Effects	107
8.7 Proposed Assessment Methodology	110
8.8 Conclusion	114

9. Water Environment	117
9.1 Introduction	117
9.2 Regulatory and Planning Policy Context	117
9.3 Study Area	118
9.4 Existing Baseline	118
9.5 Embedded and Good Practice Measures	121
9.6 Likely Significant Effects	122
9.7 Proposed Assessment Methodology	124
9.8 Conclusion	126
10. Geology and Hydrogeology	128
10.1 Introduction	128
10.2 Regulatory and Planning Policy Context	128
10.3 Study Area	129
10.4 Existing Baseline	129
10.5 Embedded and Good Practice Measures	131
10.6 Likely Significant Effects	132
10.7 Proposed Assessment Methodology	134
10.8 Conclusion	137
11. Agriculture and Soils	139
11.1 Introduction	139
11.2 Regulatory and Planning Policy Context	139
11.3 Study Area	140
11.4 Existing Baseline	140
11.5 Embedded and Good Practice Measures	142
11.6 Likely Significant Effects	143
11.7 Proposed Assessment Methodology	145
11.8 Conclusion	147
12. Traffic and Transport	148
12.1 Introduction	148
12.2 Regulatory and Planning Policy Context	148
12.3 Study Area	149
12.4 Existing Baseline	149
12.5 Embedded and Good Practice Measures	152
12.6 Likely Significant Effects	153
12.7 Proposed Assessment Methodology	155
12.8 Conclusion	161
13. Air Quality	163
13.1 Introduction	163
13.2 Regulatory and Planning Policy Context	163

13.3	Study Area	163
13.4	Existing Baseline	164
13.5	Embedded and Good Practice Measures	167
13.6	Likely Significant Effects	168
13.7	Proposed Assessment Methodology	169
13.8	Conclusion	172
14.	Noise and Vibration	173
14.1	Introduction	173
14.2	Regulatory and Planning Policy Context	173
14.3	Study Area	173
14.4	Existing Baseline	174
14.5	Embedded and Good Practice Measures	175
14.6	Likely Significant Effects	177
14.7	Proposed Assessment Methodology	179
14.8	Conclusion	182
15.	Socio-Economics, Recreation and Tourism	184
15.1	Introduction	184
15.2	Regulatory and Planning Policy Context	185
15.3	Study Area	186
15.4	Existing Baseline	186
15.5	Embedded and Good Practice Measures	195
15.6	Likely Significant Effects	195
15.7	Conclusion	201
16.	Health and Wellbeing	203
16.1	Introduction	203
16.2	Regulatory and Planning Policy Context	204
16.3	Approach to Scoping	204
16.4	Study Area	205
16.5	Existing Baseline	205
16.6	Embedded and Good Practice Measures	206
16.7	Likely Significant Effects	207
16.8	Conclusion	207
17.	Major Accidents and Disasters	209
17.1	Introduction	209
17.2	Regulatory and Planning Policy Context	209
17.3	Approach to Scoping	209
17.4	Study Area	210
17.5	Existing Baseline	211
17.6	Embedded and Good Practice Measures	214

17.7	Likely Significant Effects	215
17.8	Conclusion	216
18.	Cumulative Effects	218
18.1	Introduction	218
18.2	Regulatory and Planning Policy Context	218
18.3	Approach to Scoping	219
18.4	Existing Baseline	220
18.5	Embedded and Good Practice Measures	221
18.6	Proposed Assessment Methodology	221
18.7	Likely Significant Effects	225
18.8	Conclusion	226
19.	Environmental Management and Mitigation	227
19.1	Introduction	227
19.2	Proposed Securing Mechanisms	227
19.3	Environmental Management Post Consent	227
20.	Conclusion	228
20.1	Introduction	228
20.2	Topics Proposed to be Scoped In and Out	228
20.3	Proposed Contents of the ES	232
20.4	Next Steps	234
	Acronyms	235
	Glossary	239
	References	248
	Legislation	248
	Other Documents	248

1. INTRODUCTION

1.1 Overview

- 1.1.1 National Grid Electricity Transmission plc (hereafter 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.
- 1.1.2 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 reinforcing the network with a new 400 kilovolt (kV) electricity transmission line over a distance of 27km (16.7 miles), the majority of which would follow the general alignment of the existing overhead line network.
- 1.1.3 The reinforcement would be a combination of overhead line (conductors) and underground cable, and it is proposed that approximately 26.5km of existing overhead line could then be removed (25km of existing 132kV overhead line between Burstall Bridge and Twinstead Tee, and 1.5km of the existing Bramford-Braintree-Rayleigh 400kV overhead line to the south of Twinstead). To facilitate the overhead line removal a new grid supply point (GSP) substation is proposed at Butler's Wood, south of Sudbury, in Essex.
- 1.1.4 The Bramford to Twinstead project ('the project') is a Nationally Significant Infrastructure Project (NSIP), as defined under Part 3 of the Planning Act 2008 and some aspects constitute associated development.
- 1.1.5 The Scoping Report presents the 'Indicative Alignment', which is the current alignment identified to date in the options appraisal work. The Indicative Alignment has the potential to change as a result of ongoing technical and environmental assessments and also as a result of consultation feedback. The project will need to identify the proposed Order Limits as part of the application for development consent, which will comprise the land used during construction of the project. As the Order Limits are not yet defined and as the Indicative Alignment could be refined, a precautionary 250m buffer has been assumed around the Indicative Alignment in the Scoping Report in order to scope the potential significant effects of the project. This area has been called the 'Scoping Boundary' and is shown on Figure 1.1 and other associated figures in Volume 3. The proposed Order Limits will be defined at the next stage of the project and will replace the Scoping Boundary as the basis for the project assessment area within the future Environmental Statement (ES).

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 originally identified. National Grid considered alternative strategic options to reinforce the network and alternative route corridors, as part of the options appraisal process (see Chapter 3: Main Alternatives Considered). 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 both statutory stakeholders and the wider public to gather feedback on the proposals.

- 1.2.2 The project was preparing for the Statutory Consultation when changes to the planned dates 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.
- 1.2.3 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 is to deliver 40 Gigawatt (GW) of offshore wind farms connected to the electricity transmission network by 2030 and achieve net zero emissions by 2050 (Department for Business, Energy and Industrial Strategy, 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 network is required to deliver this change.
- 1.2.4 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.
- 1.2.5 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 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.
- 1.2.6 Reinforcing the network between Bramford and Twinstead will 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 constraint 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.
- 1.2.7 The network today is 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.

- 1.2.8 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.
- 1.2.9 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 Geographical Context

- 1.3.1 The project is located in the east of England (Figure 1.1). The Scoping Boundary 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).
- 1.3.2 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 project.
- 1.3.3 There is currently an existing 400kV overhead line operated by National Grid between Bramford and Twinstead. This 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.
- 1.3.4 The Scoping Boundary includes 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 Rivers Brett, Box and Stour.

- 1.3.5 The Scoping Boundary also crosses Hintlesham Woods Site of Special Scientific Interest (SSSI). This is designated as one of the largest remaining areas of ancient coppice woodland in Suffolk. There are many listed buildings within the Scoping Boundary including Hintlesham Hall, a Grade I listed building.
- 1.3.6 For ease of reference in project documentation, the project was initially split into seven sections based on the landscape character areas and feedback from consultation. These were described in the Connection Options Report (COR) and assisted in making the gathering, assessment and presentation of environmental information more manageable during the options appraisal (National Grid, 2012a). Sections A and B (eastern extent of the project) were subsequently combined as the landscape characteristics were considered similar. The sections comprise:
- Section AB – Bramford Substation and Hintlesham;
 - Section C – Brett Valley;
 - Section D – Polstead;
 - Section E – Dedham Vale up to the AONB boundary;
 - Section F – Leavenheath and Assington; and
 - Section G – Stour Valley.
- 1.3.7 The GSP substation is proposed at Butler’s Wood, south of Sudbury, in Essex. This lies to the west of Section G: Stour Valley. This is described separately within the report and does not lie within one of the above sections.
- 1.3.8 This Scoping Report uses the same sections as the COR to describe the project. The geographical sections and location of the substation are referenced within this report and it is also proposed to use the same references for reporting in the ES.

1.4 Purpose of this Report

- 1.4.1 Prior to the project pause, a Scoping Report was submitted to the Planning Inspectorate in February 2013, in accordance with the Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2009 (‘the EIA Regulations 2009’), as amended by the Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2012. A Scoping Opinion was received in March 2013.
- 1.4.2 Due to the time lapse since the original Scoping Report was prepared, National Grid has decided to submit a revised Scoping Report (this report) and the project will now fall within the Infrastructure Planning (EIA) Regulations 2017 (‘the EIA Regulations 2017’).
- 1.4.3 This Scoping Report has been prepared to accompany a request for an updated Scoping Opinion from the Planning Inspectorate (prepared on behalf of the Secretary of State). This Scoping Report replaces the former Scoping Report submitted to the Planning Inspectorate in February 2013. Once received, the updated Scoping Opinion will replace the former Scoping Opinion issued in March 2013. Table 1.1 outlines the chapters within the Scoping Report, along with a summary of the content.

Table 1.1: Structure of the Scoping Report

Chapter/Appendix	Content
Volume 1: Main Report	
1. Introduction	An introduction to the project and the purpose and structure of the Scoping Report.
2. Regulatory and Planning Policy Context	A review of the legislation and policy relevant to the project.
3. Main Alternatives Considered	An outline of the reasonable alternatives considered and the reasons for selecting the preferred corridor and Indicative Alignment.
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.
6-17. Topic Chapters	There is a chapter for each environmental topic, providing a summary of the existing (baseline) environment and a projection of how this is anticipated to change in the future using currently available project information. Each chapter identifies the aspects and matters that are to be scoped into the EIA and describes the methods that will be used to assess impacts and to determine significance of effect. Each chapter also describes the aspects or matters that are proposed to be scoped out of the EIA and provides justification for this.
18. Cumulative Effects	A description of the approach to the cumulative effects assessment including the potential for significant effects from different EIA topics on the same receptor group, and potential cumulative effects with other developments.
19. Environmental Management and Mitigation	A description of how the project intends to secure environmental commitments and mitigation within the DCO, and the mechanisms for delivering these during construction and implementation of the project.
20. Conclusion	Provides a summary table setting out each of the aspects and matters that are proposed to be scoped out of the EIA. It also provides the proposed outline structure of the ES.
Volume 2: Appendices	Contain additional information supporting the chapters above.
Volume 3: Figures	Contain supporting figures.
1.4.4	This Scoping Report has been prepared in accordance with Advice Note Seven (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. A scoping process has been undertaken to identify the issues that National Grid intends to include within the ES. National Grid will submit the ES as part of the application for development consent.

- 1.4.5 The Scoping Report has been developed in parallel with other regulatory environmental studies, namely the Habitats Regulations Assessment (HRA). The Draft HRA Screening Report can be found in Appendix 7.3.

1.5 Transboundary Effects

- 1.5.1 There is a requirement under the EIA Regulations 2017 to consider transboundary effects, i.e. those effects that could affect receptors within other countries. A screening exercise has been undertaken as part of the scoping process and is documented in Appendix 1.1: Transboundary Supporting Information. No transboundary effects have been identified in relation to the project, as there is no pathway for effects to occur outside the UK. Therefore, National Grid proposes to scope this topic out of the EIA.

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 two appendices:
- Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance. This presents a summary of legislation and guidance applicable to the environmental topics (Chapters 6 to 18) and how the project has considered these.
 - Appendix 2.2: Local Planning Policy. This provides an overview of local planning policies that, although not directly applicable, have been considered as potentially important and relevant by the project.

2.2 The Infrastructure Planning (EIA) Regulations 2017

- 2.2.1 The EIA Regulations which are relevant to NSIPs are the EIA Regulations 2017. Under these Regulations (paragraph 20 of Schedule 1), a project is Schedule 1 if it fulfils the following criteria '*Construction of overhead electrical power lines with a voltage of 220 kV or more, and a length of more than 15 km*'. The project comprises a 400kV electricity transmission line over a distance of 27km, 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—*
- a) *population and human health;*
 - b) *biodiversity, with particular reference to species and habitats protected under Directive 92/43/EEC and 2009/147/EC;*
 - c) *land, soil, water, air and climate;*
 - d) *material assets, cultural heritage and landscape; and,*
 - e) *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 6 to 16).
- 2.2.4 In addition, 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 is considered within Chapter 17: Major Accidents.
- 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 18: Cumulative Effects.
- 2.2.6 Regulation 32 sets out the requirements for developments that are likely to have significant effects on the environment in another European Economic Area state. As stated in Chapter 1, no transboundary effects have been identified for the project and the information supporting this assessment can be found in Appendix 1.1: Transboundary Supporting Information.

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.

2.4 Countryside and Rights of Way Act 2000

2.4.1 Areas of Outstanding Natural Beauty (AONB) are designated solely for their landscape qualities, for the purpose of conserving and enhancing their natural beauty. They are designated under 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 National Planning and Energy Policy

Planning Act 2008

2.5.1 The project is a 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")'...*
- d) any other matters which the [Secretary of State] thinks are both important and relevant to [the Secretary of State's] decision.'*

2.5.2 The two relevant NPS for the Bramford to Twinstead 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).

- 2.5.3 In the Energy White Paper - Powering our Net Zero Future (Department for Business, Energy and Industrial Strategy, 2020) the Government indicated that it will undertake a review of the existing energy NPS, with the aim of designating updated NPS by the end of 2021. However, the extant NPS (EN-1 and EN-5) have not yet been suspended and will remain in force until the designation of any new NPS. The project will continue to monitor progress on the NPS review and will take account of changes were they to occur.
- 2.5.4 Paragraph 1.4.2 of 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.

Overarching National Policy Statement for Energy

- 2.5.5 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. 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.
- 2.5.6 Section 3.7 of 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 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*'.
- 2.5.7 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 Scoping Report and the relevant policy is set out in each of the topic chapters.

National Policy Statement for Electricity Networks Infrastructure

- 2.5.8 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 topic chapters.

National Planning Policy Framework

- 2.5.9 The revised National Planning Policy Framework (NPPF) was published in February 2019 (Ministry of Housing, Communities and Local Government (MHCLG), 2019c).

Paragraph 5 of the NPPF 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 topic chapter will consider whether there is important and relevant guidance in the NPPF that may require consideration by the decision-making authority. 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

- 2.5.10 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 Box 1. These have been an important consideration during the development of the Indicative Alignment and whether certain sections should be undergrounded. The Holford Rules are also expressly considered as part of EN-5.

Box 1: The Holford Rules

1. Avoid altogether, if possible, the major areas of highest amenity value, for example designations including Areas of Outstanding Natural Beauty (AONB).
2. Avoid smaller areas of high amenity value or scientific interest by deviation where this can be done without using too many angle towers, for example Sites of Special Scientific Interest (SSSI). An explanatory note states that where possible routes should be chosen which minimise effects on the settings of areas of architectural, historic and archaeological interest including Conservation Areas, Listed Buildings, Listed Parks and Gardens and Scheduled Monuments.
3. Other things being equal, choose the most direct line, with no sharp changes of direction to minimise use of angle towers.
4. Choose tree and hill backgrounds in preference to sky backgrounds, wherever possible; and where 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 there is no dip in the ridge, cross directly, preferably between belts of trees.
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.
6. Where land is flat and sparsely planted, keep high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, to avoid 'wirescape'.
7. Approach urban areas through industrial zones, where they exist. When pleasant residential and recreational land intervenes between the approach line and the substation, consider carefully the comparative costs of undergrounding, for lines other than those of the highest voltage.

Horlock Rules

- 2.5.11 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.

2.6 Local Planning Policies

- 2.6.1 Local planning policies have also been considered in the development of the Scoping Report. Further information on these policies can be found within Appendix 2.2: Local Planning Policy.
- 2.6.2 As set out in Section 2.2, the NPSs 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.

2.7 National Grid Policy and Guidance

- 2.7.1 National Grid has its own policies and processes that are followed when developing projects. The key policies that are applicable to this project include:
- Our Stakeholder, community and amenity policy (National Grid, 2016b): This document describes the 10 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; and
 - Our approach to Options Appraisal (National Grid, 2012c): 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.
- 2.7.2 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 Scoping Report chapters where relevant.

3. MAIN ALTERNATIVES CONSIDERED

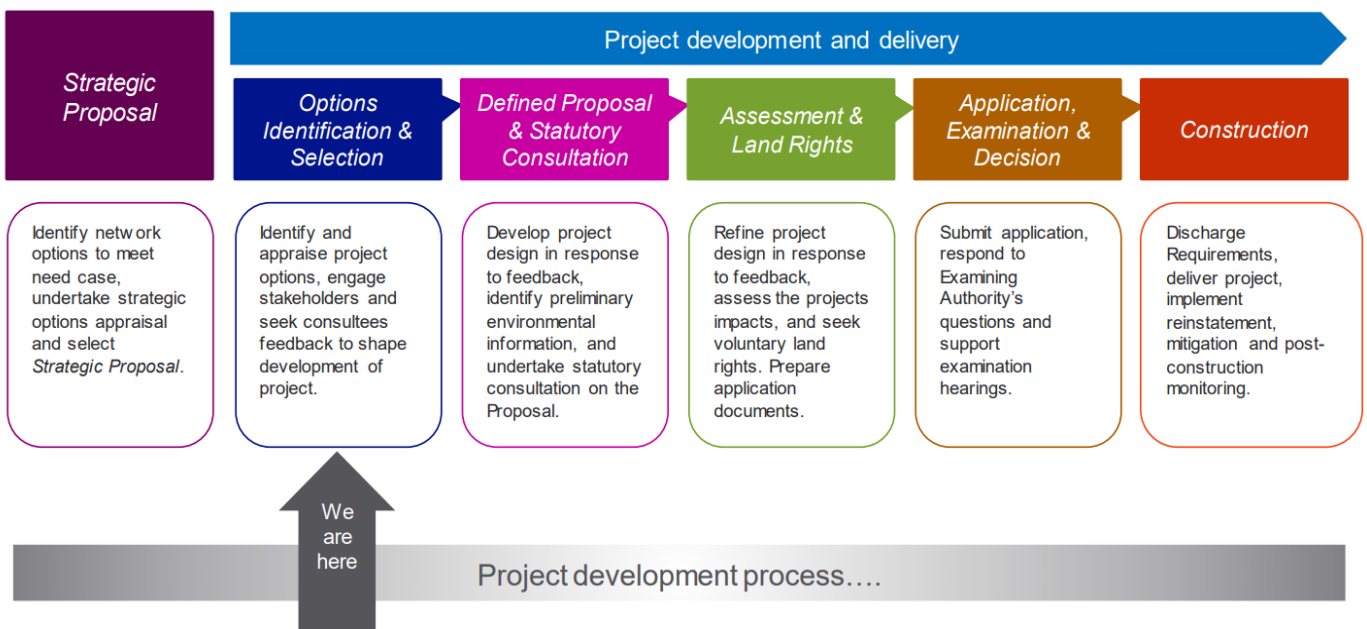
3.1 Introduction

- 3.1.1 The current stage of project design is the result of an iterative process that commenced at project inception when the need for the project was identified in 2009. Environmental, engineering and economic considerations have had a key influence in the optioneering and design evolution process and there have been extensive discussions with stakeholders during the project development. The iterative design process will continue up to submission of the application for development consent in parallel with, and informed by, the EIA process.
- 3.1.2 The need for the project is set out in Chapter 1: Introduction and is not duplicated here. Chapter 3 focuses on the way in which environmental considerations have influenced the design of the project to date and is structured as follows:
- Section 3.2 sets out National Grid's approach to options appraisal;
 - Section 3.3 to Section 3.7 provide an overview of the options appraisal undertaken for the project, from the strategic options to the current proposals;
 - Section 3.8 sets out the further work that has been undertaken since the publication of the COR (National Grid, 2012a);
 - Section 3.9 sets out the Distribution Network Options required in relation to the project and the siting of the proposed Grid Supply Point (GSP) substation; and
 - Section 3.10 brings together the measures embedded into the design of the project, as a result of the options appraisal process to reduce potential environmental impacts and effects.
- 3.1.3 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project, comprising EN-1 and EN-5, which has been considered during the options appraisal. With reference to the consideration of alternatives, paragraph 4.4.2 of EN-1 states that '*applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects including, where relevant, technical and commercial feasibility*'.
- 3.1.4 Paragraph 2.8.8 of EN-5 states that '*although Government expects that fulfilling this need through the development of overhead lines will often be appropriate, it recognises that there will be cases where this is not so*'. Paragraph 2.8.9 states that each project should be assessed individually on the basis of its specific circumstances and that consent for overhead line proposals should only be refused in favour of an underground line if '*the benefits from the non-overhead line alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable*'.

3.2 National Grid Approach to Options Appraisal

- 3.2.1 National Grid undertakes options appraisal on each new project. There are often a number of different ways that a project could be developed, perhaps involving different locations, technologies or designs. Each project will require judgements and decisions about the best way to achieve the required outcome. The options appraisal process provides information to help inform those judgements.
- 3.2.2 Options appraisal is a robust and transparent process that is used to compare options and to assess the positive and negative effects they may have, across a wide range of criteria including environmental, socio-economic, technical and cost factors (National Grid, 2012c). The aim is to find a balanced outcome, bearing in mind the range of National Grid’s statutory duties. The assessment is documented to provide in a transparent manner, the information on which decisions are based. Further details on the options appraisal process can be found in Our approach to Options Appraisal (National Grid, 2012c).
- 3.2.3 At each stage in the options appraisal process, transparent methods have been used to inform decision-making. This has included technical inputs from engineers and environmental consultants to inform the decisions and design. The assessment has drawn on data and evidence collected from both desk studies and field work. Decision-making has also taken (and will continue to take) account of feedback from both prescribed bodies, as defined in the Planning Act 2008, and the local community through an extensive programme of engagement and consultation. In addition, the project has been subject to periodic internal challenge and review to ensure the robustness of the decision made in the light of a changing environment (including technical, physical and economic). Illustration 3.1 shows where the options appraisal sits in the overall National Grid consenting process.

Illustration 3.1: National Grid Approach to Consenting



- 3.2.4 When identifying options and deciding those to take forward, National Grid has a duty under Section 9(2) of the Electricity Act 1989 ‘to develop and maintain an efficient, co-ordinated and economical system of electricity transmission...’. Section 38 and

Schedule 9 of the Electricity Act 1989 requires National Grid, when formulating proposals for new 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’.

- 3.2.5 Project decisions have taken account of National Grid's statutory obligations set out in Sections 9 and 38 of the Electricity Act 1989, its licence requirements and all other relevant considerations, including the relevant NPS. Project decisions have also had regard to the purpose of conserving and enhancing the natural beauty of the AONB, as set out under Section 85 of the CROW Act 2000. The options appraisal has also considered other policy and guidance when making judgements and decisions on the project, including the Holford Rules and the Horlock Rules, which are summarised in Chapter 2: Regulatory and Planning Policy Context.

3.3 Overview

- 3.3.1 The options appraisal on the Bramford to Twinstead project has followed a staged approach starting at considering strategic options that meet the need, through to presenting the current Indicative Alignment (and consequently the Scoping Boundary) set out within this Scoping Report. The following stages were followed and were undertaken in accordance with the guidance outlined above:

- **Strategic Options:** This considered strategic options that could fulfil the project need (see Section 3.4, originally undertaken in 2009);
- **Route Corridor Options:** The strategic option stage identified the need for reinforcement of the network between Bramford Substation and Twinstead Tee. Alternative route corridors were developed that could provide the route of the reinforcement between Bramford Substation and Twinstead Tee (Section 3.5);
- **Identification of the Preferred Corridor:** The options appraisal considered the effects of each of the route corridors. The results of the route corridor consultation undertaken in 2009-2010 resulted in National Grid identifying a Preferred Corridor in 2011 (Section 3.6);
- **Alignment Options:** Following the identification of a Preferred Corridor, National Grid looked at the detailed routing of the alignment within this corridor taking into account environmental and technical constraints. Consideration was also given to whether sections of the Preferred Corridor should be undergrounded. National Grid presented an ‘interim alignment’ in 2012 for consultation (Section 3.7); and
- **Further works to refine the Alignment:** National Grid reviewed the feedback from the consultation and refined the interim alignment in specific locations. Some of this work was undertaken during 2013 prior to the project pause and additional refinement was undertaken in 2020 when the project was un-paused (Section 3.8).

- 3.3.2 There has also been a parallel options appraisal undertaken in relation to the GSP substation. This is needed as a result of the removal of the 132kV overhead line between Burstall Bridge and Twinstead Tee. This process is documented in Section 3.9.

- 3.3.3 National Grid has undertaken a series of back checks and reviews after each of the above stages to check that decisions remain valid and to confirm actions required to take the project forward. The most recent back check and review was undertaken in 2020. This included a thorough re-appraisal of the project and the decisions taken previously and concluded that in general terms the previous project design remains valid with some specific areas requiring further work and consultation.
- 3.3.4 As noted in Chapter 1: Introduction, the Scoping Report presents the Indicative Alignment, which is the current alignment being considered. This is set within a Scoping Boundary, which includes a precautionary 250m buffer around the Indicative Alignment, which would incorporate potential amendments to the Indicative Alignment that could occur as a result of things identified within the ongoing technical and environmental assessments and also as a result of consultation feedback.

3.4 Strategic Options

- 3.4.1 National Grid commenced the project in 2009, following previous studies which had identified the need for reinforcement of the transmission network in East Anglia. The project started by considering strategic options that could deliver the reinforcement. Strategic options are a long list of technically feasible options identified by the Network Investment team. These were assessed to identify any significant differences in terms of their potential technical, cost, environmental and socio-economic performance which may aid decision-making at a strategic level. The aim of the appraisal was both to inform the selection of the strategic option that achieved the best balance between National Grid's various statutory and non-statutory duties, and to inform consultation with core stakeholders.
- 3.4.2 A list of 18 strategic options (which were all given an 'S' prefix for 'Strategic' option) were identified that would facilitate the connection between power providers and the customers. The Do Nothing and Do Minimum options were considered. Options were either discounted, parked or taken forward for further investigation based on the assessment.
- 3.4.3 The study recommended that Options S6 (Bramford to Twinstead Tee – not using the corridor of the existing distribution line) and S7 (Bramford to Twinstead Tee – using the corridor of the existing distribution line) were taken forward, as these provided the appropriate reinforcement to the transmission network. These options would provide a relatively direct and efficient route, which would achieve a balance between National Grid's technical, economic and environmental obligations. The Strategic Optioneering Report was published in October 2009, as part of a non-statutory consultation.
- 3.4.4 National Grid reviewed and updated the strategic optioneering following recommencement of the project in 2020. The review included looking at whether there were any new options that should be assessed and whether the previous options appraisal remained valid. This study identified 23 potential options (with a 'PSO' prefix for 'Potential Strategic Option') for reinforcing the network in the region. This included some overlap and some new options compared to the original strategic options appraisal. Two options were taken forward for further consideration: PSO 19 Bramford to Twinstead as an overhead connection, and PSO 22 Bramford to Twinstead as an underground connection.
- 3.4.5 An options appraisal comparison of PSO 19 and PSO 20 showed that whilst environmental effects of the options vary, both PSO 19 and PSO 22 could deliver

solutions that were expected to be acceptable in policy terms and would meet network reinforcement requirements. However, there would be a considerable cost differential, with PSO 22 being more than five times the capital and lifetime cost of PSO 19. Therefore, the 2020 strategic optioneering came to the same conclusion as the Strategic Optioneering Report, that a predominantly overhead line from Bramford substation to Twinstead Tee, would be the preferred strategic proposal and best fulfils National Grid's various duties and obligations.

3.5 Route Corridor Options

3.5.1 Having identified that a network reinforcement was needed, National Grid went on to consider potential route corridors between the connection points; Bramford Substation and Twinstead Tee. Desk-based assessment was supplemented with site visits to identify potential route corridors, which sought to avoid the areas of greatest environmental constraint. The existing 132kV and 400kV overhead lines offered the potential to be used as 'opportunity corridors', where a new overhead line in addition to or replacing the existing could lead to a lower rate of change than a new overhead line in a location where no line presently exists.

3.5.2 Four route corridors were identified, all of which were considered to be technically feasible, and all would have connection points at Bramford Substation and the existing tee at Twinstead. These are shown on Figure 3.1 and comprised:

- **Corridor 1:** A new 400kV overhead line parallel to the existing 400kV overhead line between Bramford and Twinstead c.26km in length. The overhead line would exit Bramford Substation in a westerly direction lying to the north of Hintlesham village. It would run parallel to the existing 400kV overhead line through Hintlesham Woods SSSI before continuing to the south of Hadleigh and Polstead Heath. It would pass through approximately 3km of Dedham Vale AONB, in the vicinity of the Box Valley. The line would continue to the south of Assington and Sudbury before crossing the B1508, the railway and the River Stour valley and connecting at Twinstead.
- **Corridor 2:** This corridor proposes the removal of the existing 132kV overhead line between Burstall and Twinstead and the adoption of its route for a new 400kV overhead line c.29km in length. The existing 132kV overhead line runs to the south of Bramford Substation and close to the existing 400kV overhead line for the majority of the route from a point to the south of Hintlesham Woods where they align, separating only as the 400kV overhead line approaches Twinstead Tee. Like Corridor 1, it would pass through approximately 3km of Dedham Vale AONB, in the vicinity of the Box Valley. Two alternative options were considered at the eastern end of Corridor 2; Option A followed the existing 132kV overhead line to the south of Hintlesham and Option B paralleled the existing 400kV overhead line to the north of Hintlesham. This corridor would require an additional GSP substation close to Twinstead, which would allow the Distribution Network Operator (in this case, UK Power Networks) to continue to operate its network in this area.
- **Corridor 3:** A new 400kV overhead line along a new route corridor c.26.5km in length. Corridor 3 sought to take the most direct route between Bramford Substation and Twinstead Tee to the north of Hadleigh, whilst avoiding the key environmental constraints, such as Dedham Vale AONB. The corridor leaves Bramford Substation in a westerly direction. It continued to the north of Hintlesham Woods and Hadleigh. The corridor crossed the River Brett in the vicinity of the A1141 before splitting to negotiate

the linear development of Sherbourne Street. These corridor sub-options re-joined to the west of Boxford, in the vicinity of the River Box. The corridor continues to the west, before dropping in elevation towards the River Stour valley where it crosses the B1508, the railway and River Stour close to the flat valley floor. It then takes to slightly higher ground to approach Twinstead Tee 2km to the west.

- **Corridor 4:** A new 400kV overhead line along a new route corridor c.30km in length. Corridor 4 sought a route to avoid the key environmental constraints such as Dedham Vale AONB and it was designed to take a more northerly route to largely avoid the Special Landscape Areas (SLA) defined in the Local Plan. The corridor runs in a northwest direction from Bramford Substation. It splits to avoid Flowton before re-joining to run westwards through open land between Naughton and Whatfield. The corridor splits again around Semer and continues westward to the River Box. The corridor continues to the west, avoiding settlements including Newton and Little Conrad. It drops in elevation towards the River Stour where it crosses the B1508, the railway and River Stour close to the flat valley floor. It then takes to slightly higher ground to approach Twinstead Tee 2km to the west.

- 3.5.3 Each corridor was assessed against how it performed against National Grid's obligations set out in Sections 9 and 38 and Schedule 9 of the Electricity Act 1989 and also how well each corridor performed against the Holford Rules. A high-level environmental assessment was undertaken on each of the four corridors to support the options appraisal. This included both desk-based assessment and site visits to identify designated features and site-specific features that could affect the alignment and design.
- 3.5.4 Corridors 1 and 2 were identified as 'opportunity corridors' as they used the existing overhead line routes, which already pass through Dedham Vale AONB. Corridor 1 was considered to have the greatest effect on Dedham Vale AONB, as it would introduce an additional structure. Corridor 2 would replace the existing 132kV overhead line with a new 400kV overhead line through the AONB and would therefore give rise to a lower scale of effect on landscape and views than Corridor 1. However, it was noted that building a new 400kV overhead line on the 132kV route adjacent to the existing 400kV overhead line would still give rise to notable effects.
- 3.5.5 Corridor 3 avoided Dedham Vale AONB and the potential for effects on views from within the AONB was considered to be limited. Corridor 4 also avoided the AONB and was considered to have the least effects on the AONB due to distance. However, it would introduce an overhead line into an area regarded locally as high-quality landscape, albeit undesignated, where there is presently no existing infrastructure.
- 3.5.6 The Route Corridor Study was published in October 2009 as part of a non-statutory consultation event. Twenty public consultation events were held between the end of October 2009 and the end of February 2010 and National Grid received over 3,000 individual pieces of feedback during the consultation.
- 3.5.7 There was little public support for Corridor 1, which would create an additional line through Dedham Vale AONB. The Suffolk planning authorities and Dedham Vale AONB and Stour Valley Partnership strongly recommended that Corridor 1 be ruled out and statutory bodies English Heritage (now Historic England) and Natural England considered that they could not support the option because of significant adverse impacts on Dedham Vale AONB and the settings of listed buildings and conservation areas.
- 3.5.8 English Heritage and Natural England both considered that Corridor 2 would have the least environmental impact of all route corridors, as it was recognised that this corridor

presented an opportunity to minimise the overall scale of change that a new overhead line would bring. Both organisations recommended that undergrounding be considered in the AONB and sought clarity on Corridors 2A and 2B (around Hintlesham). The Suffolk planning authorities also considered that Corridor 2 could lead to the least environmental impact, particularly if undergrounding were employed in sensitive areas. Other local bodies and the general public strongly supported the selection of Corridor 2, many adding the caveat that undergrounding should be considered.

- 3.5.9 The Suffolk planning authorities, English Heritage and Natural England all recommended that Corridors 3 and 4 be ruled out. The main reason given, being the impact on unspoilt countryside and the historic character of the countryside, where there is presently no existing infrastructure. Both corridors received little support, with large numbers of the general public recording their objections to these corridors.
- 3.5.10 The consultation on the route corridors identified Corridor 2 as the least worst by a large proportion of the consultees, although in the majority of cases this was subject to the consideration of undergrounding of some or all of the entire route.

3.6 Identification of the Preferred Corridor

- 3.6.1 The consultation feedback was used to review and validate the results of the corridor assessment work and to confirm the preferred corridor that would be taken forward. Wholly underground solutions were discounted at this stage, based on cost and technical grounds. The review concluded that the basis of the project should be an overhead line between Bramford and Twinstead, but that the undergrounding of sections of the proposed overhead line, to mitigate potential impacts of the project on sensitive locations, should be evaluated.
- 3.6.2 The review concluded that Corridor 2 (encompassing Options 2A and 2B) was the preferred corridor based on both previous assessment work and on the consultation responses. It was considered that Corridor 2 would result in the least scale of change to the existing environment and was recognised that it would involve the removal of a section of the existing 132kV overhead line, which was seen as a benefit. The review noted that a new GSP substation may be required west of Twinstead Tee to maintain security of supply to the 132kV distribution network.
- 3.6.3 The decision to progress with Corridor 2 was presented in the Selection of Preferred Corridor Report, which was published in June 2011. This set out the reasons for the selection and rejection of the different corridors.
- 3.6.4 In July 2011, National Grid announced its preferred corridor (Corridor 2) for developing a project for a 400kV overhead line connection between Bramford substation and Twinstead Tee. This corridor incorporates the route of the existing 132kV overhead line, comprising part of the electricity distribution system under the control of UK Power Networks, which would be partly removed as a result of the reinforcement.
- 3.6.5 The work undertaken since the project re-start in 2020 suggests that Corridor 2 remains appropriate and no change to the corridor option selected is proposed.

3.7 Alignment Options

- 3.7.1 Following the announcement of the preferred corridor (Corridor 2) in July 2011, National Grid progressed with identifying potential alignments within the corridor. To aid the design

and assessment work, the preferred corridor was initially split into seven sections based on the landscape character areas and feedback from consultation:

- A – Bramford substation and the Burstall area;
- B – Hintlesham;
- C – Brett Valley;
- D – Polstead;
- E – Dedham Vale up to the AONB boundary;
- F – Leavenheath and Assington; and
- G – Stour Valley

- 3.7.2 Sections A and B were subsequently combined as the landscape characteristics were considered similar and combining the two would allow consideration of the issues relating to Corridors 2A and 2B and reduce the potential for confusion.
- 3.7.3 An important reason for selecting Corridor 2 was that there would be a smaller scale of change in taking down the 132kV overhead line and erecting a new 400kV overhead line in a similar area and close to the existing 400kV overhead line. This was an opinion that was given in many representations received during the consultation on the route corridor. Therefore, indicative alignments were developed on this basis.
- 3.7.4 The indicative alignments were developed, starting within a preferred direct line between Bramford and Twinstead Tee, and then taking into account the Holford Rules, to avoid sensitive sites and residential areas as far as practicable. The visual preference was for the existing and proposed overhead lines to run in parallel and close together, to reduce wirescape (scenery or landscape dominated by overhead wires and/or pylons). Health and safety requirements state that there should be a minimum separation distance of at least 80m between the two overhead lines.
- 3.7.5 While a connection solution involving overhead lines entirely to the north or south of the existing 400kV overhead line could be accommodated, it would be more difficult to adopt a solution which involved the new alignment switching from one side of the existing 400kV overhead line to the other. This is because its construction would involve additional structures and higher costs. It could result in a complex programme of outages which would be difficult to accommodate given other constraints on the management of the electricity transmission system in East Anglia. Therefore, the alignment work resulted in two indicative overhead alignments for the majority of the route, one to the north of the existing 400kV overhead line and one to the south.
- 3.7.6 Further work was also undertaken to identify whether any specific sections should be partly or wholly undergrounded. The assessment considered National Grid's statutory duties and policy considerations. The options appraisal considered environmental, socio-economic, technical and cost issues when deciding how the reinforcement should be installed (overhead or underground) and its appropriate alignment. The appraisal also took into account comments from statutory consultees, including both Essex and Suffolk County Councils, that were received during the consultation on the route corridor with regard to undergrounding, particularly in sensitive areas such as Dedham Vale AONB and the Stour Valley (which is covered by the same AONB management plan).
- 3.7.7 The potential effects of the north and south alignments were assessed to determine the least environmentally constrained interim alignment, which was set out in the

Connections Option Report (COR), published in May 2012. The interim alignment comprised a new overhead line to the south of the existing 400kV overhead line for most of the route. An underground cable was proposed in Dedham Vale AONB (Section E) and the Stour Valley (Section G).

- 3.7.8 Non-statutory consultation was undertaken in the summer of 2012 to obtain comments on the interim alignment set out in the COR and to determine the 'preferred alignment'. Many site- or area-specific representations were received. In the main, the issues raised had already been taken into account in the assessment included in the COR and had already influenced the decision-making process.
- 3.7.9 The work undertaken since the project re-start in 2020 suggest that the overall interim alignment remains broadly appropriate, subject to further detailed refinement identified during the consultation on the COR and subsequent appraisal which is outlined within Section 3.8.

3.8 Further Work Undertaken After Identifying the Interim Alignment

Section AB (Bramford/Hintlesham)

- 3.8.1 Further work was undertaken by National Grid to identify potential options at Hintlesham Woods SSSI, including options that went through and around the SSSI. The options appraisal was documented in the Preliminary Options Appraisal of Potential Overhead Alignments on Corridor 2B at Hintlesham Woods SSSI, which formed Appendix A of the COR. This study was followed by the consideration of further options around Hintlesham Woods which were presented within the main body of the COR. OHL 2B (southern) was identified as the preferred alignment at this location within the COR.
- 3.8.2 During consultation on the COR, English Heritage made representations regarding the potential for harm to the setting of Hintlesham Hall, a Grade I listed building. The COR Consultation Feedback Report (2012b) concluded that further work should be undertaken to provide English Heritage with additional information in relation to the potential effects on Grade I listed Hintlesham Hall, before making a decision on the alignment in Section AB.
- 3.8.3 As a result of this, National Grid formally responded to English Heritage and the local authorities in November 2012 with further details about the impact to Hintlesham Hall. This response included an assessment of the significance of the group of listed buildings at Hintlesham Hall, including the contribution of the setting to that significance. The response concluded that the interim alignment in the COR (Corridor 2B) would harm the setting of Hintlesham Hall through development within its setting, but that the harm would be less than substantial. It also concluded that other heritage assets would benefit from the removal of the 132kV overhead line.
- 3.8.4 Consideration was also given to a partial underground cable option within Corridor 2B, which would avoid effects on Hintlesham Hall and on other properties highlighted in representations. However, the additional cost would be substantial and, taken together with adverse effects on ecology and buried archaeology, these factors would outweigh the benefits which would accrue. This option was therefore discounted.
- 3.8.5 Further discussions were undertaken with English Heritage and the local planning authorities during early 2013. This included discussions around the alignment and suggested mitigation which informed part of the emerging proposals (as shown in the Indicative Alignment). National Grid recommenced discussions with Historic England

(formerly English Heritage) in 2021 to confirm that the Indicative Alignment is the preferred option at this location and to agree specific mitigation measures. These discussions are ongoing and will inform the alignment refinement at this location.

Local Alignment Refinements

- 3.8.6 Responses received during the consultation on the COR included suggestions of minor alignment refinements at specific locations. In each case, National Grid undertook an options appraisal to consider the effects of the suggested alignment refinements compared to the alignment presented in the COR.
- 3.8.7 In some cases, the alternative was considered to have no benefit over the existing alignment and was discounted, for example at Burstall, Overbury Hall and Assington. In other locations the suggested alternative was accepted, for example at Kate’s Hill and Layham. These refinements are reflected within the Indicative Alignment shown on Figure 4.1.

Cable Sealing End Compound Locations

- 3.8.8 The 2012 COR concluded that there was a case for undergrounding certain sections of the project in Section E (Dedham Vale) and Section G (Stour Valley). Each of the underground sections would require a cable sealing end (CSE) compound at each end to connect the underground cable with the adjacent overhead line. The COR identified indicative locations where the CSE compounds could be located based on environmental studies. Further work was undertaken after the COR was published looking at the detailed location for each CSE Compound. A summary of the options appraisal for each is set out in Table 3.1.

Table 3.1: Summary of the Options Appraisal at CSE Compounds

CSE Compound Location	Description of the Options Appraisal
Dedham Vale East	The option presented in the COR assumed the use of horizontal directional drilling under Dollops Wood, to avoid impacts on the woodland. The CSE compound was to be located in the field to the east of the woods. However, a geotechnical feasibility study undertaken in 2013, identified that horizontal directional drilling at this location would have high construction and environmental risks. Therefore, further options appraisal has been undertaken to consider alternative options that were located to the north of Sprott’s Hall, which would affect the location of the CSE compound at this location. Technical design and engineering work is ongoing at this location. Following completion of this work, the proposed option and CSE location will be consulted upon as part of the statutory consultation for the project.
Dedham Vale West	Three options were initially considered for the western CSE compound and a fourth was later added as a result of discussions with individual landowners and land agents. The COR presented a preferred location to the west of Boxford Fruit Farm, as this location offered separation from Dedham Vale AONB to the east and there would be an opportunity to locate the compound adjacent to existing tree planting along the boundary to the orchard.
Stour Valley East	The COR concluded that the eastern CSE compound could be located to the south of Sawyer’s Farm, as this location took advantage of a natural depression on the edge of the

CSE Compound Location	Description of the Options Appraisal
	Stour Valley and the presence of existing vegetation to screen the site. Further options appraisal was undertaken in 2020, to consider options that lay outside of the Stour Valley Project Area. The assessment identified that the COR option was preferred from both a technical and environmental perspective, due to the benefit of the existing woodland to partly screen the compound site.
Stour Valley West	The COR suggested that the western CSE compound could be located adjacent to a pylon on the Bramford–Braintree-Rayleigh overhead line just to the south of Twinstead Tee. This location was chosen as it lay within a natural valley, with an existing mature hedgerow and woodland screening. The location would fall within the setting of the listed buildings at Sparrow’s Farm, particularly the barn to the west of Sparrow’s Farm, which is a Grade II listed building. National Grid undertook further options appraisal following comments from Braintree District Council, who suggested that the CSE compound could be relocated to a site 1.5km further south. The study was presented in the Western CSE End Compound study, published in November 2012. This concluded that a CSE compound 1.5km to the south should be taken forward instead of the COR option. Consultation feedback generally supported the change of location.

Pylon Design

3.8.9 Assessment of pylon design was undertaken in 2013, which considered different designs of pylons that could be used on the project and the potential effects of each. Three types of pylon were considered and the dimensions of each are set out in Table 3.2. The T- pylon and the low height steel lattice pylon are wider than the standard steel lattice pylon. There is little difference between the construction work involved in the pylon types.

Table 3.2: Comparison of Pylon Designs

Suspension Pylon Type	Height	Base at Widest Point	Number of Cross Arms	Width of Widest Cross Arm	Number of Earth Wires
Standard steel lattice pylon	49.95m	9.3m	3	20.8m	1
Low-height steel lattice pylon	35.3m	7m	2	29.2m	1
T- pylon	34.5m	2m	1	22.4m (31m including insulators)	2

3.8.10 The assessment considered the potential environmental effects of each pylon type, including landscape and visual, ecology and historic environment. It considered the effects in terms of visibility alongside the existing 400kV overhead line, which comprises steel lattice pylons.

3.8.11 The assessment concluded that although the low-height steel lattice pylon and the T- pylon would be lower in height (with potential benefits on distant views), introducing a notably different pylon design to the existing 400kV standard steel lattice pylons would have greater adverse effects on close views. The standard steel lattice pylons would also have a greater span which would allow the design to pass over sensitive features more easily, resulting in less habitat loss than low-height steel lattice pylons or T-pylons. The

assessment concluded that the standard steel lattice pylon would be the preferred pylon design.

- 3.8.12 Since the pylon design was considered in 2013, T- pylons have been constructed on other projects. The results from these projects have shown that T- pylons take longer to construct, require additional Abnormal Indivisible Loads (AIL) and require more concrete for the foundations than standard lattice pylons. This reinforces the previous assessment that standard steel lattice pylons would be the preferred pylon design.

3.9 Distribution Network Options

- 3.9.1 The project incorporates the route of a 132kV overhead line comprising part of the electricity distribution system owned and operated by UK Power Networks. This 132kV overhead line runs from Burstall Bridge, 2.5km to the south of Bramford substation, past the vicinity of Twinstead Tee and on to Pelham substation. This 132kV overhead line provides key support to the Belchamp and Thaxted substations. The project would involve removing the existing 132kV overhead line between Burstall Bridge and to the south of Twinstead Tee, to accommodate the 400kV network reinforcement. Following the removal of the 132kV overhead line between these locations, additional work would be required to maintain the connection to Belchamp and Thaxted substations and the current security of supply to local homes and businesses.
- 3.9.2 UK Power Networks initially identified eight options to maintain the security of local electricity supplies in July 2012, including Do Nothing, reinforcement of their network and new substation options. The UK Power Networks options appraisal concluded that Option 6, developing a substation in the vicinity of Twinstead Tee, should be the preferred option for replacing the capacity lost following the removal of the existing 132kV overhead line. This connection to the 132kV overhead line needs to be to the east of the Belchamp Tee (near Castle Hedringham) to satisfy the system security requirements of UK Power Networks.
- 3.9.3 The UK Power Networks report was reviewed by National Grid, who also carried out further analysis of the 132kV connection options in accordance with its own options appraisal process. This included assessing lifetime cost and environmental and socio-economic issues. The assessment also considered the Holford Rules and the Horlock Rules and likely compliance with NPS EN-1 and EN-5.
- 3.9.4 The National Grid work concurred with the work undertaken by UK Power Networks by confirming that the preferred option was to develop a new GSP substation to the west of Twinstead Tee. The report concluded that this represented the most efficient, coordinated and economical option, whilst giving rise to fewer overall environmental effects than the other options considered.
- 3.9.5 National Grid also included further appraisal work to identify potential sites for the GSP substation. An initial desk-based study identified eight potential sites within the study area, which extended from Twinstead Tee to Thaxted, and was focused along the 400kV overhead line. Three were taken forward for further options appraisal. National Grid identified individual sites within each of the Substation Study Areas for more detailed options appraisal (Figure 3.1). These were:
- Study Area A: Land north of Colne Valley Farm Park (Site A1);
 - Study Area B: Land at Delvyn's Lane (Sites B1-B5); and,
 - Study Area C: Land at Butler's Wood and Waldegrave Wood (Sites C1-C4).

- 3.9.6 The study concluded that a GSP substation between Butler's Wood and Waldegrave Wood (Study Area C) was preferred, as it would have the least impact on the landscape character of the area, visual amenity, ecology and the historic environment. This option would also be the least constrained from a technical perspective and would have the shortest access road.
- 3.9.7 In each Study Area location, further consideration was given to options which involved constructing an entirely Air Insulated Switchgear solution (400kV and 132kV elements) and options that considered constructing a 400kV AIS element with a 132kV Gas Insulated Switchgear element.
- 3.9.8 National Grid consulted on the different sites and technologies in spring 2013 and a Consultation Feedback Report was published in August 2013. The majority of representations agreed that Study Area C was the most suitable and all but one of the representations received relating to Study Area C agreed that Site C2 was the best location. A number of detailed concerns were raised, mainly related to landscape impact, which would be addressed through the detailed design of the project and associated mitigation measures. Some representations suggested potential mitigation, including lowering the ground levels at the site, setting the substation further back from the A131, or providing greater amounts of earth bunding and tree screening.
- 3.9.9 National Grid reviewed all of the representations made and concluded that the previous selection of Site C2 remained robust. National Grid also determined that the design should adopt Air Insulated Switchgear, a position supported in representations.
- 3.9.10 Since the project restarted in 2020, National Grid recommenced discussions with UK Power Networks to ensure the previous proposals are still appropriate. The work to support this is still ongoing, however there may now be a requirement for two transformers at the GSP substation site. This would require a larger footprint than assumed within the Substation Options Appraisal Study. National Grid has undertaken further assessment work during 2020 to identify whether the larger footprint could be accommodated at the preferred substation site (Site C2). The results of this work have shown that the site, hereafter referred to as Butler's Wood in the Scoping Report, can accommodate two transformers if required, within the existing woodland screening.

3.10 Current Indicative Alignment and Embedded Measures

- 3.10.1 The Indicative Alignment presented within this Scoping Report and shown on Figure 4.1 is based on the alignment presented within the COR and incorporating the alignment refinements that have happened since. As set out within this chapter, the project has taken an approach to consider the environment at each stage in the options appraisal process and to incorporate feedback from the various consultations. By doing this, a number of environmental features have been avoided through the Indicative Alignment and elements have been embedded within the design to avoid and reduce the effects from the project.
- 3.10.2 Table 3.3 outlines the key embedded measures that were identified during the corridor and route studies that have been incorporated into the designs and which reduce potential environmental effects. These are intrinsic to the project, and the EIA will take into account these embedded measures as part of the assessed design.

Table 3.3 Embedded Measures Identified During the Options Appraisal

Embedded Measures
Corridor 2 is an opportunity corridor, within which there are existing overhead lines, giving rise to a lower scale of effect on landscape and visual.
Corridor 2 involves removal of the existing 132kV overhead line between Burstall Bridge and Twinstead Tee, c.25km, which would reduce wirescape along this part of the route.
Corridor 2 parallels the existing 400kV overhead line for the majority of the route, which will reduce wirescape within the landscape.
The project includes a section of underground cable through Section E (Dedham Vale AONB).
The project includes a section of underground cable through Section G (Stour Valley).
The Indicative Alignment passes between the woodland areas to the north of Hintlesham Hall to reduce effects on these habitats. The Indicative Alignment has also been amended around Hintlesham Hall following discussions with English Heritage (now Historic England).
The Indicative Alignment uses the existing 400kV alignment through Hintlesham Woods to reduce the loss of trees. The existing 400kV overhead line will be routed to the north of the woodland.
The Indicative Alignment passes to the north of Layham Pit Woodland and Meadow, to reduce effects to the habitat.
The Indicative Alignment passes between habitats and woodland around Upper and Lower Layham, to reduce effects to these habitats.
The Indicative Alignment passes between two blocks of ancient woodland near Polstead Heath, which will reduce effects to these habitats.
The Indicative Alignment passes between woodland habitat to the east of the River Stour, to avoid effects to this habitat.
The Indicative Alignment passes between two woodland Tree Preservation Orders near Dorking Tye House, which will reduce effects to these habitats and landscape features.
The proposed CSE compound at Stour Valley East, is situated in a location which makes use of existing screening woodland to the south and east.
The proposed GSP substation is located between Butler's Wood and Waldegrave Wood to make use of natural screening.

4. PROJECT DESCRIPTION

4.1 Overview of the Project

- 4.1.1 The Bramford to Twinstead project involves reinforcement of the electricity transmission network between Bramford Substation in Suffolk and Twinstead Tee in Essex. The reinforcement would be approximately 27km long, comprising approximately 19km of overhead line and approximately 8km of underground cables (Figure 4.1).
- 4.1.2 As noted in Chapter 1: Introduction, the Scoping Report presents the Indicative Alignment, which is the current alignment being considered based on the option presented within the COR and the refinement work which has occurred since. This is set within a Scoping Boundary, which includes a precautionary 250m buffer around the Indicative Alignment, which would incorporate potential amendments to the Indicative Alignment that could occur as a result of things identified within the ongoing technical and environmental assessments and also as a result of consultation feedback.
- 4.1.3 The Indicative Alignment runs roughly parallel to the existing Bramford to Pelham 400kV overhead line and follows the existing 132kV line for the majority of the route. Approximately 25km of the existing 132kV overhead line would be removed as part of the project, including approximately 3km within Dedham Vale AONB and a further 5.4km within the Stour Valley.
- 4.1.4 The project comprises the following principal components which are shown on Figure 4.1:
- Construction and operation of a 400kV electricity transmission reinforcement between Bramford Substation and Twinstead Tee comprising:
 - installation of c.19km of 400kV overhead line;
 - installation of c.56 new steel lattice pylons (c.50m tall); and
 - installation of c.8km of 400kV underground cables.
 - The realignment of the existing 400kV overhead line to the north and west of Hintlesham Woods, to facilitate the use of the existing swathe through the woods by the new 400kV line;
 - Construction and operation of four CSE compounds (including permanent access roads), namely:
 - CSE Compound Dedham Vale East;
 - CSE Compound Dedham Vale West;
 - CSE Compound Stour Valley East; and
 - CSE Compound Stour Valley West.
 - The removal of approximately 25km of the existing 132kV overhead line and supporting pylons between Burstall Bridge and Twinstead Tee;
 - The removal of approximately 1.5km of the existing 400kV overhead line and supporting pylons between Twinstead Tee and the proposed CSE compound at Stour Valley West;
 - Construction and operation of a new 400/132kV GSP substation (including permanent access road) at Butler's Wood, to the west of Twinstead, and associated works

(including new underground cables) to tie this into the existing 400kV and 132kV networks;

- Temporary overhead line diversion from 4YLA005 – 4YLA003 to allow the building of the proposed CSE compound at Stour Valley West;
- Temporary land to facilitate construction, which would include construction compounds, haul routes and laydown areas;
- Temporary minor amendments to the existing highway network to facilitate construction vehicles;
- Environmental mitigation and enhancement, including tree planting.

4.1.5 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 is split into the following sections, which describe:

- DCO terminology and assumptions (Section 4.2);
- a description of each section of the Scoping Boundary (Section 4.3);
- good design principles (Section 4.4);
- the main construction methods that are proposed for installing the infrastructure associated with the project (Section 4.5);
- operation and maintenance requirements (Section 4.6); and
- decommissioning (Section 4.7).

4.1.6 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.

4.2 DCO Terminology and Assumptions

4.2.1 National Grid will be submitting an application for development consent in order to construct and operate the project. As part of this, National Grid will need to identify the proposed Order Limits. These will include the maximum extent of land in which the project may take place including temporary construction areas. The extent of the Order Limits may be altered or refined prior to the submission of the application for development consent based on design evolution, EIA and representations received during consultation. The proposed Order Limits will be defined at the next stage of the project and will replace the Scoping Boundary as the basis for the project assessment area in the Environmental Statement.

4.2.2 In addition, National Grid will need to identify horizontal and vertical Limits of Deviation (LoD) within the application for development consent. These are horizontal and vertical limits for the permanent project, including conductor swing. The LoD identify a maximum distance or measurement of variation from the proposed alignment to allow for localised constraints or unknown or unforeseeable issues that may arise, that would require adjustment to the alignment design.

- 4.2.3 At the present time, the proposed LoD for the overhead line would be +/- 4m vertical LoD above the ground and generally 30m from the centre line for the lateral LoD. The underground cables (excluding fibre optics) would be buried at least 1m below ground level and have an unlimited depth for the vertical LoD. The underground cables would have a lateral LoD of generally 100m (larger at locations of trenchless crossings). The LoD for the GSP substation and the CSE compounds will be defined within the ES.
- 4.2.4 The application for development consent would include indicative location of pylons. The pylon locations would not be fixed in the application for most locations in order to retain flexibility during detailed design and construction for unforeseen circumstances. The indicative locations of the pylons would be assessed within the ES along with a consideration of the worst-case effects associated with the LoD.
- 4.2.5 National Grid currently intends to construct the project between 2024 and 2028, subject to development consent being granted. Not all works would occur at the same time. One of the first phases would be the construction of the GSP substation, which would need to occur prior to the removal of the 132kV overhead line, which would also form part of the initial phase. The new overhead line and underground cables are likely to occur concurrently, with a rolling programme along the working area. 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.
- 4.2.6 An Outline Code of Construction Practice (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 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.

4.3 Description of Each Section of the Scoping Boundary

- 4.3.1 The project is divided into six sections as shown on Figure 4.1.

Section AB Bramford Substation to Hintlesham

- 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 and would be undertaken under permitted development rights. These do not form part of the application for development consent. Potential cumulative effects between the works at Bramford Substation and the project would be included within the cumulative effects assessment (see Chapter 18: Cumulative Effects for further details).
- 4.3.3 The proposed 400kV overhead line would be routed south of the existing 400kV overhead line between Bramford Substation and Hintlesham Woods. The two overhead lines would diverge at Hintlesham Woods in order to reduce the impacts on the ancient woodland and Hintlesham Woods SSSI. The existing 400kV overhead line would be re-routed to the north of Ramsey Wood before reconnecting to its existing alignment south of Hintlesham Woods near Clay Lane. The proposed 400kV overhead line would use the current route of the existing 400kV overhead line through the middle of Hintlesham Woods and would continue south of the existing 400kV overhead line for the remainder of this section. It

would reuse the existing pylons where practicable, and involve new conductors as the existing would be diverted on new pylons to the north of the wood.

- 4.3.4 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

- 4.3.5 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 approximately follows the alignment of the 132kV overhead line, which would be removed in its entirety in this section.

Section D Polstead

- 4.3.6 The proposed 400kV overhead line would run broadly parallel the existing 400kV overhead line, which lies to the north. The proposed 400kV overhead line approximately follows the route of the 132kV overhead line, which would be removed in its entirety in this section. From Stoke Road, the proposed overhead line would cross between two blocks of woodland and then would deviate slightly from the route of the 132kV overhead line, to the proposed site of Dedham Vale East CSE compound. The CSE compound provides the interface point between the 400kV overhead line in Section D and the underground cables in Section E.

Section E Dedham Vale AONB

- 4.3.7 Underground cables are proposed throughout this section (approximately 4km) and the existing 132kV overhead line would be removed entirely (approximately 3km), leaving only the existing 400kV overhead line, overhead in this section. The cables would predominantly be located to the south of the existing 400kV overhead line and would start at the CSE compound to the west of Heath Road. From this point, there are two potential options being considered (see Figure 4.1):
- **Dollops Wood Option A:** This was the option presented within the COR and includes an underground cable that would pass underneath the woodland using a trenchless method (see Section 4.5); and
 - **Dollops Wood Option B:** This is a new option being considered as a result of geotechnical investigations. This would involve an underground cable, which would pass to the north of Sprott's Hall and Sprott's Farm, in an arc around Dollops Wood. This would be constructed using an open cut method (see Section 4.5).
- 4.3.8 Both options would rejoin the COR alignment to the north of Bushy Park Wood before heading towards the River Box. Further work is currently being undertaken to understand the geology of the area and to inform the options appraisal at this location.
- 4.3.9 West of the river crossing, the proposed cables pass 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.

Section F Leavenheath and Assington

- 4.3.10 The underground cables would continue from the boundary of Section E on Brick Kiln Hill, in a northwest direction across Stoke Road. The cable would link with the Dedham Vale West CSE compound in the field to the north of Stewards Farm and a permanent access road would be constructed from Stoke Road.
- 4.3.11 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 Indicative Alignment 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

- 4.3.12 The proposed 400kV overhead line would continue west from Upper Road to the proposed Stour Valley East CSE compound to the south of Workhouse Green. The CSE compound would have a permanent access track from the B1508 (St Edmund's Hill).
- 4.3.13 From the CSE compound, the underground cables would be laid in a westerly alignment to the B1508 (St Edmund's Hill) and the River Stour. The River Stour and the Sudbury Branch Line would both be crossed using trenchless (drilled or bored) methods (see Section 4.5). The cables would then be routed southwest across Henny Road and continue on this course to Moat Lane. After crossing beneath Moat Lane, the cables would turn slightly to the south, travelling obliquely down and across the steep contours of the wooded valley Ansell's Grove. Once out of the woodland, the cables would be laid in a southwest direction to connect to the new River Stour West CSE compound to the west of Henny Back Road.
- 4.3.14 Four spans and three pylons of the existing 400kV overhead line (approximately 1.5km) 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, to the southwest of Sparrow Farm, approximately 200m south of Twinstead Tee.

Grid Supply Point (GSP) Substation

- 4.3.15 The removal of the 132kV overhead line means that alternative arrangements must be put in place to secure the supply of the local electricity distribution network at Belchamp St Paul and Thaxted. This would be achieved by establishing a new GSP substation, at Butler's Wood, near Twinstead Tee (Figure 4.1). The proposed GSP substation would transform the voltage from 400kV to 132kV, to connect the high voltage line to the local distribution network.
- 4.3.16 The GSP substation would be located between Butler's Wood and Waldegrave Wood to the west of the A131, near Wickham St Paul. It would include up to two super grid transformers, to change the voltage from 400kV to 132kV, so it can be distributed to homes and businesses. The GSP substation would include a noise enclosure around the transformers to reduce operational noise. The substation would also include a control building, protection isolation, cooling fans, diesel generator, water tank and switching devices.
- 4.3.17 The GSP substation would be secured with an electrified fence and a permanent access road would link the site to the public highway (A131). The substation would be connected to the existing 132kV overhead line via a new underground cable. Further works include

replacing and/or modifying certain existing pylons on both the 400kV and 132kV overhead lines to allow the connection to the new GSP.

4.4 Good Design Principles

4.4.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1 and EN-5. Paragraph 4.5.1 of 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'.

4.4.2 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 (see Section 3.8) which is the same style as the existing 400kV overhead line. The proposed overhead line would also comprise triple 'Araucaria' conductors which are regarded as practically quiet during all weather conditions.

4.4.3 As the project moves forward more embedded measures will be identified and included within the project design. The project will also be designed to comply with existing National Grid standards and relevant external guidance and processes, such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for reducing effects in relation to electric and magnetic fields (EMFs). These measures will mean that the designs will meet the functions required.

Approach to Materials and Waste

4.4.4 The project would require the use of new materials during construction of the project. The main materials would include steel for the pylons, concrete for the foundations, insulator sets and aluminium conductors (wire) and the underground cables. Further information regarding materials will be provided within the project description within the ES.

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

4.4.6 Temporary materials, such as hardcore for the haul route and site compounds, works cabins and security fencing would be required during construction. As is standard on large construction projects, it is assumed that these would be sourced from other construction projects within the region, where practicable, and would be reused at other construction projects after completion of the project.

4.4.7 Waste materials would be produced by the project. The contractor would be required to produce a Site Waste Management Plan (SWMP) prior to construction (commitment

GG21 in the Outline CoCP). This would set out the measures to reduce the generation of waste in the first place and appropriate measures to reuse and recycle materials where practicable. It would also identify appropriate waste facilities to dispose of materials.

- 4.4.8 One of the main waste components that are likely to be produced would be the steel lattice pylons and aluminium conductors as a result of the removal of the 132kV overhead line. These would be recycled. It is currently assumed that no soil would need to be removed from the site. Any surplus soil gained from excavation of the cable trenches or foundations would be reused within the site. The exception would be where the soil was 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 and the future SWMP.

Approach to Energy Consumption

- 4.4.9 The aim of the project is to support the UK's transition to Net Zero emissions by 2050 in terms of power generation and transmission. As outlined in Chapter 3: Main Alternatives, National Grid has a statutory duty to develop and maintain an efficient, coordinated and economical electricity transmission system. Therefore, the project would contribute to supporting the UK's Net Zero transition.
- 4.4.10 The project would consume energy during construction, 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.
- 4.4.11 The Construction Traffic Management Plan (CTMP) will set out measures to reduce journeys, such as car sharing and using public transport where practicable. It will also set out commitments regarding using electric vehicles or vehicles conforming with emission standards ratings (see commitment TT01 and TT02 in the Outline CoCP).
- 4.4.12 Energy consumption during operation would be limited to the energy required to operate the line, the CSE compounds and the GSP substation. The components are designed to meet energy efficiency standards and National Grid has existing policies to identify measures to reduce its operational energy consumption through efficient design. National Grid also has existing processes in place to monitor its energy consumption across the network. If consented, the operational energy requirements would be managed as part of the wider network operation.
- 4.4.13 The measures outlined above would reduce the energy consumption of the project during both construction and operation in line with the good design principles.

Design Resilience to Climate Change

- 4.4.14 The above ground elements of the project, including the GSP substation and the CSE compounds, have been located 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 a Flood Risk Assessment to support the application for development consent.
- 4.4.15 Chapter 17: Major Accidents sets out existing design measures that reduce risk to the project from extreme climatic events that could result from climate change. With these measures in place, the project is considered to be resilient to climate change over the project design life.

4.5 Description of Project Components and Construction Methods

General Construction Methods

- 4.5.1 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.
- 4.5.2 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 compound, which would include the site offices, welfare facilities for construction site workers, parking for cars and unloading and storage areas. There would also be satellite compounds, which would serve specific working areas and provide local welfare facilities for staff, and provide points for delivery of materials to the working areas.
- 4.5.3 Temporary haul roads 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. There would be the need for temporary bridges across watercourses in some locations to accommodate the haul route.
- 4.5.4 The temporary haul routes would be connected to the existing road network using existing access where practicable. There may be a need for new or widened accesses (bellmouths) at some locations, along with localised modifications of public highways to safely accommodate construction vehicles.
- 4.5.5 Due to the linear nature of the project, construction activities (outside of the compound areas and GSP substation) are expected to be transient, moving along the length of the working area over time. Therefore, the works in any given area would be shorter duration than the overall construction programme. Further details on the phasing of the project will be set out within the ES.
- 4.5.6 There may be a requirement to erect scaffolding in areas where pylons are being installed or removed. The scaffolding would protect existing features such as roads, railways, footpaths, existing utilities and navigable rivers during installation of the conductors. 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.
- 4.5.7 Percussive piling may be required at some pylon locations and at other areas requiring deep foundations such as at the GSP substation. This will be confirmed through a programme of ground investigations, which will inform the designs. Further details on the need for piling and specific locations will be set out within the ES.
- 4.5.8 Once the project has been constructed, the working areas would be removed and the site reinstated. Temporary haul routes (including temporary bridges) and working areas would be removed, with material and cabins reused at other construction sites. Any temporary fencing or scaffolding would be removed. The soil would be replaced, with the subsoil being placed first and the topsoil on top. The site would be reinstated to its former use,

subject to any planting restrictions. Any widened accesses would be restored to their original condition at the commencement of the works.

- 4.5.9 Reinstatement would also include landscaping, such as reseeding grassland and replanting hedges and trees and also any habitat creation as a result of biodiversity net gain requirements. It would also include additional landscaping in some areas to help screen the new infrastructure from sensitive receptors.

Proposed 400kV Overhead Line

- 4.5.10 The proposed overhead line would comprise triple 'Araucaria' conductors which would be supported by steel lattice pylons, similar to the design of pylons used on the existing 400kV overhead line. There would be three types of pylon: 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).
- 4.5.11 The standard height for a tension, terminal and suspension pylon would be approximately 50m from ground level (compared to c.30m for the existing 132kV pylons). However, the extra height means there can be a larger spacing between pylons (fewer overall) compared to the existing 132kV overhead line. The typical pylon base footprint during operation would be 10m x 10m and there would typically be approximately 360m between pylons, depending on the size of pylon and site features.
- 4.5.12 The working area 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 commitment 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.
- 4.5.13 The base of the pylons would involve the excavation of the soil and piling the foundations (subject to the underlying ground conditions). 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. 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.
- 4.5.14 The insulators would be fastened to the pylons in preparation for installing the aluminium conductors (the 'line' part). Insulators are used to resist the flow of electricity and prevent the electricity from the conductor reaching the pylon. 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.
- 4.5.15 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.
- 4.5.16 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.

Re-routing of the Existing 400kV Overhead Line

- 4.5.17 The existing 400kV overhead line passes through an existing swathe without trees, through Hintlesham Woods SSSI. The project would involve re-routing the existing 400kV overhead line to the north of the woods, in order to make use of the existing swathe through the woods for the proposed 400kV overhead line. This option would reduce potential effects at Hintlesham Woods SSSI. The existing 400kV would involve new pylons around the wood and would reconnect back to its existing alignment to the south of Bushey Cooper's Farm.

Underground Cables (Open Cut and Ducted Method)

- 4.5.18 The underground cables would likely comprise 18 cables, each approximately 150mm diameter, made of a copper core, cross-linked polyethylene insulation, seamless corrugated aluminium sheath and PVC outer sheath. Two fibre-optic cables would be laid with the electricity cables to carry the monitoring and control signalling data.
- 4.5.19 The working area would be approximately 100m wide along the length of the underground cables sections (open cut/ducted methods). Wherever there is a particular sensitive constraint or feature, efforts would be made to locally reduce this width. 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 haul route would be installed along the length of the cable section to provide access for construction vehicles to the working area.
- 4.5.20 The cables will either be laid in trenches, with 18 cables laid in six groups (six trenches) made up of three cables per group. Alternatively a ducted system may be used. The ducts would be installed using open cut methods and would allow the land to be reinstated with the exception of the joint bays and haul road. The cables would be pulled through the ducts.
- 4.5.21 The cables would generally be buried at a depth of approximately 1.1m below ground level. The excavated subsoil would be stored separately from the topsoil. Timber or plastic panels would be used to reinforce the trench sides during construction. Where the cables cross existing watercourses, the water would be over-pumped during cable 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. The temporary working methods would be agreed with the Environment Agency and the Lead Local Flood Authority (LLFA) as part of the ongoing design work.
- 4.5.22 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. Up to three cables would be laid in each trench, on a bed of cement-bound sand. The cables would be surrounded by an additional layer of cement-bound sand and protective concrete tiles would be laid on top of the cables to protect them from future excavation works. As an additional warning method, marker tape would be placed into each trench above the concrete tiles to warn that cables lie beneath.
- 4.5.23 Two separate runs of fibre-optic cables would be placed in the trenches with the electricity cables. One fibre-optic cable 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.

- 4.5.24 Depending on the cable manufacturer, joints in the cables would be required every 500m to 800m. These would be constructed on-site and the finished joints would be protected by a glassfibre box filled with resin or bitumen. At each cable joint, an above ground kiosk called a 'link pillar', or an underground pit called a 'link pit' would be required. These are used to monitor and test the underground cables and to offer protection from electric shock. There would be up to six (one per group of cables) link pillars every 500-800m. These 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.
- 4.5.25 Once the cables have been laid, the temporary works including any temporary haul routes or compounds would be removed. The land would be reinstated to its previous condition and use, subject to any planting restrictions e.g. trees cannot be planted over the top of the cables.
- 4.5.26 In general, it is expected that local road crossings would be ducted to avoid the need for a full road closure. These 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. Details of any road closures or locations for traffic management will be set out within the ES.

Underground Cables (Trenchless Methods)

- 4.5.27 Trenchless methods are proposed at locations where ground conditions are suitable for this activity and there is a specific constraint that needs avoiding during the installation of the underground cables. Trenchless crossings are proposed for crossing the River Stour and the Sudbury Branch Line, and also for Option A at Dollops Wood (see paragraph 4.37). At these locations the underground cable would be installed using a drilling or boring method to pass beneath the constraint, with limited disturbance to the land above. Drilling is an expensive option, often one of the noisiest activities during construction, and can require large quantities of imported water (additional traffic movements). It can also cause effects to groundwater and can be technically challenging in areas of unsuitable geology.
- 4.5.28 There are different methods that can be used and each method would have a different construction footprint required for the drill launching/receiving sites or drill pits. 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.
- 4.5.29 Where trenchless crossings are proposed, the cables are buried deeper and would need to be located further apart. 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 locations where trenchless crossings are proposed.

Underground Cables (including CSE Compounds)

- 4.5.30 Cable sealing end (CSE) compounds are required at the interface between overhead lines and underground cables. A CSE compound would be set within a relatively flat area,

typically 85m x 50m, surrounded by security fencing. A single-track permanent tarmac road with passing places, would be constructed from the local road network, to provide access for operation and maintenance.

- 4.5.31 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 to CSEs and other electrical equipment.
- 4.5.32 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 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.
- 4.5.33 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 compound. Once constructed, the cables would be tested using a high voltage cable testing lorry from the CSE compound.

Grid Supply Point (GSP) Substation

- 4.5.34 Construction activity at the substation would begin with site preparation including setting up the temporary accommodation, parking and laydown area. The permanent site boundary perimeter fencing would be completed early in the construction programme to secure the construction area and the permanent access road would be installed to connect the substation to the existing road network.
- 4.5.35 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. Excavations and concrete foundations would be provided for the GSP substation electrical equipment. Piled foundations may be required depending on the underlying geology. A series of copper earth tapes would be installed below the ground to create an earth mat to make the GSP compound electrically safe.
- 4.5.36 Following the preparatory works, any required permanent foul and surface water drainage systems would be installed. Hardstanding areas and roads would be drained, typically using French drains or equivalent before discharging to the surface water drainage system. All remaining areas are likely to contain porous surfacing to allow surface water to infiltrate without the need for drainage. Cess pits may be required to drain foul water from the site.
- 4.5.37 Once the foundations and drainage system are installed, the substation electrical equipment and support structures would be erected. Up to two super grid transformers would be required. They would be transported to site as AIL. The transformers will be installed within the compound and the associated wiring and cabling of the equipment and the protection and control of cabinets would be completed.
- 4.5.38 Various other works are required to connect the substation to the existing 400kV and 132kV overhead lines. These include replacing and/or modifying certain existing pylons on both lines to allow the connection to the new GSP substation. It would also include a

new 132kV underground cable to connect the GSP substation to the existing 132kV overhead line. There would also be various temporary works, including temporary pylons to divert the lines whilst work is undertaken.

- 4.5.39 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.

Removal of Sections of 132kV Overhead Line and Existing 400kV Overhead Line

- 4.5.40 The 132kV overhead line would be removed between Burstall Bridge, south of Bramford Substation, and up to and including the diamond crossing south of Twinstead Tee, a distance of approximately 25km. The 132kV overhead line is currently supported by steel lattice pylons. In addition, four spans and three pylons of the existing 400kV overhead line c.1.5km, would also be removed between Twinstead Tee and the proposed Stour Valley West CSE compound at Henny Back Road, as this section of line would no longer be required once the project was built.
- 4.5.41 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.
- 4.5.42 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.
- 4.5.43 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. Once the overhead line is removed, the temporary access tracks and working areas would be removed and the site reinstated to its former use.

4.6 Operation and Maintenance

Overhead Line

- 4.6.1 The typical lifespan of an overhead line would be at least 40 years, depending on how it is used and where it is located. Over this time, the overhead line 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 also indicate if plant/tree growth or development were at risk of affecting safety clearances.
- 4.6.2 Inspections would confirm when refurbishment is required. 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.

4.6.3 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.

4.6.4 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).

Underground Cables (including CSE Compounds)

4.6.5 Underground cables and the CSE compounds have a typical life expectancy of at least 40 years. Over this time, the cables and CSE compounds would be subject to regular checks and inspections to check for visible faults or signs of wear. 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.

4.6.6 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.

4.6.7 The CSE compound would contain equipment that would be monitored remotely. Routine site visits would be required to visually inspect condition of non-mechanical equipment, structures and buildings for signs of damage or wear. Mechanical (manually operated) earth switches would require inspection and servicing as part of these visits. There may be a need to refurbish or replace the CSE compound over time. In such cases, vans would be used to carry workers in and out of site, and lorries would be used to bring new materials and equipment to site and remove old equipment. Works could be similar to during construction.

GSP Substation

4.6.8 The 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.

4.7 Decommissioning

4.7.1 The design life of the project is at least 40 years but with regular maintenance is likely to extend further. At the time that decommissioning would take place, the regulatory framework, good industry practices and the future baseline could have altered. At the point where the project requires decommissioning, National Grid would consider and implement an appropriate decommissioning strategy taking account of good industry practice, its obligations to landowners under the relevant agreements and all relevant statutory requirements.

4.8 Embedded Measures

4.8.1 As set out within this chapter, the project has included a number of embedded measures specific to the design, to either avoid or reduce environmental effects as part of the design process. Table 4.1 outlines the key embedded measures that have been incorporated into the design to date. These are intrinsic to the project and the EIA will take into account these embedded measures as part of the assessed design.

Table 4.1: Embedded Measures Within the Design

Embedded Measures
A trenchless crossing is proposed at the River Stour, to reduce effects to the watercourse during construction.
A trenchless crossing is proposed beneath the Sudbury Branch Line, to reduce disruption to railway passengers during construction.
The project will include triple Araucaria on standard lattice pylons, to reduce the effects of line crackle (corona discharge) from the overhead line during operation.
The project will 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, including the ICNIRP guidelines (1998).
The project will also need 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.
Routing the existing 400kV overhead line to the north of Hintlesham Woods SSSI and using the existing alignment through the woods for the proposed 400kV overhead line, in order to reduce effects on the SSSI.
The GSP substation would include a noise enclosure around the transformers to reduce operational noise.

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 is issued to consultees for comment on the scope and methodology proposed;
- **Preliminary Environmental Information (PEI) Report:** 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; and
- **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 was implemented, and any proposed mitigation to reduce those significant effects. The ES is submitted as part of the application for development consent and is taken into account during the decision-making process.

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 and operational phases of the project. This information will be presented in an ES.

5.2.2 Each environmental topic chapter within this Scoping Report includes a description of the proposed methodology for determining the significance of effects. The EIA will also be supported by discussion from the technical specialist author to justify the final judgements on significance.

5.2.3 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 project. When deciding on which receptors to include within the Scoping Report, 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 Order Limits proposed with the application for development consent will encompass the land required permanently and temporarily to build and operate the project. The Order Limits will include the working width to install the overhead line and underground cables, including the construction compounds, road access points, and land required for permanent above and below ground features. They will also include the GSP substation

and the proposed removal of the 132kV overhead line. See Chapter 4: Project Description for further details.

- 5.3.2 The Order Limits will include the Limits of Deviation (LoD), which represent the area within which the final alignment and associated features would be installed. The EIA will be based on the assumption that the alignment could lie anywhere within the LoD and will take a reasonable worst-case approach when undertaking the assessment. This allows for minor deviations in the siting and alignment during detailed design and construction, without triggering the need to revise the EIA.
- 5.3.3 When considering the geographical scope of the assessment, consideration has been given to the distance over which an impact is likely to occur. The study area is defined in each of the topic chapters and varies between topics depending on the nature of the effects. It may also vary within a topic chapter between the construction and operational phases. For example, direct physical impacts would only occur within the construction footprint; impacts on water quality at crossings would extend further downstream than upstream; and the visual impact of the project may occur over a long distance.

Temporal Scope

- 5.3.4 Works to construct and operate the project are currently expected to start in 2024 and would be completed by 2028.
- 5.3.5 The EIA will predict the changes (effects) to the current and future baseline during the construction and operation 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 reference level of the environmental conditions without implementation of the project, against which the potential effects of the project are assessed. The baseline year is 2021, when the majority of baseline surveys are to take 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. This will include effects resulting from the activities associated with installation of the overhead line, underground cables, CSE compound, substation and the removal of 132kV and 400kV overhead lines. It also includes effects associated with the temporary works such as access tracks, haul roads, construction compound areas and work activities. Construction is anticipated to be between 2024 to 2028; and
 - **Operation Phase:** these are effects that will potentially occur as a result of the presence, operation and maintenance of the project. Operation is anticipated to start in 2028.
- 5.3.6 There are no plans to decommission the project. The design life of the project is currently at least 40 years, although this could be extended with regular maintenance (see Section 4.6). When National Grid determine that it will no longer require all or part of the project, it will consider and implement an appropriate decommissioning strategy taking into account good industry practice, its obligations to landowners under the relevant deeds and all relevant statutory requirements. The environmental effects associated with decommissioning are likely to be similar to those associated with construction, subject to any changes to the baseline environment in the intervening period.

- 5.3.7 At the time that decommissioning would take place, the regulatory framework, good working practices, and the future baseline are all likely to have altered. Therefore, it is not possible to assess the probable future effects at the present time. National Grid therefore proposes to scope decommissioning out of the assessment.
- 5.3.8 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 topic chapter:
- Short term: This is assumed to be up to 2029, which covers construction plus one-year reinstatement;
 - Medium term: This is assumed to be 2029 to 2044, which is based on 2-15 years post construction;
 - Long term: This is assumed to be 2044 onwards and is used to describe effects with a duration that extends longer than 15 years post construction.
- 5.3.9 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 implementation of the project. Embedded measures are those that are intrinsic to and built into the design. The current embedded measures are described in both Chapter 3: Main Alternatives Considered and Chapter 4: Project Description. They include the avoidance of designated sites through sensitive design routing, the removal of the existing 132kV overhead line between Burstall Bridge and Twinstead Tee, and trenchless crossings beneath the Sudbury Branch Line and the River Stour.
- 5.4.2 In addition, National Grid has identified a number of good practice measures, which are set out within the 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 are set out within the Outline CoCP in Appendix 4.1. This will continue to be updated in parallel with preparation of the ES.
- 5.4.3 Embedded and good practice measures are assumed to be in place prior to undertaking the scoping of likely significant effects, in accordance with guidance from the Institute of Environmental Management and Assessment (IEMA, 2015). The Scoping Report refers to embedded and good practice ‘measures’ to differentiate them from 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 state 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 will be based on a three-step process, as set out in the following paragraphs.
- 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 Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (Highways England *et al.*, 2020b). Each topic chapter defines the sensitivity or value of aspects specific to that topic where scoped into 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 will determine the likely magnitude of the potential impact. This is the scale of the change caused to the baseline conditions, considering both the degree of change from the baseline conditions and the duration and/or reversibility of the effect. The assessment of magnitude takes into consideration all embedded measures and good practice measures as described in Chapter 3: Main Alternatives Considered, Chapter 4: Project Description and 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). Each topic chapter defines the magnitude criteria of aspects specific to that topic where scoped into the assessment.

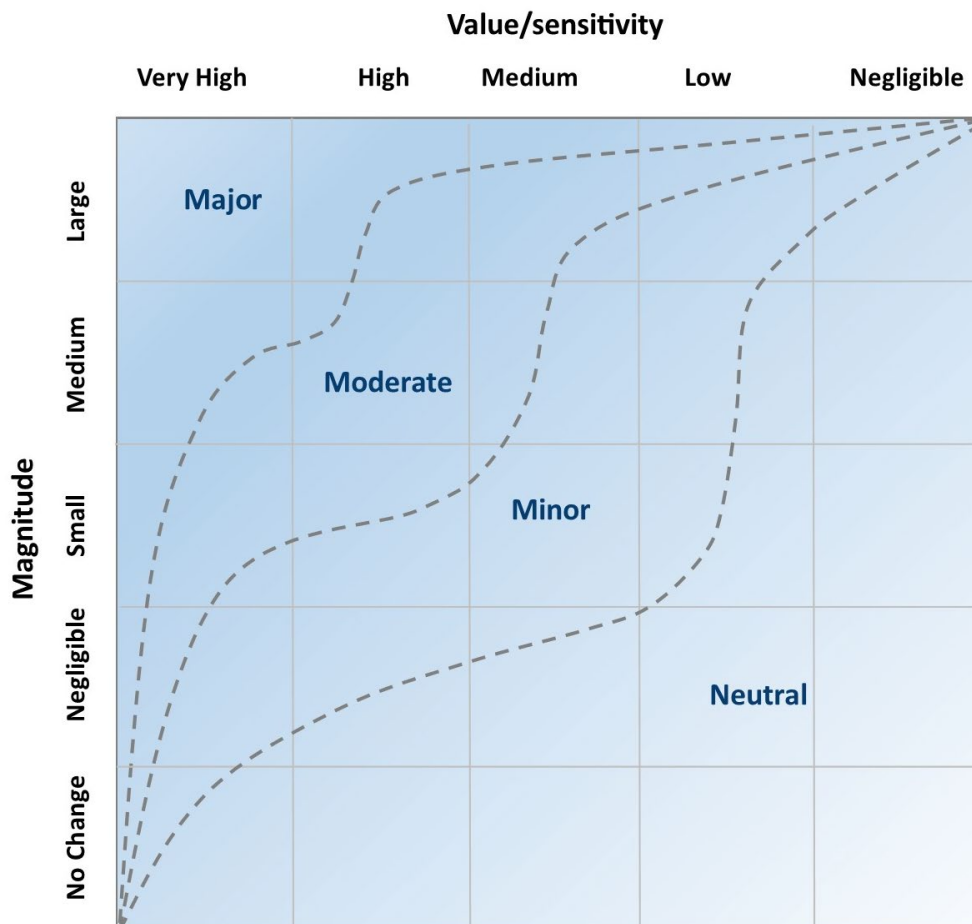
Table 5.2: Magnitude Criteria (based on Highways England *et al.*, 2020a-e)

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.

Magnitude	General Criteria
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 will be 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 will be used as the basis for assigning significance to an effect. As an illustration, a high sensitivity receptor subject to a large magnitude of change would experience a major significance effect, and a low sensitivity receptor subject to a small magnitude of change would experience a minor or neutral significance effect.

Illustration 5.1: Matrix of Significance



- 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 The influence of impact duration on the overall significance of effect will also be considered as part of the determination of magnitude and sensitivity to change.
- 5.5.10 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 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 are used to acknowledge that there may be some differences from the baseline conditions.

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 topic chapter of the ES, where relevant, will identify proposed mitigation measures that may 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 will be described at the end of each topic chapter within the ES.

5.8 Cumulative Effects

- 5.8.1 The project could result in cumulative effects both between different topics (intra-project cumulative effects) or between the project and other proposed development in the area (inter-project cumulative effects). These will be considered as part of the ES. The cumulative effects chapter will not assign a category of significance to effects, and will just conclude whether an effect is likely to be significant or not. Further details can be found in Chapter 18: 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 set out clear and proportionate objectives for monitoring, where required, along with 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 sets out the proposed approach to assessing the landscape and visual impacts associated with the construction and operation of the project. The approach is based on principles set out in the third edition of Guidelines for Landscape and Visual Assessment (GLVIA3) (Landscape Institute and IEMA, 2013). The landscape and visual impact assessment (LVIA) will consider the effects on the landscape of the area, including its physical and perceptible qualities and how these interact to create its overall character and the views and visual amenity experienced by people in the locality.
- 6.1.2 The project has the potential to affect landscape designations, landscape character and views through the removal and/or introduction of man-made and natural features. The aspects included within this chapter comprise the identification and description of:
- effects on the landscape as a resource (the landscape effects); and
 - effects on views and visual amenity as experienced by people (the visual effects). (GLVIA3, paragraph 2.21).
- 6.1.3 This chapter has links with other chapters, in particular, Chapter 7: Biodiversity, Chapter 8: Historic Environment, and Chapter 15: Socio-Economics, Recreation and Tourism.
- 6.1.4 This chapter is supported by the following appendices (Volume 2) and figures (Volume 3):
- Appendix 6.1: Key Characteristics of Landscape Character Assessment;
 - Appendix 6.2: Landscape Assessment Methodology;
 - Appendix 6.3: Visual Assessment Methodology;
 - Appendix 6.4: Wireline and Photomontage Methodology;
 - Appendix 6.5: Arboricultural Survey Methodology;
 - Figure 6.1: Landscape and Visual Designations and Features;
 - Figure 6.2: Landscape Character Areas; and
 - Figure 6.3: Draft Zone of Theoretical Visibility.

6.2 Regulatory and Planning Policy Context

- 6.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1 and EN-5. The following paragraphs from EN-5 relates to LVIA and have been considered within this chapter:

'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 (see paragraph 2.2.6 above). 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.'

'Sometimes positive landscape and visual benefits can arise through the reconfiguration or rationalisation of existing electricity network infrastructure.' (paragraphs 2.8.2 and 2.8.3)

- 6.2.2 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to LVIA. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to LVIA.

6.3 Study Area

- 6.3.1 The LVIA will focus on those areas which are likely to experience significant effects. The study area will include the project and the landscape around it, which the project may influence in a significant manner.
- 6.3.2 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 0.61cm 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.
- 6.3.3 Field assessment has also 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.
- 6.3.4 Based on these observations, the suggested study area for the LVIA is defined as a 5km distance from the project (the 'wider landscape'). This is considered to cover receptors which could be affected to a significant degree. The emphasis of the LVIA will, however, be based on receptors lying within 3km where significant effects are most likely.
- 6.3.5 To support the assessment, Zone of Theoretical Visibility (ZTV) maps will be produced up to a 10km distance surrounding the project based on the Zone of Influence (ZOI) (see Chapter 18: Cumulative Effects, for more details). These will help to determine the area over which the proposed 400kV overhead line could theoretically be visible. The reason the ZTVs will be prepared over a 10km distance is to inform the assessment of cumulative landscape and visual impacts with other proposed developments.
- 6.3.6 A draft ZTV for the overhead line elements of the project is presented on Figure 6.3. The draft ZTV is based on the overhead lines as these are the tallest components of the project. The draft ZTV demonstrates that the difference in extent of theoretical visibility (worst-case scenario) between the proposed 400kV overhead line and the 132kV overhead line to be removed, is relatively small in terms of geographical coverage. The draft ZTV excludes the GSP substation and CSE compounds at this stage.

6.4 Existing Baseline

Data Sources

- 6.4.1 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:
- work undertaken by The Environmental Partnership on behalf of National Grid before the project paused in 2013;
 - national and local landscape character assessments;
 - 1:25,000 and 1:50,000 Ordnance Survey (OS) maps;
 - aerial photography, Google Earth and Google Maps Street View;
 - terrain data;
 - open source GIS data; and
 - other advice and information provided by stakeholders and referenced within the chapter including the Dedham Vale AONB and Stour Valley Management Plan.
- 6.4.2 The desk-based study has been supported by an initial site familiarisation visit. The site visit was undertaken on 18 February 2021 by car. Weather conditions were varied. The purpose of the visit was to gain a high-level overview of the general landscape character and visual resource in proximity to the project.

Baseline Environment

- 6.4.3 The following text provides an overview of the landscape character and visual amenity within the 5km study area, firstly as a summary for the overall study area, and secondly broken down into sections. The existing 400kV overhead line and the 132kV overhead line are considered as forming part of the baseline.

Overview

- 6.4.4 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.
- 6.4.5 At a national level, the project (and entirety of the study area) falls within the Natural England National Character Area (NCA) 86: South Suffolk and North Essex Clayland (Natural England, 2014c). Relevant characteristics of this NCA are listed in Appendix 6.1.
- 6.4.6 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.
- 6.4.7 At a county council 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).
- 6.4.8 At a district council 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, 2013). This is based on Landscape Character Areas (LCA) as defined by Suffolk County Council (2010), with further information and detail to ensure each area is clearly relating to the Babergh and Mid Suffolk District. Section AB to Section F of the project fall within Ancient Estate Claylands, Ancient Plateau Claylands, Ancient Rolling Farmlands, Rolling Valley Farmlands, and Valley Meadowlands. These are shown on Figure 6.2: Landscape Character Areas.

- 6.4.9 The western sections of the project are covered by the Landscape Character of Braintree District (Braintree District Council, 2006). Section G falls within Stour River Valley, and the proposed GSP substation at Butler's Wood falls within Wickham Farmland Plateau.
- 6.4.10 These district level assessments have been used for the purposes of this scoping chapter, and are considered in further detail in the baseline condition description under each section of the project.
- 6.4.11 With regard to landscape-related designations the project crosses directly through the nationally designated Dedham Vale AONB. The Dedham Vale AONB is recognised in NCA 86 (Natural England, 2014c):
- 'The area was made famous worldwide through the paintings of the landscape artist John Constable. Many of the scenes that brought him inspiration two centuries ago can still be seen today, especially at Flatford and along the banks of the River Stour. This area, now known as 'Constable Country', is a popular visitor destination, particularly during the summer months.'* (Page 3)
- 6.4.12 There is also an application to extend the AONB which has been accepted by Natural England and a decision is pending. This may be decided prior to submission of the application for development consent. This includes parts of the Stour Valley Project Area, which does not benefit from the same level of protection as Dedham Vale AONB but is included in the Dedham Vale AONB and Stour Valley Management Plan (Dedham Vale AONB, 2016b) and also within the draft management plan for 2021-26 (Dedham Vale AONB, 2021). In addition, the Stour Valley has '*similar picturesque landscape qualities to Dedham Vale*' (Land Use Consultants, 2018).
- 6.4.13 There are also locally designated SLAs including the Gipping Valley, Brett Valley, Box Valley and Stour Valley SLAs (Babergh District Council, 2006 and Mid Suffolk District Council, 1998). These are shown on Figure 6.1: Landscape and Visual Designations and Features.
- 6.4.14 The project also runs through ancient woodland at Hintlesham Woods SSSI and in close proximity to other areas of ancient woodland. It passes numerous listed buildings and historic environment records. These are discussed further in Chapter 7: Biodiversity and Chapter 8: Historic Environment respectively.
- 6.4.15 Landscape designations are further considered in the baseline condition description under each section of the project.

Section AB: Hintlesham

Landscape Related Designations

- 6.4.16 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) Saved Policies. This designation extends northeast from the valley up to the local authority boundary, which is to the southwest of Bramford Substation.

Landscape Character

- 6.4.17 The majority of Section AB 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 district level in the Babergh and Mid Suffolk District Council Landscape Guidance (2015). The key characteristics of these landscape character areas are listed in Appendix 6.1.
- 6.4.18 A number of ancient woodlands are present in close proximity to Section AB or directly beneath the overhead lines, including Hintlesham Great Wood, Ramsey Wood, and Tom's Wood.

Existing Environment and Views

- 6.4.19 Bramford Substation lies at the northeast extent of the project and is on an interfluvium of higher ground between the Gipping Valley to the east, and a smaller valley which contains Belstead Brook to the west. Land is mainly in arable use with an irregular pattern of predominantly large fields. Fields have a mixture of open and hedgerow boundaries, interspersed by belts and blocks of broadleaved woodland. Bramford Substation, the existing 400kV and 132kV overhead lines which connect to Bramford Substation, the nearby A1071 (2km south), and views toward the edge of Ipswich influence the landscape character of this area. To the north of the A1071 the area is served by a network of minor roads and lanes, and extending from these are a series of public footpaths and bridleways which cross the land surrounding Bramford Substation. The Gipping Valley River Path, a long-distance route, follows the River Gipping approximately 2km east of Bramford Substation. Intervening landform prevents views to the west from this route. A regional cycle route (no. 48) runs through the hamlet of Flowton (approximately 1.5km to the northwest of Bramford Substation) and has some open views of the existing 400kV overhead line to the south.
- 6.4.20 The village of Burstall is approximately 1km to the south of Bramford Substation, on the edge of the Belstead Brook valley. Mature vegetation and intervening built form restrict views toward Bramford Substation and the existing 400kV overhead line from the majority of houses in the village. Residential properties in the hamlet of Flowton have views toward Bramford Substation and existing 400kV overhead line. There are a number of isolated farmsteads and groups of houses between Flowton and Burstall and east of Burstall that have views toward Bramford Substation and of the existing 400kV overhead line. The villages of Bramford and Sproughton are approximately 2km east of Bramford Substation in the Gipping Valley. Landform restricts views to the west from these settlements.
- 6.4.21 Belstead Brook is a small watercourse approximately 1.5km west of Bramford Substation, which is a tributary of the River Orwell. Belstead Brook lies in a small secluded valley to the west of the village of Burstall. Large arable fields extend into the valley with pastoral land at the valley bottom. Fields have a mixture of open and hedgerow boundaries. There are Public Rights of Way (PRoWs) running along and crossing the valley. Mature vegetation along the watercourse and woodland belts on the valley sides offer localised screening in this area. A small number of houses in the valley have views of the existing 400kV overhead line. Views of the existing 400kV overhead line crossing Belstead Brook are limited from houses in Burstall by mature vegetation and tree belts to the western and southern edges of the village. There are potential visual receptors at Burstall Hill, a group of houses that sit in the valley to the northwest of the project and are served by a minor road which crosses the valley at this point. Belstead Brook is also crossed by the A1071 approximately 1.5km to the southeast of the project (at Burstall Bridge). Views to the northwest are limited by vegetation along the watercourse at this point.

- 6.4.22 The central portion of Section AB is on an interfluvium of higher ground north and west of Hintlesham. Land is mainly in arable use with a broadly geometric pattern of predominantly large fields. Fields have a mixture of open and hedgerow boundaries, interspersed by belts and blocks of broadleaved woodland, which help to limit the effect on views of the existing 400kV overhead line. Some of this woodland forms remnants of the former parkland that surrounded Grade I listed Hintlesham Hall (see Chapter 8: Historic Environment). This includes Hintlesham Woods SSSI. The hall is now a hotel and a golf course has been developed on the land between the hall and the Belstead Brook valley to the east. The existing 400kV overhead line crosses the former parkland, less than 0.5km from the hall and there are views of the existing overhead line from locations within the grounds of the hall and from parts of the golf course.
- 6.4.23 The A1071 runs through the village of Hintlesham and north of Hintlesham Woods SSSI toward Hadleigh. A secondary road (Pond Hall Road/Duke Street) connects with the A1071 at Hintlesham and also runs westward toward Hadleigh, but passes Hintlesham Great Wood to the south. A minor road network extends to the north of the A1071 and south of Pond Hall Road and there are also a number of public footpaths crossing the area. There are views of the existing 400kV overhead line from these routes. National Cycle Network (NCN) 1 is well-screened where it runs along Hadleigh Railway Walk on the eastern edge of the Brett Valley, but where the route runs approximately 1km to the south of the existing overhead lines there are views of the existing 400kV overhead line and the 132kV overhead line.
- 6.4.24 The village of Hintlesham is approximately 1km to the south of the Indicative Alignment. The majority of views to the north are limited by woodland and mature vegetation associated with Hintlesham Hall and the golf course. Ribbon development extends along Duke Street, west of Hintlesham and a number of residences here have views of the existing 400kV overhead line, where not obscured by Hintlesham Great Wood. Approximately 1km to the south of Hintlesham is the village of Chattisham and there are views of the existing 400kV overhead line from houses in the western part of the village. There are a number of other residential visual receptors at farmsteads in the area, and individual houses and groups of houses located principally along the A1071 and Pond Hall Road.
- 6.4.25 There are views from a number of houses in Hintlesham, Chattisham and Duke Street of the existing 132kV overhead line, which runs south of Hintlesham. There are also views of the 132kV overhead line from the A1071 (east of Hintlesham), the minor road network (including part of the NCN) and PRoW network.

Section C: Brett Valley

Landscape Related Designations

- 6.4.26 Dedham Vale AONB lies approximately 2km to the south of Section C.
- 6.4.27 The Brett Valley is designated as an SLA in the Babergh District Local Plan (2006) Saved Policies, and covers the whole of Section C.

Landscape Character

- 6.4.28 Section C lies in landscape characterised as Rolling Valley Farmlands, and Valley Meadowlands at a district level in the Babergh and Mid Suffolk District Council Landscape Guidance (2015). The key characteristics of these landscape character areas are listed in Appendix 6.1.

- 6.4.29 The ancient woodland of Raydon Great Wood lies approximately 1.2km to the southeast of Section C.
- 6.4.30 There are a number of cultural associations linked to the landscape of Section C. Although John Constable mainly painted the Flatford area within the Dedham Vale, there is evidence that he visited the Brett Valley as he sketched Overbury Hall, which is on the western side of the Brett Valley. Benton End Farm in the Brett Valley was former home to the East Anglian School of Painting and Drawing, run by Sir Cedric Morris between 1939 and the 1960s, which attracted a range of artists including Lucian Freud and Maggi Hambling. The landscape immediately surrounding Benton End Farm was a source of inspiration for Sir Cedric and some of the students.

Existing Environment and Views

- 6.4.31 The Brett Valley broadly comprises arable land to its valley sides with pockets of pastoral land to the valley bottom. There is an irregular pattern of predominantly large fields which have a mixture of open and hedgerow boundaries. There are some small blocks of broadleaved woodland, woodland belts and mature trees on the valley sides, some of which are associated with a small area of parkland at Layham Park.
- 6.4.32 The B1070 runs through the Brett Valley to the east of the river, from Hadleigh north of the existing 400kV overhead line and through the village of Upper Layham to the south. A minor road runs south from Hadleigh on the western side of the river and through Lower Layham and a further minor road runs parallel to this route on the upper valley side. There are PRowS crossing the valley between Hadleigh and Upper Layham and a PRow link between Upper and Lower Layham which crosses the river. There are views of the existing 400kV overhead line from these routes. There are no long-distance walking routes in this area however there is the NCN 1 from which there are views of the existing 400kV overhead line and 132kV overhead line where the NCN 1 runs through the Brett Valley on the minor road network and a discussed rail line.
- 6.4.33 The southern extent of the town of Hadleigh is approximately 0.6km from the Indicative Alignment and there are a number of potential visual receptors at the southern edge of the town. The village of Upper Layham is in the valley bottom, approximately 0.25km to the south of the Indicative Alignment and there are likely to be a number of visual receptors in the village. The village of Lower Layham is approximately 0.5km to the south of the Indicative Alignment and is tucked into a small tributary valley on the edge of the main Brett Valley. Apart from a few houses at the edge of the village, intervening landform restricts views northward. Within the Brett Valley, between Hadleigh and Upper and Lower Layham there are some individual residential properties on the B1070 and minor roads, which have views of the existing 400kV overhead line and 132kV overhead line.

Section D: Polstead

Landscape Related Designations

- 6.4.34 Dedham Vale AONB abuts the western end of Section D and lies between 0.2km and 2km to the south of Section D.
- 6.4.35 The Brett Valley is designated as an SLA in the Babergh District Local Plan (2006) Saved Policies and covers the eastern half of Section D.

Landscape Character

- 6.4.36 Section D lies in a landscape which in the main is characterised as Ancient Rolling Farmlands at a district level in the Babergh and Mid Suffolk District Council Landscape

Guidance (2015). The eastern end of Section D lies within Rolling Valley Farmlands. The key characteristics of these landscape character areas are listed in Appendix 6.1.

Existing Environment and Views

- 6.4.37 This section of the project is on an interfluvium of higher ground between the Brett Valley and the Box Valley. Land is mainly in arable use, with a mix of geometric and irregular pattern of medium to large sized fields. Fields are generally bound by hedgerows with hedgerow trees, interspersed by blocks of broadleaved woodland, which break up views of the existing 400kV overhead line and 132kV overhead line. There is a small tributary valley connected to the Brett which extends into the eastern part of this area and which contains a number of woodland belts. In the eastern part of this area, the existing overhead lines cross the Brett Aggregates' Layham Quarry. The quarry consists of some restored areas as well as worked areas. It is relatively well screened from the surrounding area by mature vegetation around its periphery.
- 6.4.38 The A1071 is approximately 1.5km to 3km to the north of the existing 400kV overhead line. A network of minor roads and lanes serves the area to the south. There are PRowS across farmland to the north and to the south of the existing 400kV overhead line and 132kV overhead line, but few PRowS cross beneath the existing overhead lines. Users of these routes have views of the existing overhead lines along at least part of the routes. There are no long-distance footpath routes, national or regional cycle routes in this immediate area, although there are distant views of the existing 400kV overhead line from part of the Stour Valley Path long-distance route on high ground east of Stoke by Nayland (approximately 3km distant and within the Dedham Vale AONB).
- 6.4.39 The small village of Polstead Heath is approximately 0.2km to the north of the existing 400kV overhead line in the western part of this area. Millfield Wood, a block of mature woodland, sits between the village and the existing overhead line and limits views to the south from some residential properties, although there are views of the existing 400kV overhead line from the eastern and western edges of the settlement. On the edge of the Box Valley, and approximately 1km to the south of the route, is the village of Polstead, which lies in the Dedham Vale AONB. The village is set on lower ground and the majority of views from the village are restricted by a combination of landform and mature vegetation, apart from a few properties at the northern edge of the village. There are a number of other potential residential visual receptors at farmsteads in the area, and at individual houses and groups of houses along the A1071 and on the minor road network. There are also existing views of the 400kV overhead line on the interfluvium between the Brett and Box Valleys from the edge of the village of Stoke by Nayland.

Section E: Dedham Vale Area of Outstanding Natural Beauty (AONB)

Landscape-Related Designations

- 6.4.40 The majority of Section E runs directly through Dedham Vale AONB. The AONB designation protects an exceptional example of a lowland river valley. The Dedham Vale AONB and Stour Valley Project Area have published a position statement on 'Development in the setting of the Dedham Vale AONB' (Dedham Vale AONB, 2016a) and their description of the special qualities of the Dedham Vale AONB is included in Appendix C of the statement.
- 6.4.41 The Dedham Vale AONB and Stour Valley Management Plan (2016-2021) provides a statement of significance which outlines what is special about the AONB (Page 19):
- *'The Dedham Vale AONB is a subtle lowland river valley with an assemblage of features associated with this landscape still in place and intact. These features include*

a gently winding river and tributaries; gentle valley sides with scattered woodlands; sunken rural lanes; picturesque villages with imposing churches and historic timber framed buildings; scattered farmsteads and agricultural buildings; small fields enclosed by ancient hedgerows; riverside grazing meadows with associated drainage ditches and visible and hidden archaeology providing evidence of human habitation over previous millennia.

- *The area remains an overwhelmingly agricultural landscape, free of incongruous development and large scale industrial developments. Despite some intrusions of human activity in the twentieth and twenty first centuries, the area retains a rural charm and tranquillity and is largely free of infrastructure associated with modern life.*
- *The essential character of the Dedham Vale AONB was established in the middle of the previous millennium and has remained intact despite social, technological events. The fundamental beauty of the area and the scenes of a working landscape were captured by England's finest landscape artist, John Constable RA. The sites of those outdoor paintings are still recognisable in the heart of what is now the AONB.'*

6.4.42 The River Box is designated as an SLA in the Babergh District Local Plan (2006) Saved Policies and the southern extent of this designation lies approximately 0.5km to 1.4km to the north of this project section.

Landscape Character

6.4.43 This section of the project lies in landscape characterised as Ancient Rolling Farmlands, Rolling Valley Farmlands, and Valley Meadowlands at a district level in the Babergh and Mid Suffolk District Council Landscape Guidance (2015). The key characteristics of these landscape character areas are listed in Appendix 6.1.

6.4.44 Areas of ancient woodland are present to the north and south of the central section of the project in Section E, including Broom Hill and Bushy Park Wood.

6.4.45 There are cultural associations linked to the landscape of Section E. As noted in Babergh and Mid Suffolk District Council Landscape Guidance (2015) Paragraph 1.9.53 on landscape designations, the area is associated with the paintings and work of John Constable.

Existing Environment and Views

6.4.46 The Box Valley mainly comprises pastoral land with some broadleaved woodland blocks to the valley sides, some of which are associated with parkland at Peyton Hall. On the eastern side of the valley is a tributary valley that joins the main valley south of Polstead. The minor valley is flanked on its eastern side by Dollops Wood, a broadleaved woodland belt designated with a Tree Preservation Order. The upper valley sides and the area of higher ground between the Box and this tributary valley are in arable use with an irregular pattern of predominantly large fields. Fields in this area have a mixture of open and hedgerow boundaries. On the western extent of the valley side are orchards and related infrastructure, including agricultural buildings, which form part of Boxford Fruit Farm.

6.4.47 The A1071 varies between approximately 1km to 2km to the north of the Indicative Alignment and intervening landform and vegetation restricts views to the south. A network of minor roads and lanes provides connections between the A1071 and B1068. A number of PRowS cross the area, including the PRow which runs along the bottom of the Box Valley and is part of the Suffolk Way, a published long-distance walking route. There is also a small network of public paths to the north of Polstead associated with the tributary

valley and Dollops Wood. The long-distance Stour Valley Path and St Edmund Way run through Stoke by Nayland, approximately 2.5km to the south of the Indicative Alignment.

- 6.4.48 The village of Boxford and hamlets of Stone Street, Calais Street and Whitestreet Green lie to the north of this section. Views south from Boxford and Stone Street are restricted by intervening landform and vegetation. Calais Street is on higher ground but is over 1km from the northern alignment (Dollops Wood Option B). There are some houses at the southern and western edge of Whitestreet Green, which are on higher ground overlooking the valley. The village of Polstead lies approximately 0.7km to the southeast of the southern alignment (Dollops Wood Option A). Views to the northwest from Polstead are restricted by intervening landform. Views northward toward the Box Valley from the village of Stoke by Nayland (approximately 2km south of the Indicative Alignment) are limited by a combination of distance and intervening vegetation. There are other potential individual residential visual receptors in the Box Valley and tributary valley.

Section F: Leavenheath/Assington

Landscape Related Designations

- 6.4.49 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. The potential AONB extension lies approximately 1km to the south of the western extent of Section F.
- 6.4.50 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 Local Plan (2006) Saved Policies).

Landscape Character

- 6.4.51 This section of the project lies in landscape which is characterised as Ancient Rolling Farmlands at a district level in the Babergh and Mid Suffolk District Council Landscape Guidance (2015). The key characteristics of this landscape character area are listed in Appendix 6.1.
- 6.4.52 Blocks of ancient woodland present within 1km of the Indicative Alignment in the Ancient Rolling Farmlands landscape include Assington Thicks.

Existing Environment and Views

- 6.4.53 Section F is on an interfluvium of higher ground between the River Stour valley and the River Box valley. Land is mainly in arable use with an irregular pattern of predominantly large fields. Fields have a mixture of open and hedgerow field boundaries, interspersed with some blocks of woodland, including a substantial block of ancient replanted woodland at Assington Thicks. There are also woodland belts associated with minor watercourses which run in a southerly direction across the plateau. These linear features meet at an area of woodland known as Arger Fen, which is designated a SSSI and is a Local Nature Reserve (LNR) open to the public. These mature landscape features assist in limiting some views of the existing 400kV overhead line, although long views across the plateau are possible from a number of locations. As well as the existing 400kV overhead line and 132kV overhead line in the landscape, in the western part of the area, close to the eastern edge of the Stour Valley, and approximately 0.6km north of the existing 400kV overhead line are two television transmitter masts (known as the Assington masts). The taller mast is approximately 160m high and the shorter mast is approximately 100m high. The masts form prominent landmarks in the surrounding landscape.

- 6.4.54 The A134 runs south from Sudbury through the eastern part of this area. At a point just south of the existing overhead lines the B1068 runs southeast from the A134 toward Stoke by Nayland, following the western edge of the Box Valley. The remainder of the area is served by a network of minor roads, which provides further connections between these main routes and also between the A134 and B1508 in the Stour Valley.
- 6.4.55 A number of PRowS cross this landscape and there are existing views of the existing overhead lines along at least part of these routes. There are no long-distance footpaths, national or regional cycle routes in this immediate area. However, there are views of the existing 400kV overhead line from the Stour Valley Path long-distance walking route, which is approximately 2km to the south in the eastern part of the area, and the St Edmund Way long-distance walking route, which is approximately 2km to the south in the western part of the area. The village of Leavenheath, which comprises separate northern and southern parts of the settlement, is in the eastern part of this section. The northern settlement is at the junction between the A134 and B1068. Houses here are approximately 0.2km from the existing 400kV overhead line and would be close to the project. The southern settlement at Leavenheath is on the western side of the A134, approximately 1km to the south of the existing 400kV overhead line. Houses along the northern edge of the village have views of the existing 400kV overhead line, obscured in places by vegetation along field boundaries and intervening woodland. Further west and to the north of the existing overhead lines is the village of Assington. This village forms a linear settlement along a minor road (The Street) orientated in a north-south direction. Houses at the southern edge of the village are approximately 0.2km from the existing overhead lines. There are a number of other potential residential visual receptors at farmsteads in the area, and at individual houses and groups of houses along the A134, B1068 and minor road network.
- 6.4.56 To the southwest of the B1068 and south of Boxford Fruit Farm is the Stoke by Nayland hotel and golf club. Although views from the hotel toward the existing overhead lines are restricted by tall and dense screen planting, there are some glimpsed views of the existing 400kV overhead line from the golf course.
- 6.4.57 Approximately 3km southeast of this area, is the village of Stoke by Nayland on high ground in the AONB. There are existing views of the 400kV overhead line on the interfluvium between the River Box and River Stour valleys from the edge of the village.

Section G: Stour Valley

Landscape-Related Designations

- 6.4.58 The whole of Section G lies within the Stour Valley Project Area which is subject to a number of ecological and access enhancement schemes. While not a designated landscape in itself it is worth noting the Stour Valley Project Area has been described as having ‘*similar picturesque landscape qualities to Dedham Vale*’ (Land Use Consultants, 2018). The Dedham Vale AONB and Stour Valley Project Management Plan 2016-2021 (Dedham Vale AONB, 2016b) notes:

‘The [Stour Valley] Project Area is predominately rural and often demonstrates medieval settlement patterns. In places the growth of villages and changes to agricultural practices have altered the landscape but not fundamentally changed it. Many of the villages retain their historic centres and have timber framed buildings, imposing churches and village greens. Historic hamlets and isolated farm buildings are scattered throughout the landscape. The area has many woodlands situated within the tributary valleys but much of the valley floor is given over to arable crops with the notable exception of Sudbury

Common Lands where large tracts of water meadows remain as an important feature of the landscape.' (Page 5)

- 6.4.59 The western portion of Section G is within an area proposed as an extension to the Dedham Vale AONB. The current boundary of the AONB lies approximately 1km to the south of the eastern portion of Section G. The eastern portion of Section G is covered by the SLA designation over the eastern extent of the Stour Valley (Babergh District Local Plan (2006) Saved Policies).

Landscape Character

- 6.4.60 The eastern part of this section lies in landscape characterised as Ancient Rolling Farmlands and Rolling Valley Farmlands at a district level in the Babergh and Mid Suffolk District Council Landscape Guidance (2015). The key characteristics of these landscape character areas are listed in Appendix 6.1.
- 6.4.61 There are some small areas of ancient replanted woodland at Parkhill Wood, Appletree Wood, and Twinsteadhall Wood.
- 6.4.62 There are a number of cultural associations linked to the landscape of Section G. Although Constable mainly painted within the Flatford area within the Dedham Vale, there is evidence that he visited the Stour Valley as he painted a view of Daws Hall near Lamarsh.
- 6.4.63 The artist Gainsborough was born in Sudbury and painted and sketched in the area as a child and was inspired by the landscape within the Stour Valley. Although it is not always possible to pinpoint the exact locations of his paintings, there are recognisable features in his compositions.
- 6.4.64 The painter John Nash lived in Wormingford from 1929 until his death in 1977. Wormingford is approximately 2km to the southeast of Bures on the valley top with commanding views of the Stour and the landscape to the north and the local landscape was captured in many of his paintings.

Existing Environment and Views

- 6.4.65 The land in the Stour Valley is a mix of arable and pasture with fields ranging in size, defined by a mixture of open and hedgerow field boundaries. On the western side of the valley and valley tops there is a greater predominance of grazing land and field sizes are much smaller and more enclosed by hedgerow trees and woodland belts. This reflects the more intricate nature of the topography in this particular area, where a series of tributary valleys connect with the main valley. As well as woodland belts associated with tributary valleys, some blocks of broadleaved woodland are found on the Stour Valley's sides and plantations of cricket bat willow on the valley floor.
- 6.4.66 In the Stour Valley, on the eastern side of the river, the B1508 runs southward from Sudbury (approximately 2km to the north of the existing overhead lines) to Bures (approximately 2km to the south of the existing overhead lines). A minor road runs between Sudbury and Bures on the western side of the river. The Sudbury Branch Line is also routed along the valley bottom. This part of the Stour is also navigable. A network of minor lanes crosses the valley sides; many of these are sunken and flanked by tall hedgerow trees.
- 6.4.67 On the western side of the valley some of these lanes are designated protected lanes in Braintree District Council Local Plan (2005). Protected lanes are designated for their traditional landscape and nature conservation character and protection extends to their tranquillity as well as their physical appearance. The project crosses two protected lanes.

The Stour Valley Path and St Edmund Way long-distance footpath routes take the same path northwards from Bures along the valley bottom before climbing up along the western valley side and approaching Sudbury from the southwest. These long-distance paths cross the project on the valley side. There are a number of other PRow in the area and the NCN 13 crosses the Indicative Alignment north of Lamarsh.

- 6.4.68 The southern residential edge of Sudbury extends southward along the Stour Valley as ribbon development along the B1508 and is approximately 2km to the north of the existing 400kV overhead line. The village of Bures also sits in the valley bottom and is approximately 2km to the south of the existing overhead lines. There are a number of other small villages on the valley sides between Sudbury and Bures. The small village of Workhouse Green is on the eastern valley side and approximately 0.2km to the north of the existing 132kV overhead line. The village of Lamarsh is on the western edge of the valley bottom, 0.25km to the south of the existing 132kV overhead line. The village of Alphamstone is on the western edge of the Stour Valley, approximately 1km to the south of the existing 132kV overhead line. The village of Twinstead is 0.6km to the west of the Indicative Alignment. There are other potential visual receptors relevant to the project at individual residences in the Stour Valley.

Butler's GSP Wood Substation

Landscape-Related Designations

- 6.4.69 The potential Dedham Vale AONB extension, and the Stour Valley Project Area, lie approximately 0.75km to the east of the proposed GSP substation.

Landscape Character

- 6.4.70 This proposed GSP substation lies in landscape characterised as Wickham Farmland Plateau in the Landscape Character of Braintree District (Braintree District Council, 2006). The key characteristics of this landscape character area are listed in Appendix 6.1.
- 6.4.71 Areas of ancient woodland lie to the north and south of the proposed GSP substation at Butler's Wood and Waldegrave Woods.

Existing Environment and Views

- 6.4.72 The landscape broadly comprises gently undulating arable land, interspersed with broadleaved blocks of woodland. There is an irregular pattern of predominantly large fields which have a mixture of open and hedgerow boundaries with hedgerow trees. The project is on a low rise in the undulating landscape; however Butler's and Waldegrave Woods, within the study area, limit views.
- 6.4.73 There is potential for views towards the proposed GSP substation from the potential Dedham Vale AONB extension, however landform and vegetation are likely to restrict views.
- 6.4.74 The A131 runs in a southerly direction from Sudbury to Halstead and passes to the immediate east of Butler's and Waldegrave Woods and there are views of the existing overhead lines where not obscured by the woods. There are views of the existing overhead lines from the minor road network that extends east and west of the A131 (including the protected lanes), although views are limited where lanes are sunken and hedge-lined.
- 6.4.75 There are PRow to the west and east of Butler's and Waldegrave Woods that have open views of the existing overhead lines. Views to the north and south are restricted by woodland, although there are views from public footpaths to the south to the existing

overhead lines. There are no long-distance footpaths or regional or National Cycle Network routes in the vicinity.

- 6.4.76 The nearest villages are Twinstead to the east, Wickham St Paul to the west and Bulmer Tye to the north, all approximately 1km from the proposed GSP substation. Views from these locations are limited by intervening hedgerows and mature trees. The hamlet of Twinstead Green is at the southeastern edge of the study area and there are some existing views toward the proposed GSP substation from the residential properties nearest, however mature vegetation to garden curtilages limits views. There are views towards the proposed GSP substation from a few individual farmsteads and other groups of houses within 0.5km of the woods; intervening vegetation again limits existing views.

Future Baseline

- 6.4.77 The future baseline is related to landscape 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.
- 6.4.78 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 will be considered within the cumulative effects assessment, see Chapter 18: Cumulative Effects.
- 6.4.79 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 called *Hymenoscyphus fraxineus* (*H. fraxineus*; formerly called *Chalara fraxinea*). 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. 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 surveys will record incidents of ash dieback during the site surveys (see Appendix 6.5).
- 6.4.80 In contrast to expected loss of ash trees, some positive landscape changes are also anticipated. These relate to agri-environment and woodland planting schemes which will continue enhance the landscape. For example, since this project was paused in 2013, there have been new areas of woodland and hedgerows planted in the study area. Furthermore, it is anticipated the landscape being managed in accordance with the Dedham Vale AONB and Stour Valley Management Plan (Dedham Vale AONB, 2016b) will continue to be enhanced.
- 6.4.81 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.

6.5 Embedded and Good Practice Measures

- 6.5.1 The project has avoided sensitive features such as larger settlements and woodlands through the options appraisal. In addition, the project has assumed the following embedded measures to reduce operational landscape and visual effects:

- underground cables proposed through Dedham Vale AONB and the Stour Valley Project Area (part of which may potentially be encompassed within the Dedham Vale AONB if the proposed AONB extension is confirmed by Natural England);
 - rationalisation of overhead lines through the proposal to replace the existing 132kV overhead line with a new 400kV overhead line;
 - reduction of the number of overhead lines in Dedham Vale AONB by securing the removal of the 132kV overhead line; and
 - reduction of the number of overhead lines in the Stour Valley Project Area and proposed Dedham Vale AONB extension area by securing the removal of the 132kV overhead line and a small section of the existing 400kV overhead line.
- 6.5.2 During the ongoing design process, it is envisaged there will be further opportunities for embedding design measures into the design through sensitive siting of:
- temporary and permanent access routes;
 - construction areas and compounds;
 - new above ground infrastructure such as pylons; and
 - the four proposed CSE compounds and the proposed GSP substation.
- 6.5.3 In addition, the LVIA will continue to identify embedded design measures through the location of any screening of equipment and, where practicable, influencing the proposed materials and colour finishes of equipment, security fencing and surfacing.
- 6.5.4 The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to LVIA:
- GG20: Construction lighting will be of the lowest luminosity necessary to safely perform each task. It will be designed, positioned and directed to reduce the intrusion into adjacent properties, protected species and habitats.
 - LV01: The contractor(s) will retain vegetation where practicable. Where vegetation is lost and trees cannot be replaced in situ due to the restrictions associated with land rights required for operational safety, native shrub planting approved by National Grid will be used as a replacement, in accordance with the outline vegetation reinstatement plans included within the Landscape and Ecological Management Plan (LEMP).
 - LV02: The contractor(s) will apply the relevant protective principles set out in British Standard (BS) 5837:2012: Trees in relation to design, demolition and construction. This will be applied to trees within the Order Limits which will be preserved through the construction phase, and to trees outside of the Order Limits where such measures do not hinder or prevent the use of the relevant working width for construction. All works to high grade trees, including trees under Tree Preservation Orders and veteran trees, will be undertaken or supervised by a suitably qualified arboriculturist.
 - LV03: A five-year aftercare period will be established for all reinstatement and mitigation planting.
 - B07: Where the works require the crossing or removal of hedgerows, the gap will be reduced to a width required for safe working ... New hedgerow planting will contain native, woody species of local provenance.

- 6.5.5 Careful planning, siting and design of the project is able to ‘design out’ some adverse impacts. Where this is not possible or feasible, then additional mitigation measures will be considered to prevent/avoid or reduce adverse impacts.
- 6.5.6 The project has also committed to producing an Outline LEMP (commitment GG03), which will set out the measures to protect existing vegetation and details regarding the reinstatement and additional planting. This will also take into account biodiversity net gain targets (see Chapter 7: Biodiversity).

6.6 Likely Significant Effects

- 6.6.1 This section sets out the likely significant effects of the project on landscape and visual receptors. It assumes that the relevant embedded measures and good practice measures outlined within the Outline CoCP are in place before assessing the impacts.
- 6.6.2 The potential construction and operation impacts of the project on landscape and visual receptors comprise in brief:
- physical and perceptible impacts on designated landscapes and their setting through removal and addition of landscape features and infrastructure elements;
 - physical and perceptible impacts on landscape character through removal and addition of landscape features and infrastructure elements; and
 - impacts on the visual amenity of people living in and moving around the landscape through removal and addition of landscape features and infrastructure elements.

Landscape-Related Designations

- 6.6.3 The project has the potential to impact the special qualities and setting of nationally designated Dedham Vale AONB during construction and operation. There is potential for these impacts to result in likely significant adverse effects during construction due to the intrusive nature of the construction works associated with undergrounding. In operation this likelihood is greatly reduced as the new 400kV network reinforcement will be underground and the existing 132kV overhead line will have been removed. Without the detail of undergrounding and associated CSE compounds, it is considered appropriate to scope in the assessment of both construction and operation landscape effects on Dedham Vale AONB and its setting, for robustness.
- 6.6.4 Parts of the Stour Valley Project Area may potentially be encompassed within the Dedham Vale AONB if the proposed AONB extension is confirmed by Natural England. The situation regarding the potential extension will be closely monitored throughout the EIA process. The Stour Valley Project Area itself is not covered by designation at the current time, and as such impacts on this area will be considered under landscape character in the ES.
- 6.6.5 There is potential for the project to impact the current locally designated Stour Valley SLA, Brett Valley SLA, and Gipping Valley SLA. The assessment of construction and operation landscape effects on these SLAs are therefore scoped into the ES.
- 6.6.6 It is unlikely that the project would have significant effects on SLAs that are not physically impacted by construction or operation, for example the River Box SLA (Babergh District Local Plan (2006) Saved Policies). These are therefore scoped out of the ES.
- 6.6.7 During operation there are likely to be beneficial landscape effects as a result of the impact of the 132kV overhead line removal and undergrounding of the new 400kV

network reinforcement through Dedham Vale AONB and the Stour Valley Project Area (part of which includes the proposed Dedham Vale AONB extension area and also the Stour Valley SLA).

- 6.6.8 There is no anticipation of significant effects on designated landscapes at night. The Outline CoCP includes good practice measures for lighting during construction (GG10 and GG20). The only operational lighting would be at the proposed GSP substation and CSE compounds. Lighting would only be switched on when needed. Lighting is therefore scoped out of the assessment of construction and operation effects in relation to landscape designations.

Landscape Character

- 6.6.9 The construction and operation of the different elements of the project, including the proposed 400kV overhead line, underground cables, CSE compounds, and GSP substation have the potential to impact on landscape character along the proposed alignment.
- 6.6.10 During construction, impacts on landscape character would be likely to arise from direct loss or fragmentation of distinctive landscape elements, for example this may include (but is not limited to): highway works on protected lanes, vegetation clearance to allow for temporary work areas, access and construction of the different elements of the project.
- 6.6.11 During operation, impacts would include the introduction and removal of infrastructure elements in the landscape, the requirement for permanent tree clearance beneath the overhead line and above underground cables and also the positive impact of the re-establishment of woodland, trees and hedgerows.
- 6.6.12 There is potential for these impacts to result in likely significant adverse effects on the landscape character areas within which the project is located. The assessment of landscape impacts during construction and operation is therefore scoped into the ES. Judgements will be made in relation to impacts and resultant effects on district-scale landscape character areas only to avoid duplication in the assessment.
- 6.6.13 It is unlikely that the project would have significant effects on landscape character areas that are not physically impacted by construction or operation, for example the Plateau Farmlands, Urban and Rolling Estate Farmlands landscape character areas of Babergh and Mid Suffolk District Council Landscape Guidance (2015). These are therefore scoped out of the ES for both construction and operation.
- 6.6.14 There is no anticipation of significant effects on the landscape at night. The Outline CoCP includes good practice measures for lighting during construction (GG10 and GG20). The only operational lighting would be at the GSP substation and possible CSE compounds. Lighting would only be switched on when operational staff are there and it is needed. This is therefore effects in relation to landscape character are scoped out of the ES for both construction and operation.

Views

- 6.6.15 There is no anticipation of significant visual effects at night. The Outline CoCP includes good practice measures for lighting during construction (GG10 and GG20). The only operational lighting would be at the proposed GSP substation and CSE compounds. Lighting would only be switched on when needed. The assessment of construction and operation night-time impacts on views for all receptors is therefore scoped out of the ES.

- 6.6.16 The LVIA will not appraise the effects of the project on visual receptors that are located wholly outside the ZTV (which in itself illustrates a worst-case scenario using bare earth without intervening buildings and vegetation) as there would be no likelihood for any visual effects on these receptors. Construction and operation impacts on views for all receptors outside the ZTV are therefore scoped out of the ES.
- 6.6.17 The assessment of visual effects on private views will not be considered. In law, private individuals do not have a right to a view (as established in Aldred's Case (1610) 9 Co Rep 57b; (1610) 77 ER 816, [1558-1774] All ER Rep 622). Impacts on living conditions are usually dealt with through a separate residential visual amenity assessment, if required. In this case, it is not considered such an assessment is required because the project is not likely to meet the threshold criteria as set out within Residential Visual Amenity Assessment Technical Guidance Note (Landscape Institute, 2019). Construction and operation impacts on private views are therefore scoped out of the ES.
- 6.6.18 The project has potential to impact on the visual amenity of people living and moving around the area (communities). There is potential for these impacts to result in likely significant adverse effects during both construction and operation. The focus of the assessment will be within 3km of the project as the most likely significant effects will be within 1km from the new 400kV overhead line, proposed GSP substation and CSE compounds. Construction and operation impacts on views from the community are therefore scoped into the ES.
- 6.6.19 The project has potential to impact on the visual amenity of people visiting and/or taking part in recreational activities within the study area such as people walking on regional trails, PRowS, people cycling on national and promoted cycle routes and people visiting trig points and visitor attractions (recreational receptors). There is potential for these impacts to result in likely significant adverse effects during both construction and operation. The focus of the assessment will be within 3km of the project as the most likely significant effects will be within 1km from the reinforcement 400kV overhead line, proposed GSP substation and CSE compounds. Construction and operation impacts on views from the recreational receptors are therefore scoped into the ES.
- 6.6.20 Assessment of visual effects on people travelling by car through the area (road receptors) will not be considered as visual receptors in their own right. The consideration of views from people travelling in and around local communities will be considered as part of the assessment of visual effects on communities.
- 6.6.21 There is no anticipation of significant visual effects on people travelling by train. Due to the speed of travel and the proposal to construct underground cables within the Stour Valley, the assessment of visual effects on people travelling on the Sudbury Branch Line (rail receptors) is scoped out of the ES.
- 6.6.22 During operation, there are likely to be beneficial visual effects on some views. The nature of these will depend on the extent to which the removal of the 132kV overhead line improves the views experienced. This will be considered in more detail in the assessment.

6.7 Proposed Assessment Methodology

- 6.7.1 This section sets out an overview of the proposed assessment methodology for LVIA. Supplementary information relating to the LVIA methodologies can be found in Appendix 6.2 and Appendix 6.3.
- 6.7.2 LVIA is a tool used to systematically identify and assess the likely significance of the effects of change resulting from the project both on the landscape and on peoples' views and visual amenity. The purpose of the LVIA is to identify the nature and importance of the changes arising from the project and through an iterative design process to inform changes to the project and evolution of mitigation strategies which reduce significant impacts wherever possible.
- 6.7.3 The methodology for undertaking the LVIA will be based on principles set out in GLVIA3 (Landscape Institute and IEMA, 2013). This not only establishes good practice guidance for LVIA but also complies with the requirements of EN-1 and EN-5. It advocates that the assessment should be proportionate to the scale and nature of the proposals and should focus on the 'likely' significant effects, rather than every conceivable effect, which aligns with the requirements of the EIA Regulations 2017. This approach provides greater opportunity to scope out particular receptors, where it can be demonstrated that significant effects would be unlikely to arise. The ultimate aim is to present more concise and meaningful assessments.
- 6.7.4 The general approach to assessing potential impacts of the project on landscape and visual receptors will be as follows:
- An assessment of the potential impacts of the project on landscape receptors will be 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; and
 - An assessment of the potential impacts of the project on visual receptors will be 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 will focus 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.
- 6.7.5 The assessment will involve a combination of quantitative and qualitative assessment and the application of professional judgement within a structured assessment framework. As discussed in GLVIA3, '*...whilst there is some scope for quantitative measurement of some relatively objective matters, ...much of the assessment must rely on qualitative judgement, for example what effect the introduction of a new development or land use change may have on visual amenity, or about the significance of change in the character of the landscape and whether it is positive or negative*' (Paragraph 2.23).

- 6.7.6 *'In all cases there is a need for judgements that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others.'* (Paragraph 2.24).
- 6.7.7 Where relevant, the LVIA will consider any inter-relationship of baseline information and impacts from the project between different aspects of the environment. For example, the outputs of the biodiversity assessment (Chapter 7) will provide information on existing vegetation and species including ancient woodland and veteran trees, the historic environment assessment (Chapter 8) will be cross-referenced in relation to historic assets including protected lanes, historic landscapes and registered parks and gardens which may contribute to baseline landscape value.
- 6.7.8 Information contained within the future Arboricultural Impact Assessment will be referenced to inform the LVIA and also in relation to mitigation proposals. Appendix 6.5 sets out the proposed arboricultural survey methodology.

Zone of Theoretical Visibility (ZTV)

- 6.7.9 ZTV maps will be produced to inform the assessment. These will illustrate theoretical visibility during the operational phase. The ZTVs will take no account of the screening effects of buildings and vegetation, which may in reality preclude visibility from certain areas. As a result they will be referred to as 'bare earth' ZTVs and provide the 'worst-case' scenario (largest geographical area) from which the project may be visible.
- 6.7.10 The ZTVs will be generated in Geographic Information System (GIS) using an Ordnance Survey Terrain 5 Digital Terrain Model. A draft ZTV has been produced for the scoping stage for information, shown on Figure 6.3. The ZTV will be refined and updated as the assessment progresses.
- 6.7.11 As the ZTVs are theoretical, fieldwork will be undertaken to take into account local screening elements within the landscape and confirm locations from where the different elements of the project would actually be visible (i.e. a more realistic scenario). The results of the fieldwork will inform the assessment.

Site-Based Assessment

- 6.7.12 The findings of the desk-based study will be supplemented with a programme of seasonal site surveys. This will include surveys during both summer and winter months to fully understand the visual baseline.
- 6.7.13 Visual site surveys will be undertaken for a selection of agreed representative public viewpoints for a variety of receptor types and at a range of distances from the project. Surveys will include viewpoint photography to assist in the creation of wireframes and for photomontages (see Appendix 6.3: Wireline and Photomontage Methodology).
- 6.7.14 Whilst the main aim of these viewpoint surveys will be to obtain baseline photographs, the site visits will also provide the opportunity to gain an understanding and appreciation of the landscape character of the study area.
- 6.7.15 Viewpoints will be selected to represent the different groups of people likely to be affected by the project. The selection of viewpoints will be informed by the ZTV analysis, site visits, desk-based research on access and recreation, (including footpaths, bridleways and public land), tourism including popular vantage points, and by the distribution of the different groups of visual receptors.

- 6.7.16 Viewpoints will then be examined in detail to determine the value of the view and the magnitude of change that would be likely to arise from the project during construction, operation in Year 1 and operation Year 15. The value of a view and magnitude of change does not change depending on the receptor and then can therefore be reported on by viewpoint.
- 6.7.17 The visual assessment will focus on the wider visual amenity of people living and moving around settlements or aggregated groups of dispersed properties. Wherever possible, viewpoints will be selected to represent several different receptor groups, for example on the edge of a settlement, on a promoted PRow, at a trig point or near to a cluster of properties.
- 6.7.18 Because each viewpoint will typically represent a number of different receptor groups, the level of effect will vary depending on the sensitivity of a receptor. A level of effect will not be determined at each viewpoint for this reason. The baseline value of the view and assessment of magnitude of change will be reported for each viewpoint. This information will then be used to inform the assessment of effects on visual receptors on a receptor by receptor basis.
- 6.7.19 In order to assess the impacts on communities, the study area will be divided into community areas. Areas will be identified by grouping scattered properties with main towns and villages with consideration of common views, topography and with an understanding of the landscape through desk-based study and site visits.

Wireframes and Photomontages

- 6.7.20 Wireframe diagrams will be produced to show the outline of the above ground structures (overhead lines, pylons, CSE compounds and GSP substation) associated with the project in the context with the baseline. These will be computer-generated line drawings, based on a digital terrain 'bare earth' model combined with information about the location and scale of elements of the project, to give a relatively simple indication of how the project would appear from different viewpoints. Wireframe diagrams will be produced for all viewpoints in order to assist the assessment process.
- 6.7.21 A number of the viewpoint locations will be taken forward for photomontage to illustrate the project to the public and stakeholders. Photomontages show more detail than wireframes, including buildings, vegetation, colour, texture and lighting conditions. The objective of a photomontage is to simulate the likely visual changes that would result from the project and to produce printed images of a size and resolution sufficient to match the perspective in the same view as in the field. It is important to note that the photomontages will not form the basis of the assessment but will be purely for illustrative purposes. Viewpoint locations to be used for photomontages will be discussed and agreed with stakeholders. See Appendix 6.4: Wireline and Photomontage Methodology.

6.8 Ascribing Value/Sensitivity

- 6.8.1 An assessment of receptor sensitivity is made by combining judgements about the value attached to the landscape or view (established and reported as part of the baseline) with judgements about the susceptibility of the landscape or view to change arising from the project.
- 6.8.2 Value judgements are unrelated to the nature of the project, whilst judgements on susceptibility may vary in response to the type of project proposed and the attributes of the area in which it is to be located.

- 6.8.3 The final assessment of landscape sensitivity is based on informed professional judgement based on consideration of the susceptibility and value assessment and the relative weight attached to these which will vary from landscape to landscape. For the full methodology on how landscape value and susceptibility is determined refer to Appendix 6.2: Landscape Assessment Methodology.
- 6.8.4 It is important to note that the landscape sensitivities identified in this assessment will be relative to the landscapes of Essex and Suffolk and to the nature of the project.
- 6.8.5 The criteria used to determine the sensitivity of receptors specific to landscape are set out in Table 6.1. These are based on guidance in GLVIA3 and also guidance contained in an approach to landscape sensitivity assessment – to inform spatial planning and land management (Natural England, 2019). The rationale in support of the assessment is set out for each receptor so that it is clear how each judgement has been made.

Table 6.1: Criteria for Determining Landscape Sensitivity

Landscape Sensitivity	Landscape Criteria
Very high	The key characteristics and qualities of the landscape are very highly susceptible to change from the type and scale of the project being assessed; and/or the value of the landscape is notably high. Key landscape characteristics are very highly vulnerable and unable to accommodate the project without significant consequences for character.
High	The key characteristics and qualities of the landscape are highly susceptible to change from the type and scale of the project being assessed; and/or the value of the landscape is medium-high to high. Key landscape characteristics are highly vulnerable and unable to accommodate the project without significant consequences for character.
Medium-High	The key characteristics and qualities of the landscape are very susceptible to change from the type and scale of the project being assessed; and/or the value of the landscape is medium to medium-high. Key landscape characteristics are vulnerable and unable to accommodate the project without some significant consequences for character. Parts of the landscape may be able to accommodate the project but only in limited situations without significant character change or adverse effects.
Medium	Some of the key characteristics and qualities of the landscape are susceptible to change from the type and scale of the project being assessed; and/or the value of the landscape is medium-low to medium. Although the landscape may be able to absorb some development if sensitively sited and designed, it may introduce new inappropriate characteristics or result in a change in character. Parts of the landscape may have potential to accommodate the project in some defined situations without significant character change or adverse effects.
Medium-Low	Few of the key characteristics and qualities of the landscape are susceptible to change from the type and scale of the project being assessed; and/or the value of the landscape is medium-low to medium-high.
Low	Key characteristics and qualities of the landscape are robust or degraded and are not susceptible to change; and/or the value of the landscape is low. The landscape is unlikely to be adversely affected by the type and scale of the project being assessed.

- 6.8.6 Table 6.2 provides guidance on the evaluation of visual sensitivity. For visual receptors the sensitivity is primarily born from the susceptibility of the visual receptor to the project

proposed, though the value of the view does have influence. Receptors are classified into one of four threshold categories of sensitivity; very high, high, medium, and low. These serve to capture all visual receptor groups that might potentially be affected by the project.

Table 6.2: Criteria for Determining Visual Sensitivity

Visual Sensitivity	Visual Criteria
Very High	<p>Locations which people might visit purely to experience a highly scenic view, and which typically offer a prolonged viewing opportunity, including:</p> <ul style="list-style-type: none"> • panoramic viewpoints (often marked on OS plans and providing interpretation facilities); • mountain and hilltops; • tourist, visitor and other destinations where the view is of paramount importance and contributes to the experience; and • publicly accessible heritage destinations affording a specific, important and highly valued view (note: the visual assessment will consider people as receptors and not the heritage asset itself. Impacts on heritage assets and their setting will be considered in Chapter 8: Historic Environment).
High	<p>Locations where people are likely to pause to appreciate a scenic view, including:</p> <ul style="list-style-type: none"> • local communities within which people are living and moving around; • promoted scenic drives or tourist routes; • designed landscapes/parks and gardens with specific views/vistas/borrowed landscapes and visual experiences which are fundamental to the appreciation of the attraction; • tourist, visitor or heritage destinations where views of the surroundings are fundamental to the experience (note: the visual assessment will consider people as receptors and not the heritage asset itself. Impacts on heritage assets and their setting will be considered in Chapter 8: Historic Environment); • viewpoints marked on road atlases, or referred to in guidebooks, and which have brown road signage and/or interpretation boards; and • nationally/regionally promoted walks and cycle routes.
Medium	<p>People with a general interest in their surroundings or with transient viewing opportunities combined with a view of average scenic quality, including:</p> <ul style="list-style-type: none"> • people using incidental footpaths and local PRowWs; • people travelling on residential distributor routes and the local road network; • people using general public open spaces, greenspace, recreation grounds and play areas; • people in rural offices and business parks; and • rural outdoor workers and those engaged in marine surface-based activities such as fishing.
Low	<p>People with limited opportunity to enjoy the view due either to the speed of travel or because their attention is elsewhere, combined with a view of limited scenic quality, including:</p> <ul style="list-style-type: none"> • workers in industrial and commercial buildings; • people in schools; • people travelling on main roads (although susceptibility may be higher in scenic locations);

Visual Sensitivity **Visual Criteria**

- people in indoor facilities;
 - commuters; and
 - people engaged in outdoor sport or recreation which does not depend on an appreciation of views of their surroundings.
-

- 6.8.7 In formulating sensitivity categories, it is important to acknowledge the special circumstances where peoples' expectations in relation to the view are enhanced and where a sensitivity category of 'very high' has been introduced. This means for example that many receptors experiencing views from locations within Dedham Vale AONB may be defined as 'high' rather than 'very high'. The 'very high' category will only apply to designed landscapes/parks/gardens and/or specific promoted views, vistas and visual experiences which are the main focus of the activity and fundamental to the appreciation of that location. If the sensitivities of all receptors within nationally designated landscapes were defined as 'very high' then this would undervalue the primacy of panoramic viewpoints (such as those identified on OS maps) and designated views or particularly valued viewpoints where the prime objective is for receptors to be able to absorb the valued view.
- 6.8.8 The rationale and justification behind attributing a 'high' rather than 'very high' sensitivity for people living in local communities also needs clarification. People living in settlements are acknowledged as having a higher than average sensitivity to the project (even though local residents are potentially habituated to it, due to the presence of the existing 400kV and 132kV overhead lines). They do not, however, have the highest level of sensitivity unless standing at a specific destination and/or valued viewpoint in which case they are captured under that category of visitor.

Impact Magnitude

- 6.8.9 As explained in paragraphs 5.48 and 6.38 of GLVIA3, the nature or magnitude of change that is likely to occur is determined by considering the following factors:
- size/scale;
 - geographical extent; and
 - duration and reversibility.
- 6.8.10 For the full methodology on how these factors are determined see Appendix 6.2: Landscape Assessment Methodology and Appendix 6.3: Visual Assessment Methodology.
- 6.8.11 The judgements on the size/scale of changes proposed by the project, geographical extent and duration and reversibility will be considered together to derive an overall magnitude of predicted change for each receptor, which will be determined through informed professional judgement guided by the indicative criteria set out in Table 6.3.
- 6.8.12 The magnitude of both landscape and visual change is described as large, medium-large, medium, medium-small, small, negligible or no change. The rationale in support of the assessment is set out for each receptor so that it is clear how each judgement has been made.

6.8.13 For some receptors, the judgement on magnitude may need to be adjusted (either up or down) to reflect the duration of the change and whether it is likely to be reversible.

Table 6.3: Criteria for Determining Magnitude

Magnitude	Landscape Criteria	Visual Criteria
Large	<p>Considerable change to the landscape over a wide area or intensive change over a limited area with dramatic consequences for the elements, character and quality of the baseline landscape.</p> <p>The project will form a dominant landscape element and post development the baseline situation will be fundamentally changed, potentially creating a different landscape character.</p>	<p>The project would form a dominant element in the view and result in a dramatic change to the character and quality of the existing view and how it is perceived.</p> <p>Typically, this would be where a project would be seen in very close proximity with a large proportion of the view affected by no or minimal screening/filtering or backgrounding of views.</p> <p>The project would dominate the view and may also be long-term and seen by many people.</p>
Medium-Large	<p>Substantial change to the landscape over a wide area or considerable change over a limited area, with consequences for the elements, character and quality of the baseline landscape.</p> <p>The project will form a prominent landscape element and post development the baseline situation will be substantially changed.</p>	<p>The project would be a prominent feature and result in a substantial change to the character and quality of the existing view and how it is perceived.</p> <p>Typically, this would be where a project would be seen in close proximity with a large proportion of the view affected by little filtering or backgrounding.</p> <p>The project would affect the main focus of the view and may also be long-term and seen by many people.</p>
Medium	<p>Noticeable change to the landscape over a wide area or conspicuous change over a limited area, with some consequences for the elements, character and quality of the baseline landscape.</p> <p>The project will form a conspicuous landscape element and post development the baseline situation may be noticeably changed.</p>	<p>The project would be a conspicuous element in the view and result in a noticeable change to the character and quality of the existing view and how it is perceived.</p> <p>Typically, this would be where a project would be seen in views where a moderate proportion of the view is affected, although there may be some screening or backgrounding.</p> <p>The project would be clearly visible and well-defined. It may be also medium-term and seen by a number of people.</p>

Magnitude	Landscape Criteria	Visual Criteria
Medium-Small	<p>Slight change to the landscape over a wide area or noticeable change over a limited area, with few consequences for the elements, character and quality of the baseline landscape.</p> <p>The project will be perceptible but post development, the baseline landscape may exhibit some differences, but will be largely unchanged.</p>	<p>The project would form a small part of the view and result in a slight change to the character and quality of the existing view and how it is perceived.</p> <p>Typically, this would be where a project would be seen in distant views, where only a small proportion of the view is affected, where the magnitude is reduced due to a high degree of filtering of backgrounding or where there is a low scale of change from the existing view.</p> <p>The project would be visible but indistinct and/or partially obscured. It would be seen only briefly and by few people.</p>
Small	<p>Inconspicuous change to the landscape over a wide area or slight change over a limited area, with very limited consequences for elements, character and quality of the baseline landscape.</p> <p>The project will be just perceptible and post development, the baseline landscape will appear largely unchanged.</p>	<p>The project would be perceptible but result in an inconspicuous change to the character and quality of the existing view and how it is perceived.</p> <p>Typically, this would be where a project would form a barely perceptible part of a long-distance panoramic view and/or where a very small proportion of the view was affected.</p> <p>The project would be barely discernible and likely to be visible only under certain weather or lighting conditions.</p>
Negligible	<p>Almost indiscernible change to the landscape, with no consequences for elements, character and quality of the baseline landscape.</p> <p>The project will be barely perceptible and post development, the baseline landscape will appear unchanged.</p>	<p>Almost indiscernible change to the view, with no consequences for the character and quality of the view.</p> <p>The project would be barely perceptible and post development, the baseline view would appear unchanged.</p>
No Change	<p>The assessment also identifies areas where no landscape change is anticipated. In these instances, 'no change' is inserted into the appropriate magnitude of change column.</p>	<p>The assessment also identifies areas where no visual change is anticipated. In these instances, 'no change' is inserted into the appropriate magnitude of change column.</p>

6.8.14 It should be noted that for the assessment of magnitude of impact for the construction phase, the presence of the project itself will not be considered. The parts of the project (new 400kV overhead line, CSE compounds etc) will be considered as an operational impact only, to avoid assessing the same impact twice. This will concentrate on the impacts of the construction activities taking place.

Significance

6.8.15 The overall approach to evaluating the significance of effect is explained in Chapter 5: EIA Approach and Method.

- 6.8.16 Not all landscape and visual effects will be significant. Moreover a significant landscape effect does not necessarily mean that such an effect will be unacceptable to the decision maker considering an application for development consent. This is a matter that the decision maker will weigh in the planning balance alongside other factors. What is important is that the likely significant landscape effects of a project are transparently assessed and described in order that the determining authority can bring a balanced and well-informed judgement to bear as part of the decision-making process.
- 6.8.17 For the purposes of this assessment, effects will be categorised as major, moderate, minor or neutral and where 'no effect' is anticipated this will also be stated. To determine the overall category of each landscape and visual effect, the separate judgements about the sensitivity and the predicted magnitude of change are combined to allow a judgement to be made as to whether or not the effect is considered significant. The determination of significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5, supplemented by professional judgement. The nature of the effects is described as either being positive (beneficial), neutral, or negative (adverse).
- 6.8.18 Each of the effect categories covers a broad range of effects and represents a continuum or sliding scale. The final decision on the level of effect and therefore significance ultimately relies on professional judgement which, in the assessment, is informed by recognised guidance and supported through qualitative text to draw out the important issues, describe the effects and explain the underlying rationale.

Limitations of Assessment

- 6.8.19 Assessment, site work, and photography will be undertaken from publicly accessible locations, such as the public highway and PRowS. The assessment will be based on views from the ground (therefore not taking into consideration private views from upper storeys).
- 6.8.20 Screening and filtering of views by vegetation does not remain constant throughout the year, and as such the assessment will be primarily based on the worst-case scenario of winter views.
- 6.8.21 At the time of undertaking this Scoping Report, the potential Dedham Vale AONB extension has been submitted but not yet approved or rejected. As such the LVIA will recognise the proposal for the extension in terms of landscape value and sensitivity but the landscape within it will not be considered as designated. If this situation changes prior to the application for development consent then this will be re-considered accordingly. The Stour Valley Project Area (outside the proposed AONB extension) is also not designated; however, its value will also be acknowledged in the baseline and in judgements regarding landscape sensitivity.
- 6.8.22 The assessment will consider the construction and operation impacts of the project. The principal information which will be used to inform the assessment of impacts on landscape and visual receptors will include the location of temporary construction and storage areas, access roads, the location, number and heights of pylons, overhead lines, underground cable routes, the location of any equipment such as CSE compounds and the GSP substation as well as other temporary or permanent infrastructure required to facilitate the project. It may be that locations are not fixed as part of the application as a degree of flexibility may be required. The assessment will therefore be based on a worst-case assumption. Due to this flexibility, it may not be possible to provide accurate quantification of landscape elements which may be lost. Likewise, any wireframes produced will only give an indication of how the project might be perceived in a view.

6.9 Conclusion

- 6.9.1 There is potential for landscape impacts on designated landscapes including the special qualities of Dedham Vale AONB and its setting and on SLAs. There is also potential for impacts on landscape character as well as the visual amenity and views experienced by people living within and visiting the area. It is likely that significant impacts will occur in close proximity to the project (typically within 1km from the project) and these will diminish with distance. The proposed scope, as set out in this chapter, is intended to focus the attention of the LVIA on likely significant effects and to avoid assessing the same impact twice.
- 6.9.2 An initial meeting was held with representatives from Babergh District Council, Mid Suffolk District Council and Braintree District Council on 3 March 2021. The intended scope of the LVIA was presented in line with the scope set out in this chapter. No specific technical queries were raised at the time of the meeting.
- 6.9.3 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 6.5.

Table 6.5: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Designated landscapes – Dedham Vale AONB	Impacts on the special qualities and setting of the nationally designated Dedham Vale AONB.	Construction and operation	Scoped in
Designated landscapes – SLA	The project will directly impact the Gipping Valley SLA, Brett Valley SLA and Stour Valley SLA; existing local planning designation.	Construction and operation	Scoped in
Designated landscapes, landscape character and views	No likely significant effects on designated landscapes, landscape character or views at night.	Construction and operation	Scoped out

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Landscape character	<p>Effects on landscape character will be assessed in relation to the district-scale landscape character areas within which the project falls (including the proposed AONB extension and Stour Valley Project Area).</p> <p>Landscape elements (i.e. tree cover, field boundaries, landform, watercourses) will not be appraised as receptors in their own right but will be considered as part of the baseline in terms of contribution to landscape character and value.</p> <p>The assessment will consider likely impacts on landscape elements in terms of how any changes may influence effects on landscape character.</p> <p>Likely impacts in terms of potential tree and hedgerow loss will be described in relation to each character area and cross reference will be made to other chapters such as Chapter 7: Biodiversity, and the Arboricultural Impact Assessment.</p> <p>National Character Areas and county-scale landscape character areas will not be considered as landscape receptors. This is to avoid duplication in the assessment.</p>	Construction and operation	Scoped in
Views – communities	<p>Assessment of visual effects on people living and moving around the area (communities) will be considered. An assessment of private views will not be considered.</p> <p>Focus of the assessment will be within 3km as the most likely significant effects of the project will be within 1km from the new 400kV overhead line, proposed GSP substation, CSE compounds and 132kV overhead line removal.</p> <p>The LVIA will not appraise the effects of the project on visual receptors that are located wholly outside the ZTV.</p>	Construction and operation	Scoped in
Views – recreation	<p>Assessment of visual effects on people visiting and/or taking part in recreational activities within the area (recreational receptors).</p> <p>Focus of the assessment will be within 3km as the most likely significant effects of the project will be within 1km from the new 400kV overhead line, proposed GSP substation, CSE compounds and 132kV overhead line removal.</p>	Construction and operation	Scoped in
Views – road users	No likely significant visual effects on people travelling by car through the area (road receptors).	Construction and operation	Scoped out
Views – rail users	No likely significant visual effects on people travelling on the Sudbury Branch Line (rail receptors).	Construction and operation	Scoped out

7. BIODIVERSITY

7.1 Introduction

- 7.1.1 This chapter sets out the proposed scope of the Ecological Impact Assessment relating to the project and potential effects on habitats and species during both construction and operation. The approach is based on guidance provided in the Guidelines for Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management (CIEEM), 2019).
- 7.1.2 The project has the potential to affect biodiversity through a number of ways as the new 400kV overhead line, removal of the 132kV overhead line, installation of underground cables, construction of the CSE compounds and the GSP substation could affect biodiversity through disturbance, habitat loss/fragmentation, direct injury or mortality. The construction phase could also cause more indirect effects such as pollution of watercourses, which could affect dependent habitats and species.
- 7.1.3 The aspects included within this chapter comprise:
- statutory ecological designated sites;
 - non-statutory ecological designated sites;
 - habitats and vascular plants;
 - protected and notable species; and
 - invasive and non-native species (INNS) – plant and animal.
- 7.1.4 This chapter considers both terrestrial (e.g. grassland, woodland, hedgerows) and freshwater environments (e.g. watercourses and ponds).
- 7.1.5 This chapter has links with other chapters, including Chapter 9: Water Environment, Chapter 10: Geology and Hydrogeology, Chapter 13: Air Quality, and Chapter 14: Noise and Vibration.
- 7.1.6 This chapter is supported by the following appendices (Volume 2) and figures (Volume 3):
- Appendix 7.1: Biodiversity Supporting Information;
 - Appendix 7.2: Ecological Survey Methodology;
 - Appendix 7.3: Draft Habitats Regulations Assessment Screening Report;
 - Figure 7.1: European Designated Sites;
 - Figure 7.2: Statutory and Non-Statutory Designated Sites;
 - Figure 7.3: Priority Habitats and Ancient Woodland;
 - Figure 7.4: Phase 1 Habitat Survey; and
 - Figure 7.5: Biodiversity Baseline for Selected Receptors.

7.2 Regulatory and Planning Policy Context

- 7.2.1 Chapter 2 Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which has been considered within this chapter. Paragraph 5.3.3. of 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.'

7.2.2 Paragraph 5.3.14 in 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'*.

7.2.3 EN-1 is supported by EN-5, which contains the following paragraphs in 2.7.1 and 2.7.2 relating 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.'

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.'

7.2.4 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to Biodiversity. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy considerations relevant to Biodiversity.

7.3 Approach and Methods

7.3.1 This scoping process, and the proposed assessment EIA methodology, has been undertaken with reference to guidance provided in the CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019a) (hereafter referred to as 'the CIEEM guidelines'). In the proposed assessment, the term 'biodiversity receptor' will be used in preference to 'ecological feature' as is used in the CIEEM Guidelines. This is to provide consistency between different discipline chapters within the ES.

7.3.2 The CIEEM Guidelines (2019a) recommend that the technical scope of the assessment should comprise those biodiversity receptors (as defined above) 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.

7.3.3 As such, the source-pathway-receptor approach has been followed in this Scoping 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 ZOI was defined, and the pathway recorded. For a significant effect to occur, all three elements of the concept must be in place. The absence or removal of one of the elements means there is no likelihood for the significant effect to occur.

- 7.3.4 A separate assessment relating to potential likely significant effects to European sites (Special Protection Area (SPA), Special Area for Conservation (SAC) and Ramsar sites, including potential sites) is provided in Appendix 7.3: Draft Habitats Regulations Assessment Screening Report. The final HRA Screening Report will be produced in parallel with the ES to determine whether the project will have any likely significant effects on European sites.
- 7.3.5 Compliance with the legislation relating to the protection of species of fauna will be assessed in a Biodiversity Legislation Compliance Report. This report will be provided as an appendix to the ES and would address all relevant legally protected and controlled species, regardless of whether these had been scoped in or out of the ES.
- 7.3.6 Draft European protected species (EPS) licences are not proposed to be submitted with the application for development consent, as sufficient information on mitigation and legal compliance will be provided in the ES chapter and supporting appendices (including the Biodiversity Legislation Compliance Report). This information will be provided to Natural England to satisfy their requirements that a robust assessment has been undertaken and 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 Order is granted.
- 7.3.7 Great crested newt (GCN) (*Triturus cristatus*) will be subject to a District Level Licence. This will not require any field work so no further assessment is required and GCN will not be considered any further in this chapter. This approach by National Grid has been agreed through discussions with Natural England.
- 7.3.8 National Grid has a target to seek 10% biodiversity net gain (BNG) on its projects. This project will identify potential areas for BNG using the most recent methodology. At present, this is Biodiversity Metric 2.0 (Defra, 2019a) which is anticipated to be updated in spring 2021. Although not currently a requirement of NSIPs, the 10% BNG is expected to be included within the application for development consent. Specific measures will be set out within the Outline LEMP.

7.4 Study Area

- 7.4.1 The study area for the project varies with the different biodiversity receptors. In summary the study areas comprise (as shown on Figures 7.1 and 7.2):
- internationally important statutory designated sites (SPAs; SACs; and Wetlands of International Importance (Ramsar sites) within 2km of the Scoping Boundary, extending to 30km for SACs where bats are the qualifying interest and European sites hydrologically connected to the project that occur within 10km);
 - nationally designated statutory designated sites (SSSIs; National Nature Reserves (NNRs); and Local Nature Reserves (LNRs)) within 2km of the Scoping Boundary;
 - non-statutory sites of local nature conservation importance (County Wildlife Sites (CWSs); Local Wildlife Sites (LWSs) and Roadside Nature Reserves (RNRs); ancient woodland, and habitats of principal importance (referred to as Priority habitats in this report) within 1km of the Scoping Boundary; and
 - desk study records of protected or otherwise notable habitats and species, veteran or ancient trees within 1km of the Scoping Boundary.

7.5 Existing Baseline

Desk Sources

7.5.1 The baseline assessment has been informed by a desk study which has drawn on the following 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, 2021);
- non-statutory designated sites information has been provided by Suffolk Biodiversity Information Service (SBIS) and Essex Wildlife Trust Biological Records Centre;
- Natural England Open Data Geoportal was consulted for designated sites, Ancient Woodland, Priority habitats, GCN licence returns and risk zones, and freshwater ecology datasets;
- species records were requested in 2021 from SBIS, Essex Wildlife Trust Biological Records Centre, North Essex Badger Group, Essex Field Club, British Trust for Ornithology (who also hold records from Suffolk Bird Recorder and Essex Bird Watching Society), Suffolk Badger Group, Froglife (Toad Patrol areas), Royal Society for the Protection of Birds (RSPB); and
- aerial photography and Ordnance Survey maps were reviewed.

Field Survey

7.5.2 Ecological field surveys for the project were undertaken between 2009-2013, prior to the project pause. A summary is provided in Table 7.1. Appendix 7.2: Ecology Survey Methodology provides further details about the previous surveys and the approach proposed for additional field surveys on the project.

Table 7.1: Surveys Undertaken (2009 – 2013)

Survey	Methods
Habitats	
Extended Phase 1 habitat survey	The survey was undertaken for the project between 2011 and 2012. The survey was undertaken in line with Joint Nature Conservation Committee (2010) guidelines.
Grassland National Vegetation Classification (NVC)	Surveys were undertaken in summer 2012 on grasslands of interest identified during the extended Phase 1 habitat survey. The Rodwell (2006 and 1998) methodology was used.
Hedgerow Survey	Surveys were undertaken in spring and summer 2012 and spring 2013 on hedgerows intersected by the project in order to identify 'important hedgerows' in accordance with the Hedgerows Regulations 1997.
Woodland NVC Survey	Woodlands of interest identified during the extended Phase 1 habitat surveys were surveyed in spring and summer 2012 using the NVC methodology (Rodwell, 2006 and 1998).

Survey	Methods
Species	
Badger	Badger (<i>Meles meles</i>) surveys were undertaken as part of the extended Phase 1 habitat survey. All signs of badger and setts were recorded and mapped.
Bat Roosts - Ground Level Roost Assessment of Trees	In 2013 trees within 100m of the project were ground assessed for bat roosting potential in accordance within the Bat Conservation Trust 2012 guidelines (hereafter referenced as Hundt, 2012).
Bat Roosts – Tree Emergence and Re-entry Surveys	Trees identified with a 1 or 1* category for roosting potential were surveyed for bat roosts in accordance with Hundt (2012).
Bat Activity - Transect Surveys	Surveys were undertaken for the project 2012 and 2013 in line with Hundt (2012). <ul style="list-style-type: none"> Walked transects used PRoWs and publicly accessible land and were repeated once a month in July, August and September (six). Static surveys were undertaken July to October focusing on linear habitat features (26 locations).
Birds - Breeding Bird Survey	Transects and point counts were undertaken during two morning visits (April to June), four weeks apart in 2012. Species and activity patterns were recorded.
Birds - Raptor Vantage Point Survey	Vantage point surveys for raptors were undertaken between April and September 2010 with additional observational records in 2011
Birds - Wintering Bird Survey	Surveys were undertaken on a monthly basis during winters 2009/10 and 2010/2011 which focused on potential 'hotspots' for roosting lapwing (<i>Vanellus vanellus</i>) and golden plover (<i>Pluvialis apricaria</i>) from desk study data.
Dormouse Survey	Habitat survey data were used to identify suitability for dormouse with subsequent nest tube surveys undertaken April to December 2012. Surveys were undertaken in line with Dormouse Conservation Handbook (Bright <i>et al.</i> , 2006).
Reptile Survey	A habitat suitability assessment was undertaken for reptiles and followed with presence/absence surveys (Froglife, 1999) in targeted locations using artificial refuges.
Riparian Mammal Survey	Surveys for riparian mammals were undertaken at rivers, streams and suitable field ditches for the project for at least 50m along watercourses either side of the proposed alignment. Surveys followed guidance set out in the Water Vole Conservation Handbook (Strachan, 2006). Signs of otter (e.g. runs, feeding remains, couches, holts, spraints) were also searched for.
Terrestrial Invertebrate Survey	Semi-natural broad-leaved woodland, species diverse grassland, unimproved acid grassland, ponds and swamps, rivers and streams and species-rich hedgerows were identified for field survey in May and August 2013 using techniques described by Drake <i>et al.</i> (2007) which included direct observation, sweep netting, hand searching, aquatic netting, beating and pitfall traps.

Baseline Environment

Statutory Designated Sites

7.5.3 Statutory designated sites within their respective study area are detailed in full in Appendix 7.1: Biodiversity Supporting Information and are shown on Figure 7.1: European Designated Sites and Figure 7.2: Statutory and Non-Statutory Designated Sites. Appendix 7.1 details the location and approximate distance of designated sites from the Scoping Boundary and the reason for designation. Designated sites within the study area comprise:

- The Stour and Orwell Estuaries SPA/Ramsar site is located approximately 5.8km east of the Scoping Boundary and is hydrologically connected by the River Stour, River Box, River Brett and Belstead Brook. The 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.
- Three SSSIs are located within 2km of the Scoping Boundary: Hintlesham Woods SSSI is designated for its ancient woodland habitat and breeding bird assemblage and also forms part of a RSPB Reserve; Arger Fen SSSI is designated for woodland, fen and acid grassland habitats; and Cornard Mere, Little Cornard SSSI is designated for fen and wetland areas. The value of these sites is high as the sites are of national importance.
- Five LNRs are located within 2km of the Scoping Boundary: Hadleigh Railway Walk LNR (woodland copse and hedgerows); Hadleigh LNR (woodland), Tiger Hill LNR (heathland, fen and woodland with hazel dormouse (*Muscardinus avellanarius*)); 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

7.5.4 There are 36 Suffolk CWSs, 19 Essex LWSs and two Suffolk RNRs within the study area, see Appendix 7.1: Biodiversity Supporting Information and Figure 7.2. The value of these sites is medium because the sites are of county importance.

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 would 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 the 1km study area, several of which are located within the Scoping Boundary. Based on their designation and the irreplaceable nature of this habitat, these sites are valued as high. Ancient Woodland Inventory sites are shown on Figure 7.3.

7.5.7 Priority habitats within the study area comprise lowland mixed deciduous woodland, wet woodland, traditional orchards, coastal and floodplain grazing marsh, lowland meadows, lowland fens, lowland dry acid grassland, hedgerows, rivers and ponds (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 within the Scoping Boundary are summarised in Table 7.2. The value of these Priority habitats is medium

because the habitats are of county importance. A precautionary high value is given to lowland fen due to its 'irreplaceable' definition as per the NPPF (MHCLG, 2019c).

Table 7.2: Summary of Habitats

Habitat Types	Description	Value
Priority habitats	Uncommon habitats within the study area. Listed in accordance with Section 41 of the Nature Environment and Rural Communities (NERC) Act 2006 as habitats of principal importance in England. There is low to high difficulty in creation of these habitats depending on their features.	High-Medium
All other habitats recorded	Considered widespread and commonly occurring habitats including arable; scrub; amenity grassland; bare ground; introduced shrub; semi-improved grassland; tall ruderal; and plantation (mixed, coniferous and broad-leaved).	Low
Arable plant assemblage	Arable plant assemblage comprises a number of notable species.	Medium
Vascular plant assemblage	The general vascular plant assemblage across the project is of negligible value	Negligible

7.5.8 Groundwater dependent terrestrial ecosystems (GWDTEs) within the Scoping Boundary include Bushy Park Wood CWS (wet woodland), Sproughton Park CWS (wet grassland and wet woodland), Valley Farm Meadows CWS (wet grassland), Alphamstone Complex LWS (wet woodland and swamp) and Ansell's Grove/Ash Ground LWS (wet woodland). 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 to 2013 identified valuable habitats including semi-natural ancient woodlands, wet woodlands, species-rich hedgerows, river valleys and ponds. A preliminary desk review using recent aerial photography has been undertaken to update the original Phase 1 habitat survey findings. This is shown on Figure 7.4.

7.5.10 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).

Vascular and Lower Plants

7.5.11 The desk study identified the presence of notable plant species within the Scoping Boundary, most of these were connected with designated sites. The most notable species identified were: 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); and lesser calamint, a nationally scarce species and categorised as Vulnerable in the Red Data List. The sites where lesser calamint has been recorded on road verges (where it is now largely confined) have been designated.

7.5.12 Other plant species listed as Vulnerable in the Vascular Plant Red Data List for Great Britain (Cheffings and Farrell, 2005) recorded within the Scoping Boundary comprised dwarf spurge (*Euphorbia exigua*) and prickly poppy (*Papaver argemone*). Species listed

as Near Threatened in the Red List and present within the Scoping Boundary were common cudweed (*Filago vulgaris*); field woundwort (*Stachys arvensis*); and hoary cinquefoil (*Potentilla argentea*).

- 7.5.13 Outside of the Scoping Boundary, additional notable plant species were recorded including a variety of orchid, helleborine and twayblade species associated with woodlands and species related to arable field margins: corn spurrey (*Spergula arvensis*); annual knawel (*Scleranthus annuus*) and field woundwort (*Stachys arvensis*).

Species

- 7.5.14 The desk study and field surveys to date have confirmed the presence of several legally protected and notable species within 1km of the Scoping Boundary. These are summarised below and given a precautionary value, to be updated as necessary in the future assessment. Further details on the previous field survey results can be found in Appendix 7.2: Ecology Survey Methodology.

Bats

- 7.5.15 The following bat species have been recorded in the study area:

- 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*); and
- serotine (*Eptesicus serotinus*).

- 7.5.16 High value bat species are also present, including a known roost of Annex II species barbastelle bat (*Barbastella barbastellus*) in Ramsey Wood, near Hintlesham. Barbastelle bat activity was also recorded during bat surveys in 2012/3 in the centre of the project.

- 7.5.17 Bats are likely to be roosting in trees and agricultural buildings within the Scoping Boundary. Previous surveys identified a number of bat roosts in trees comprising pipistrelle and some unknown species.

- 7.5.18 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 it was not possible to identify species specific to the confirmed bat roosts in trees in 2012/3.

- 7.5.19 Most of the Scoping Boundary is 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 to the east and connective hedgerow habitats within the Scoping Boundary 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.

Badger

- 7.5.20 Badgers are common and widespread across the UK and are present in suitable habitat throughout the Scoping Boundary, particularly associated with woodland and woodland edge habitats. Considering the abundance, wide distribution and low conservation status of badger, a negligible value is given as they are of site level importance.

Breeding Birds and Raptors

- 7.5.21 There are numerous records of birds within the study area. These include species that have increased levels of legal protection or are listed under LBAPs and/or Section 41 of NERC Act 2006. Hintlesham Woods SSSI has breeding buzzard (*Buteo buteo*) and kestrel (*Falco tinnunculus*). Hobby (*Falco subbuteo*) have been recorded breeding in Brimlin Woods.
- 7.5.22 The project is linked to the Stour and Orwell Estuaries SPA/Ramsar which designated for breeding avocet (*Recurvirostra avosetta*). However, no records for avocet have been identified in the study area in the desk study or field survey.
- 7.5.23 Breeding birds, including notable species, could be present in almost all habitats within the Scoping Boundary, including arable field, grassland, hedgerow and woodland.
- 7.5.24 Seventy-eight bird species were recorded during the bird surveys; 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.
- 7.5.25 As such, 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, breeding birds and raptors outside of statutory designated sites are valued as low, as they are of local importance.

Fish and Aquatic Receptors

- 7.5.26 Aquatic receptors are known to be present within the Scoping Boundary including those within rivers, minor tributaries, ditches and ponds. These features have the potential to support species of conservation and recreational interest including macroinvertebrates, fish, aquatic flora and INNS.
- 7.5.27 The fish communities with migratory life stages are particularly sensitive to in-channel works and so are considered to be of medium value as they are of county importance. This includes rivers known to support European eel (*Anguilla anguilla*), lamprey species and sea trout (*Salmo trutta trutta*). Fish communities comprising non-migratory species are typically ubiquitous to watercourses in the Scoping Boundary. These communities have a lower sensitivity to change and are therefore assessed as being of low value, as they are of local importance.
- 7.5.28 Field surveys for aquatic macroinvertebrates in 2013 identified no nationally or locally important species. However, desk study data suggest some species of local value may be present. A low value is given as they are of local importance.
- 7.5.29 No notable or protected macrophytes species were identified during field survey in 2012 or 2013. However, a precautionary approach to valuing is used and a low value has been given, as they are of local importance.

Hazel Dormouse

- 7.5.30 Initial desk study has identified hazel dormouse presence within the study area. Eastern Essex and Suffolk are on the edge of the dormouse UK range (People's Trust for Endangered Species, 2021) and are mostly confined to the south of the county 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 Scoping Boundary 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 Scoping Boundary is typically well connected to these wider landscape habitats by hedgerows and lines of trees.
- 7.5.32 Field survey undertaken by Suffolk Wildlife Trust (SWT) in 2021 confirmed presence of dormouse across the Scoping Boundary, with a suggestion that all suitable habitats may support dormouse even if they were not confirmed as present in the field survey. The population recorded was spread over a wide geographical area and was not focused on a specific location. Those 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.

Riparian Mammals

- 7.5.33 Initial desk study suggests the recent recorded presence of otter (*Lutra lutra*) and water vole (*Arvicola amphibius*) within the study area. Desk study records of water vole and otter were identified within the last 15 years on the Rivers Box, Brett and Stour. Field survey in 2013 confirmed presence of water vole on the River Box and evidence of otter on watercourses sporadically throughout the Scoping Boundary.
- 7.5.34 A national water vole survey carried out in the 1990s suggested water vole were on the brink of extinction in Essex and Suffolk. However, the Water for Wildlife Project run by the SWT has undertaken habitat management and mink control resulting in presence of water vole in most suitable Suffolk habitat (SWT, 2021b) where mink are controlled (SWT, 2021a). As such, water vole are considered present in the Scoping Boundary and are valued as medium as they are of county level importance.
- 7.5.35 Otter are considered widespread in Suffolk (SWT, 2021a). The desk and field study suggest the watercourses in the Scoping Boundary are unlikely to make a significant contribution to breeding, commuting or foraging otter. However, otter have the potential to use any watercourses occasionally and as such otter are precautionarily valued as medium as they are of county level importance.

Reptiles

- 7.5.36 The 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.
- 7.5.37 The reptile species recorded 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

- 7.5.38 Hintlesham Woods SSSI and Arger Fen SSSI, which 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 it is thought to be expanding its range.

7.5.39 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 Scoping Boundary.

7.5.40 Although individuals of terrestrial invertebrate species of principal importance may be sensitive to potential impacts, the local populations and assemblage of those is 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. As such, terrestrial invertebrate assemblages outside of designated sites are valued as low as they are of local importance.

Wintering Birds

7.5.41 Initial desk study has identified limited wintering bird diversity within the study area. A winter bird survey was undertaken for the Scoping Boundary and three other route corridor options in 2009/2010 and 2010/2011. These identified low numbers of lapwing (*Vanellus vanellus*), a single golden plover (*Pluvialis apricaria*) and waders or wildfowl species limited to occasional mallard (*Anas platyrhynchos*) and mute swan (*Cygnus olor*). 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 in the study area is low. As such, wintering bird assemblages outside of designated sites are valued as low as they are of local importance.

7.5.42 The project is hydrologically linked to the Stour and Orwell Estuaries SPA and Ramsar, which are designated for overwintering bird populations. However, the desk and field study 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 the Scoping Boundary are not functionally linked with the European site. This is further discussed in Appendix 7.3: Draft Habitats Regulations Assessment Screening Report.

Other Notable Species

7.5.43 Initial 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 NERC Act 2006 as species of principal importance and include brown hare (*Lepus europaeus*), harvest mouse (*Micromys minutus*), polecat (*Mustela putorius*) and hedgehog (*Erinaceus europeus*). Froglife identified one toad (*Bufo bufo*) within the study area.

7.5.44 These species are relatively common and widespread in the study area but have elevated conservation status. As such these are given a low valuation as they are of local importance.

Invasive Non-Native Species

7.5.45 The following INNS listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) have been identified in the study area from initial 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*).

7.5.46 Invasive aquatic invertebrate species, not listed in legislation, have also been recorded namely Jenkins' Spire Snail (*Potamopyrgus antipodarum*); and freshwater shrimp species *Crangonyx pseudogracilis/floridanus*.

7.5.47 INNS do not have intrinsic value and will therefore be considered of negligible value in the assessment.

Future Baseline

7.5.48 Large parts of land within the Scoping Boundary is 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.

7.5.49 In general, hedgerows, woodlands and trees are likely to be retained by landowners, although these may be subject to routine management activities. However, 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, 2016b). Even so, unpredictable changes in the biodiversity value or spatial extent of semi-natural habitat are unlikely to occur.

7.5.50 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, 2021). As such further hedgerow, woodland and habitat connection planting can be expected in the area.

7.5.51 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 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 Embedded and Good Practice Measures

7.6.1 The project has avoided sensitive receptors as far as practicable, such as the avoidance of statutory designated sites and ancient woodland through the routing of the Indicative Alignment. The designs also include embedded measures, that would avoid or reduce the potential environmental effects on ecological receptors, for example the trenchless crossing proposed at the River Stour.

7.6.2 The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures relating to Biodiversity. These include, but are not limited to, the following key commitments:

- B01: The contractor(s) will comply with relevant protected species legislation. Appropriate licences will be obtained where necessary from Natural England for all works affecting protected species as identified by the ES and through pre-construction surveys. All applicable works would be undertaken in accordance with the relevant requirements and conditions set out in those licences.
- B02: The assumption will be that vegetation with the potential to support breeding birds will not be removed during the breeding bird season (March to August inclusive). If any works become necessary during the breeding bird season, works will be supervised by an Environmental Clerk of Works. Appropriate protection measures should be put in place should active nests be found. These will include exclusion zones around active nests until chicks fledge or nests become inactive as determined by monitoring by the Environmental Clerk of Works.
- B03: Where there will be a risk of animal entrapment, a means of escape would be installed into all excavations left open overnight.
- B04: To control the spread of invasive weeds in accordance with the Wildlife and Countryside Act 1981, any plant or machinery that has been used in areas infested with invasive species (both terrestrial and aquatic), such as Japanese knotweed and Himalayan Balsam, will be thoroughly cleaned. Water used to clean vehicles will be controlled to prevent the spread of the plant (through seeds, rhizomes, fragments, etc.). The area will be cordoned off to prevent any inadvertent spreading.
- B05: All habitats suitable for common reptiles will be subject to two-stage habitat manipulation that will take place between mid-March and mid-October. Firstly, vegetation will be cut to approximately 150mm (with the arisings removed) under the supervision of an Environmental Clerk of Works and the site left for a minimum of two days to allow reptiles to naturally disperse from the area. Secondly, vegetation will be cleared down to ground level under the supervision of an Environmental Clerk of Works. Vegetation will be cleared using appropriate equipment based on the type of vegetation to be removed, the area affected, and the risk of mortality or injuring reptiles. Construction works could commence immediately after completion of the second stage. Reptile hibernacula will be retained and protected during construction where practicable. If unavoidable, the removal of vegetation and groundworks at hibernacula will be timed to avoid the hibernation season (late October to early March). Replacement hibernacula and refugia will be provided.
- B06: Alternative roost structures (bat boxes) will be provided (with landowner consent) on retained trees within the Order Limits or areas outside of the Order Limits agreed with landowners. Three boxes will be provided for each trees with moderate bat roost potential to be felled. Five boxes will be provided for each trees with high bat roost potential to be felled.
- B07: Where the works require the crossing or removal of hedgerows, the gap will be reduced to a width required for safe working. Where hedge removals are necessary, 'dead hedging' should be used, where practicable, in the interim periods to retain connectivity during construction. Dead hedging can comprise vegetation arisings or artificial provision, such as willow screening panels or Heras fencing covered in camouflage netting. New hedgerow planting will contain native, woody species of local provenance.

7.6.3 Numerous other measures cover other disciplines which have a beneficial impact on biodiversity, e.g. measures to control pollution events (GG14) and surface runoff (GG15),

dust management (GG17, GG18 and GG19) and measures to maintain hedgerow connectivity (B07).

7.7 Likely Significant Effects

- 7.7.1 This section sets out the likely significant effects of the project on biodiversity receptors. It assumes that the relevant embedded measures and good practice measures set out within the Outline CoCP are in place before assessing the effects.
- 7.7.2 This scoping chapter does not replace the detailed assessment that would be undertaken as part of the HRA or the details that will be provided within the Biodiversity Legislation Compliance Report.
- 7.7.3 The project has the potential to affect both freshwater and terrestrial habitats and species of biodiversity value within the project's Zone of Influence (ZOI; the area within which a project activity may be experienced). The direct effects of electricity reinforcement projects on biodiversity are generally confined to the construction period. They are usually temporary, reversible and short in duration, although permanent effects can arise in specific circumstances, (for example through changes to hydrological processes) and around the footprint of permanent structures, such as at the Grid Supply Point (GSP) Substation and CSE compounds, changes to hydrological processes, and around the footprint of permanent structures, such as at the GSP Substation and CSE compounds.

Identification of Biodiversity Receptors

- 7.7.4 The identification of biodiversity receptors considered during the Scoping assessment has been informed by a combination of desk study, a review of the previous ecological survey results, stakeholder engagement and professional judgement. The receptors have been selected based on an understanding of their value and the potential for the project to result in direct and indirect significant effects.

Ascribing Value

- 7.7.5 The criteria used to determine the value of biodiversity receptors are set out in Table 7.3. These values are based on CIEEM Guidelines (2019a). In this Scoping Report and the subsequent ES, the term 'value' will be used in preference to 'importance' in order to provide consistency in terminology between different topic chapters within the EIA. The corresponding importance and value categories are detailed in Table 7.3.

Table 7.3: Ascribing Value of Biodiversity Receptors in the EIA

CIEEM importance	Value	Criteria
International	Very high	European designated sites: SPAs; potential SPAs; SACs; candidate or possible SACs, and Wetland of International Importance (Ramsar sites).

CIEEM importance	Value	Criteria
National	High	<p>Statutory designated sites, comprising SSSIs and NNRs.</p> <p>'Irreplaceable natural habitat' e.g. ancient woodland, veteran trees, blanket bog, limestone pavement, sand dunes, saltmarsh and lowland fen.</p> <p>Species recorded as 'critically endangered' under the International Union for Conservation of Nature Red List of Threatened Species; resident or regularly occurring populations of species which may be considered at an international or national level where either of the following criteria is met:</p> <ul style="list-style-type: none"> the loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or the population forms a critical part of a wider population at this scale. <p>Nationally Rare or Scarce taxa: Nationally Rare taxa are those occurring in 15 or fewer 10x10km OS grid-squares in the UK; Nationally Scarce species are those occurring in 16-99 10x10km squares.</p>
County/regional	Medium	<p>Statutory designated sites: Local Nature Reserves.</p> <p>Non-statutory designated sites; (i.e. Essex Local Wildlife Sites Suffolk CWSs and Roadside Nature Reserves.</p> <p>Areas of key/Priority habitats or species identified in the Local Biodiversity Action Plan (LBAP).</p> <p>Species or habitats listed in accordance with the requirements of Section 41 of the NERC Act 2006.</p> <p>Resident or regularly occurring populations of species which may be considered at a regional or county level where either of the following criteria is met:</p> <ul style="list-style-type: none"> the loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or the population forms a critical part of a wider population at this scale.
Local	Low	<p>Receptor is relatively common and widespread (e.g. it is listed in accordance with the requirements of Section 41 of NERC Act 2006, LBAPs, Birds of Conservation Concern Red or Amber listed, Red Data Book listed and/or is legally protected).</p>
Site	Negligible	<p>Receptor is abundant and widespread, receives no legal protection and is not of elevated conservation concern status.</p>

Identification of Impact Pathways

- 7.7.6 The potential impacts from the project, and the ZOI within which receptors might experience effects, are listed in Table 7.4. It is important to highlight that the ZOI for each of the impacts is the same for all aspects of the project but the physical area covered by the ZOI would be much larger for the underground cable sections where working widths are likely to be 100m wide, compared to the far more restricted overhead line sections where impacts will mainly be limited to the construction footprint of a haul road and the pylon bases.
- 7.7.7 Assessment has been made as to whether significant effects might arise. This enables a decision on whether the impact pathway and/or receptor can be scoped out of the ES. It

is possible that due to the physical extent of potential impacts, the same potential impact may be scoped out in the overhead line assessment but be scoped in for the underground cable assessment.

Table 7.4: Summary of Potential Impact Pathways and Zones of Influence

Impact pathway	Zone of influence and rationale	Receptor potentially sensitive to the impact pathway for construction or operation
Mortality and injury of species	<p><u>Construction:</u></p> <p>Physical interaction between species and project machinery or activities e.g. vegetation clearance and groundworks, that would be limited to areas within the construction working area.</p>	<p>Badger</p> <p>Bats</p> <p>Birds</p> <p>Hazel dormouse</p> <p>Riparian mammals</p> <p>Reptiles</p> <p>Fish and other aquatic fauna</p> <p>Other notable species</p>
	<p><u>Operation:</u></p> <p>Physical interaction between species and new permanent overhead line infrastructure. However, the existing 132kV overhead line will be removed, reducing potential impact.</p>	<p>Birds</p> <p>Bats</p>
Habitat loss, fragmentation or severance	<p><u>Construction:</u></p> <p>Habitat loss would be restricted to areas cleared for construction activities e.g. temporary habitat loss at construction compounds, haul routes, cable trenches. The removal would be generally 100m wide for underground cable areas.</p> <p>There could be permanent habitat loss at the GSP substation, CSE compounds and around pylon bases.</p> <p>Retained habitats within the project may be temporarily fragmented between the period when vegetation/topsoil clearance works start and habitat reinstatement and creation are completed.</p>	<p>Ancient woodland and veteran trees</p> <p>Priority habitats</p> <p>Vascular and lower plants</p> <p>Badger</p> <p>Bats</p> <p>Birds</p> <p>Hazel dormouse</p> <p>Riparian mammals</p> <p>Fish and other aquatic fauna</p> <p>Other notable species</p>
	<p><u>Operation:</u></p> <p>The presence of new structures i.e. GSP substation, pylons, conductors and CSE compounds in the landscape could have a severance/displacement effect on mobile species in flight. However, the removal of the 132kV overhead line will reduce the potential impact.</p>	<p>Bats</p> <p>Birds</p>
Species disturbance (from changes in levels of noise,	<p><u>Construction:</u></p> <p>Disturbance could arise from construction activities, including construction plant and machinery. Temporary</p>	<p>Badger</p>

Impact pathway	Zone of influence and rationale	Receptor potentially sensitive to the impact pathway for construction or operation
vibration, visual and light stimuli)	security lighting would be required to illuminate site compounds, where trenchless crossing works extend into night-time hours or in winter at specific works areas.	Bats (within roosts only) Birds Hazel dormouse Riparian mammals Fish and other aquatic fauna Other notable species
	<p><u>Operation:</u> There would be no changes to noise, vibration or visual stimuli during operation.</p> <p>The only operational lighting would be at the GSP substation and possible CSE compounds. Lighting would only be switched on when operational staff are there and it is needed.</p>	None
Air quality changes (resulting in habitat loss/modification)	<p><u>Construction:</u> Air quality changes could occur through dust and changes in pollutant levels caused by emissions from construction plant and machinery. Vehicle emissions can occur up to 200m from their origin (Institute of Air Quality Management, (IAQM), 2020) and the impact of dust on biodiversity can occur up to 50m from the works (IAQM, 2014).</p>	Statutory designated sites Non-statutory designated sites
	<p><u>Operation:</u> Changes in air quality are not anticipated during operation.</p>	None
Hydrological changes in surface water and groundwater (resulting in mortality/injury of species and/or habitat loss/modification)	<p><u>Construction:</u> Changes to groundwater flows or levels due to temporary dewatering works at locations of cable trenching, trenchless crossings and during construction of foundations.</p> <p><u>Operation:</u> Changes to groundwater flows or levels due to underground features such as cables and foundations.</p>	<p>GWDTEs which could include statutory and non-statutory designated sites and priority habitats Fish and other aquatic fauna</p> <p>GWDTEs which could include statutory and non-statutory designated sites and priority habitats Fish and other aquatic fauna</p>
Introduction and/or spread of INNS (resulting in habitat loss/modification)	<p><u>Construction:</u> Effects associated with INNS would only likely be experienced within the immediate vicinity of areas where machinery movements, soil stripping, storage and habitat reinstatement would be undertaken.</p>	Statutory designated sites Non-statutory designated sites Priority habitats Vascular and lower plants

Impact pathway	Zone of influence and rationale	Receptor potentially sensitive to the impact pathway for construction or operation
	<p>However, there is potential for wider effects to occur where works would be within the vicinity of flowing watercourses.</p>	
	<p><u>Operation:</u></p>	
	<p>No impacts from INNS are predicted during operation.</p>	<p>None</p>

Mortality and Injury of Species

- 7.7.8 During the construction phase, the following activities could potentially result in mortality and injury of species receptors: vegetation clearance; topsoil clearance; watercourse crossings; and entrapment in excavations. Significant effects could arise if protected or notable species are affected because they cannot avoid the works. Good practice measures set out in the Outline CoCP would reduce the risk, for example regarding works avoiding bird nesting season (commitment B02) and through using escape measures in excavations (commitment B03). These are likely to avoid any significant effect but until there is certainty on the extent and presence of certain species, this impact pathway will be scoped into the ES for relevant species.
- 7.7.9 Potentially species could also be killed or injured through collision with construction machinery. This is not expected to affect any nocturnal species since construction will not (in the main) be undertaken at night. The likelihood that significant effects could arise from this pathway is low and is therefore scoped out of the ES.
- 7.7.10 Paragraph 2.7.1 of EN-5 identifies a risk of bird collision with overhead lines. It states *'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'*.
- 7.7.11 Bat and bird collisions with pylons and overhead lines in the operational phase is scoped out of assessment as there will be the same number of overhead lines in the landscape as at present (due to the removal of the 132kV overhead line) and in underground cable sections there will be one less, effectively reducing any risk of collision. The new 400kV overhead line will be taller than the existing 132kV overhead line, with pylons c.50m compared to the existing 30m. However, the new 400kV overhead line will be a similar height to the existing 400kV overhead line, so there is unlikely to be any additional risk of collision and this is scoped out of the ES.
- 7.7.12 The proposed 400kV overhead line will use the alignment of the existing 400kV overhead line through Hintlesham Woods SSSI (designated for its breeding bird assemblage). The existing 400kV overhead line would be diverted to the north and west of the woods. No significant effect is anticipated as the pylons would be approximately 50m in height, far in excess of the height of the woodland where bats and birds would be most active. In addition, the 132kV overhead line is proposed to be replaced with underground cables in the Stour Valley and Dedham Vale AONB, to result in an overall reduction in overhead lines through the study area. Therefore, this is unlikely to result in any adverse significant effects due to collisions with overhead lines and is therefore scoped out of the ES.

Habitat Loss/Gain and Fragmentation

- 7.7.13 Construction work will require the temporary loss of terrestrial and aquatic habitats likely to be used by protected and notable species. Permanent habitat loss would be limited to the footprint of the GSP substation, CSE compounds, pylon bases and permanent access tracks. As far as practicable, all other habitats would be reinstated on completion of construction and additional areas of planting and BNG would be implemented. All proposed habitat mitigation would be discussed and agreed with relevant stakeholders and would be set out in the LEMP.
- 7.7.14 Habitat fragmentation would occur where any linear features such as hedgerow, lines of trees or watercourses are temporarily removed. This can affect protected and notable species when foraging, commuting, or dispersing. This impact pathway is scoped into the ES for construction for relevant receptors in the underground cable sections.
- 7.7.15 Fragmentation in the overhead line sections will be reduced to the minimum required to allow safe working. Where practicable, the contractor will retain vegetation. Where vegetation is lost and trees cannot be replaced in situ due to the restrictions associated with land rights required for operational safety, native shrub planting approved by National Grid will be used as a replacement, in accordance with commitment LV01 in the Outline CoCP. As such, habitat fragmentation is scoped out of the ES for the overhead line sections.
- 7.7.16 No habitat loss is proposed during the operation phase. As such, significant effects could not arise and this is scoped out of the ES.

Species Disturbance (Changes in Noise, Vibration, Visual and Light Stimuli)

- 7.7.17 Disturbance to aquatic and terrestrial species could occur during construction from: lighting, compound set up, vegetation removal, construction and reinstatement. There is the potential for disturbance to protected or notable species. Noise, vibration and lighting for a project are all controllable by existing good practice measures set out within the Outline CoCP. However, noise and vibration will be scoped in during the construction phase on a precautionary basis as extent and presence is uncertain for some species. This is likely to be focused on areas of static working such as at the GSP substation, CSE compounds and the temporary construction compounds.
- 7.7.18 Provision of artificial lighting is likely to be confined to where 24-hour works are required for example at trenchless crossings and where security lighting is required such as the site compounds. Lighting would be controlled to be the lowest luminosity necessary for safe delivery of each task and would be designed to avoid spill into adjacent habitats (commitment GG20). Therefore, effects from lighting are scoped out of the ES.
- 7.7.19 No change to noise, vibration, or visual stimuli during the operational phase is anticipated, with only limited lighting provided at the GSP substation for occasional maintenance visits. As such, no significant effects are expected, and operational disturbance is scoped out of the ES.

Air Quality Change

- 7.7.20 Air quality changes can occur through dust and changes in pollutant levels caused by emissions from construction plant and machinery. Further details are set out in Chapter 13: Air Quality.
- 7.7.21 Dust can be controlled by existing good practice measures set out in the Outline CoCP (e.g. commitments GG03 and GG05). A dust risk assessment will be appended to the Outline Construction Environmental Management Plan (CEMP), which will outline any

further specific good practice measures required to control dust. No significant effects are anticipated and therefore effects due to dust are scoped out of the ES.

- 7.7.22 There would be an increase in traffic during construction, which could result in a deterioration in local air quality (PM10 and PM2.5) around the Affected Road Network (ARN) see Chapter 13: Air Quality. The traffic numbers and likely construction routes are not known at the current time and therefore the ARN is also not known. Once the ARN is identified, this will be reviewed to see if there are likely to be significant effects on ecological receptors from nitrogen deposition. This is currently scoped into the ES.
- 7.7.23 There would be limited emissions to air during the operational phase from maintenance activities due to the very low vehicles numbers (see Chapter 13: Air Quality). Therefore, this pathway to ecological sites is scoped out of the ES.

Hydrological Changes

- 7.7.24 Changes in hydrology, fluvial geomorphology and hydrogeology are important to terrestrial and aquatic ecology due to the following factors:
- water quality has an important role in structuring flora and fauna communities in watercourses, ponds and wetlands;
 - sediment and other pollutant releases have the potential to adversely affect sensitive ecological receptors;
 - ecological receptors can be sensitive to alterations of runoff regimes changing the quality of surface and groundwater; and
 - change in the hydrological regime due to the excavation and subsequent presence of the underground cables can affect groundwater levels in GWDTEs.
- 7.7.25 Although there may be direct impacts on watercourses in sections of underground cable, where open cut trenches are necessary to cross them, potential impacts on surface water changes can be controlled with existing good practice measures set out in the Outline CoCP (e.g. commitments GG03, GG14, GG15, GG16, W02, W05, W07) in order to avoid significant effects. There would be no generation of emissions to surface or groundwater in the operational phase. As such, potential impacts on surface water are scoped out of the ES for both construction and operation.
- 7.7.26 There is potential for excavation and presence of new subsurface infrastructure, such as underground cables and foundations, to impact groundwater flow (quality and amount). Further details can be found in Chapter 10: Geology and Hydrogeology. These could directly or indirectly affect GWDTEs, including wetlands, fens and wet woodland in the study area during both construction and operation. Change to groundwater regime during operation is scoped into the ES and will be focused on areas where deeper excavations are required, such as trenchless crossings, the GSP substation and the CSE compounds.

Introduction and Spread of Invasive Non-Native Plant and Animal Species

- 7.7.27 The introduction or spread of INNS could potentially cause significant adverse effects to sensitive habitats and species. Invasive species can easily dominate native species and lead to their decline.
- 7.7.28 During construction, topsoil or subsoil which potentially contains INNS plant material could cause the spread of seed or 'propagules' during such activities as excavation and vehicle movements. Invasive fauna, particularly waterborne macroinvertebrates and vascular plants can be transferred between watercourses by construction machinery and personnel. These risks would be controlled adequately through good practice measures

set out in the Outline CoCP (e.g. commitment B04) to avoid adverse significant effects. Further good practice measures will be set out within the LEMP.

- 7.7.29 There is considered to be a negligible risk of spreading INNS plants during the operation. As such, INNS are scoped out of the ES for both construction and operation.

Receptor Based Assessment

Scoped In

- 7.7.30 There is the potential for significant effects to occur on the following biodiversity receptors:

- statutory designated sites;
- non-statutory designated sites;
- ancient woodland and veteran trees;
- Priority habitats, including GWDTEs;
- arable plant assemblage;
- bats;
- birds (breeding, raptors and wintering);
- fish and aquatic fauna;
- hazel dormouse; and
- riparian mammals (otter and water vole).

- 7.7.31 Appendix 7.2: Ecology Survey Methodology details the scope of the proposed ecological surveys. The survey scope has been sent to Natural England for comment and their comments will be considered when finalising the scope of the surveys required to inform both the ES and post-application EPS licences.

Scoped Out

- 7.7.32 Potential for likely significant effects has been reviewed for the following receptors, which have been scoped out for the reasons given.

Vascular and Lower Plants

- 7.7.33 The general plant assemblage within the study area has been valued as negligible. Therefore, in accordance with the methodology, vascular and lower plants have been scoped out of the ES.

Great Crested Newt

- 7.7.34 Great crested newt will be subject to a District Level Licence, which will cover legal and EIA impacts on GCN. This approach by National Grid has been agreed through discussions with Natural England.

Badger

- 7.7.35 Badgers are common and widespread throughout the UK (Roper, 2010). The Protection of Badgers Act 1992 affords protection to badgers for welfare reasons and not because this species is of conservation concern. Given the conservation status of badger and the fact they are incredibly abundant in the study area, a negligible value has been given. Therefore, in accordance with the methodology, badger has been scoped out of the ES.
- 7.7.36 Issues relating to badger will be reported in a Biodiversity Legislation Compliance Report. This will accompany the ES and demonstrate how legal compliance will be achieved.

Reptiles

7.7.37 As the location and extent of the potential impacts on reptiles are well understood for this project (i.e. low populations within suitable habitat), reptiles will be scoped out of the further assessment. Standard techniques relating to habitat manipulation where reptiles are assumed present, in order to avoid injury or mortality, are uncontroversial and commonplace. These are included within the good practice measures set out in the Outline CoCP (e.g. commitment B05). Although individual reptiles may be sensitive to potential habitat loss or mortality and injury impacts, the local reptile population is not considered sensitive to any impact where a significant effect could occur. As such, reptiles are scoped out of the ES.

7.7.38 Issues relating to reptiles will be reported in a Biodiversity Legislation Compliance Report. This will form an appendix to the ES and will demonstrate how legal compliance will be achieved.

Terrestrial Invertebrates

7.7.39 Although individuals of terrestrial invertebrate species may be sensitive to potential impacts, the local populations and assemblage present is not considered sensitive to any impact which would be considered significant. Priority habitats, including woodlands, are scoped into further assessment thereby providing a proxy assessment for dependent terrestrial invertebrate species. The scale of the effect would be so low that that there would not be a significant effect and as such, terrestrial invertebrates are scoped out of the ES.

Other Notable Species

7.7.40 The desk study confirmed presence or likely presence of a number of Species of Principal Importance or 'priority species' such as brown hare, common toad, hedgehog and several species of invertebrate and birds. These notable species will be present within the study area at various densities depending on their specific habitat requirements and the quality of the habitat present. Potential effects will be indirectly included through the assessment of habitat loss. Therefore, separate assessment is considered unnecessary as there would not be a significant effect on notable species as a result of the construction or operation of the project and so this has been scoped out of the ES.

7.8 Proposed Assessment Methodology

7.8.1 This section sets out the proposed methodology for the Ecological Impact Assessment. This is based on the CIEEM Guidelines (CIEEM, 2019a) with some minor amendments to enable consistency of terms across the different topics in the EIA.

Characterisation of Effect

7.8.2 In accordance with the CIEEM Guidelines (CIEEM, 2019a), the characterisation of effect would be determined referring to the following characteristics:

- positive (beneficial) or negative (adverse);
- direct, indirect, cumulative;
- magnitude: size or amount of an impact, determined on a quantitative basis;
- extent: area measurements and percentage of total (e.g. percentage area of habitat or territory lost);

- duration: permanent or temporary in ecological terms (where differing timescales are determined in relation to the life cycle of the receptor, these would be defined);
- reversibility: whether the effect can be reversed, and whether or not this is planned; and
- timing and frequency: important seasonal and/or life-cycle constraints and any relationship with frequency considered.

Impact Magnitude

7.8.3 The criteria used to determine the magnitude of change are set out in Table 7.5.

Table 7.5: Criteria for Determining Magnitude

Magnitude	Description
Large	<p>Adverse: Total loss or major alteration to key elements or features of the baseline conditions to the extent that post-development character composition of baseline conditions will be fundamentally changed</p> <p>Beneficial: Large-scale or major improvement of quality; extensive restoration or enhancement; major improvement in attribute quality.</p>
Medium	<p>Adverse: Loss or alteration to one or more key elements or features of the baseline conditions to the extent that post-development character or composition of the baseline conditions will be materially changed.</p> <p>Beneficial: benefit to, or addition of key characteristics, features or elements; improvements of attribute quality</p>
Small	<p>Adverse or beneficial: Changes arising will be detectable but not material; the underlying character or composition of the baseline conditions will be similar to the pre-development situation.</p>
Negligible	<p>Adverse or beneficial: no change from baseline conditions</p>

Assessment of Significance

7.8.4 In accordance with CIEEM Guidelines, a significant effect is one that either supports or undermines biodiversity and/or conservation objectives for valuable biodiversity receptors.

7.8.5 The assessed degree of significance of effect is a function of a biodiversity receptor's value and the potential magnitude of impacts as caused by a given effect. To determine this, the guidance given in Table 7.5 would be used, together with professional judgement. Only those effects considered likely to result in a 'moderate' or 'major' significance of effect would be considered as significant. Where significant effects are predicted, additional mitigation would be applied to reduce the significance of potential effects, where practicable.

Limitations of Assessment

7.8.6 The original baseline species surveys were undertaken in 2009-2013. The desk study has indicated that there are no significant changes to land use within the Scoping Boundary since the initial surveys were undertaken. Therefore, it is unlikely that the overall biodiversity baseline will have changed significantly along the majority of the

Scoping Boundary. However, being mindful of the CIEEM Advice Note (CIEEM, 2019b) which states that surveys greater than three years old are ‘*unlikely to still be valid and most, if not all, of the surveys are likely to need to be updated*’, this limitation is accepted. Validation surveys are programmed over 2021 and 2022 to verify the habitats present and to reduce the risk associated with this potential limitation.

- 7.8.7 The programme of survey between 2009-2013 was undertaken in accordance with the latest survey guidance available at that time. For some species, the survey guidance has been since updated. However, this is not considered a significant limitation for the purposes of the EIA process as techniques used to survey bats and water vole have identified presence in their respective habitats and it is unlikely that the latest survey guidance would have provided a significantly different baseline.
- 7.8.8 In desk study data, the absence of a species record within the background data search for the project does not necessarily reflect an absence of that species from the same area. Similarly, the distribution of species records may reflect survey effort rather than an accurate distribution of that species. This potential limitation will be addressed through the validation surveys.

7.9 Conclusion

- 7.9.1 The Scoping assessment has identified that there are unlikely to be significant effects during operation. Therefore, the ES will focus on likely significant effects resulting from construction activities, particularly regarding temporary habitat loss, fragmentation or modification. There are unlikely to be significant effects on certain species, such as badgers and reptiles, which can be managed through standard good practice measures. The assessment will focus on protected species including bats, dormouse, riparian mammals, birds, fish and other aquatic species that could be harmed or disturbed during construction.
- 7.9.2 Initial meetings have been held with Natural England (14 January and 26 February 2021), the Environment Agency (28 January and 8 March 2021) and the county and district councils (2 March 2021). The purpose of these discussions was to introduce the project, gather baseline data and to provisionally set out the approach to and scope of the assessment. The proposed scope of the assessment was presented, including the targeted approach to site surveys. Comments raised during these meetings have been considered when drafting the Scoping Report.
- 7.9.3 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 7.6.

Table 7.6: Proposed Scope of the Assessment

Receptor	Potential Significant Effects	Timing	Scoped In/Out
Statutory designated sites (excluding GWDTEs)	Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Non-statutory sites (excluding GWDTEs)	Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in
	No likely significant effects	Operation	Scoped out

Receptor	Potential Significant Effects	Timing	Scoped In/Out
Ancient woodland and veteran trees	Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Priority habitats (including GWDTEs)	Potential for habitat loss, fragmentation or modification during construction. Potential for hydrological changes as a result of dewatering during temporary works (mainly in areas of deeper foundations and trenchless crossings).	Construction	Scoped in
	Potential for hydrological change at locations of deeper underground features such as trenchless crossings, the GSP substation and the CSE compounds.	Operation	Scoped in
Bats	Mortality/injury and disturbance (noise and vibration) as a result of construction activities. Potential for habitat loss, fragmentation or modification during construction (for underground cable sections only).	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Great crested newts (GCN)	Subject to District Level Licence. No likely significant effects	Construction and operation	Scoped out
Hazel dormouse	Mortality/injury and disturbance (noise and vibration) as a result of construction activities. Potential for habitat loss, fragmentation or modification during construction (for underground cable sections only).	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Badger	No likely significant effects	Construction and operation	Scoped out
Riparian mammals	Mortality/injury and disturbance (noise and vibration) as a result of construction activities. Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Birds – breeding, wintering, raptors	Mortality/injury and disturbance (noise and vibration) as a result of construction activities. Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in

Receptor	Potential Significant Effects	Timing	Scoped In/Out
	No likely significant effects	Operation	Scoped out
Terrestrial invertebrates	No likely significant effects	Construction and operation	Scoped out
Reptiles	No likely significant effects	Construction and operation	Scoped out
Vascular and lower plants – arable plant assemblage only	Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Fish and other aquatics	Mortality/injury and disturbance (noise and vibration) as a result of construction activities. Potential for habitat loss, fragmentation or modification during construction.	Construction	Scoped in
	No likely significant effects	Operation	Scoped out
Other notable species	No likely significant effects	Construction and operation	Scoped out

8. HISTORIC ENVIRONMENT

8.1 Introduction

- 8.1.1 This chapter sets out the proposed approach to assessing the likely significant effects on the historic environment associated with the construction and operation of the project. The chapter uses the term heritage asset, as used within NPS EN-1. Paragraph 5.8.3 defines designated heritage assets as ‘*a 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)*’. Heritage assets can be designated or non-designated.
- 8.1.2 Heritage assets considered within this chapter comprise:
- 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;
 - 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; and
 - 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.
- 8.1.3 The project has the potential to 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 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, 2019b). 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 chapters, in particular Chapter 6: Landscape and Visual which considers the ZTV, relevant for the setting of heritage assets. It also has links to Chapter 12: Traffic and Transport, and Chapter 14: Noise and Vibration, as traffic and noise can affect the setting of a heritage asset.
- 8.1.6 This chapter is supported by the following figure:
- Figure 8.1: Designated Heritage Assets

8.2 Regulatory and Planning Policy Context

- 8.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the Overarching National Policy Statement for Energy (EN-1). EN-1 contains the following paragraphs relating to cultural heritage which has been considered within this chapter:
- Paragraph 5.8.12 – ‘*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.'

- Paragraph 5.8.14 – *'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.'*

8.2.2 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to cultural heritage. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy relevant to cultural heritage.

8.3 Study Area

8.3.1 A study area has been defined as the Scoping Boundary plus a 250m area surrounding in all directions. This study area has been used for data collection of all heritage assets (designated and non-designated). This study area identified any heritage assets likely to be directly affected by the project, and to provide the context for the historic environment within, and immediately adjacent to, the Scoping Boundary. This is considered an appropriate study area based on technical knowledge of similar projects and accepted good practice. The study area is shown on Figure 8.1.

8.3.2 Based on these observations set out in Chapter 6: Landscape and Visual, the maximum distance over which visual effects would be experienced would be 5km. However, likely significant effects would be expected over a much shorter distance. Therefore, a wider study area has been defined at 5km distance from the Scoping Boundary (the 'wider study area'). This is considered to cover heritage assets where the setting could be affected to a significant degree, although the emphasis will be on heritage assets lying within 2km where significant effects are most likely to be experienced.

8.3.3 As noted in Chapter 6: Landscape and Visual, the ZTV maps will be produced up to a 10km distance surrounding the project based on the ZOI (see Chapter 18: Cumulative Effects for more details). These will help to determine the area over which the proposed 400kV overhead line could theoretically be visible. The reason the ZTVs will be prepared over a 10km distance is to inform the assessment of cumulative setting and visual impacts with other proposed developments. Therefore, the Scoping Report also includes described designated heritage assets within 10km of the Scoping Boundary to inform the future cumulative effects assessment.

8.3.4 As noted in Chapter 6: Landscape and Visual, the ZTV will be further refined in order to compile an accurate, proportionate and evidenced baseline of all designated heritage assets which may experience significant effects on their settings.

8.4 Existing Baseline

Data Sources

8.4.1 The baseline assessment has been informed by a desk study which has drawn on the following 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, 2013);
- 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;
- Aerial Photographic Assessment of the project (Essex County Council, 2012). The results of this assessment have been integrated into the current Essex HER dataset; and
- technical reports, drawings and previous cultural heritage assessments for the project provided by National Grid.

8.4.2 The desk study has been supported by archaeological geophysical survey undertaken in underground cable sections within the Scoping Boundary. The geophysical survey was conducted in April to June 2013 (Oxford Archaeology East, 2013a) and was undertaken to better identify areas of archaeological potential along the underground cable sections.

8.4.3 No geophysical survey has been undertaken in areas outside of the proposed underground cables sections. However, the 2012 Aerial Photographic Assessment has covered the majority of the Scoping Boundary. The combined results of these assessments, in conjunction with the potential for targeted non-intrusive assessment in areas not previously covered by either, is considered sufficient to inform post-scoping assessment and the scope of intrusive evaluation.

Baseline Environment

Designated Heritage Assets

8.4.4 The following designated heritage assets are situated within the study area and are shown on Figure 8.1:

- one scheduled monument: the Moated Site at Moat Farm, 450m south of Cobbler's Corner (NHLE 1019889);
- two Grade I listed buildings: Hintlesham Hall (NHLE 1036917); and the Parish Church of the Holy Innocents (NHLE 1166331);
- four Grade II* listed buildings: Sawyer's Farmhouse (NHLE 1036687), the Service Ranges, Stables, Former Coach House and Brewhouse Attached to Hintlesham Hall (NHLE 1036918), Round Hill House (NHLE 1122858), and Benton End House (NHLE1194592);

- 71 Grade II listed buildings; and
 - one conservation area (Polstead Conservation Area).
- 8.4.5 All of the above, except the conservation area, are designations of national importance and have therefore been initially assessed to be of high value. Polstead Conservation Area (Babergh District Council, 2012) has been initially assessed to be of medium value.
- 8.4.6 There are no World Heritage Sites, registered parks and gardens, battlefields, or protected wrecks within the study area.
- 8.4.7 In addition to the known heritage assets within the study area, designated heritage assets situated within the wider study area and within the 10km ZOI are summarised in Table 8.2.

Table 8.2 Designated Heritage Assets Within 10km of the Scoping Boundary

Designated Heritage asset	Scoping Boundary	Scoping Boundary – 250m	250m – 2km	2km – 5km	5km – 10km	Total
Scheduled monuments	0	1	5	17	34	57
Grade I listed buildings	0	2	9	43	80	134
Grade II* listed buildings	0	4	34	79	175	292
Grade II listed buildings	22	49	558	1,456	2,672	4,757
Registered parks and gardens	0	0	0	3	8	11
Conservation areas	0	1	5	12	24	42
Total	22	57	611	1,610	2,993	5,293

Non-Designated Heritage Assets

- 8.4.8 The following non-designated heritage assets are situated within the study area:
- 230 non-designated historic buildings and archaeological assets recorded in the EHER and SHER;
 - 15 non-designated possible archaeological remains identified during geophysical survey undertaken within underground cable sections (Oxford Archaeology East, 2013a);
 - 22 non-designated historic landscape types (HLTs) defined by the historic landscape characterisation projects for Essex and Suffolk; and
 - eight protected lanes (Essex only).

- 8.4.9 Evidence for potential archaeological sites and features is provided by an Aerial Photographic Assessment which was undertaken for the project (Essex County Council, 2012) and which has now been incorporated within the HER dataset. The assessment mapped 28 cropmark sites comprising:
- 18 enclosures or possible enclosures (nine of which were previously unrecorded in the HER);
 - seven round barrows (one of which was previously unrecorded in the HER);
 - one possible roundhouse (previously unrecorded in the HER);
 - one trackway; and
 - one windmill.
- 8.4.10 Archaeological geophysical survey undertaken within underground cable sections further identified potential archaeological remains including two areas of more distinct and well-defined archaeological potential (Oxford Archaeology East, 2013a). These areas corroborate the results of the Aerial Photographic Assessment but also identify three anomalies interpreted as ditched enclosures, which were not previously identified in the aerial imagery. The site of one of these ditched enclosures has been interpreted as a curvilinear enclosure which may relate to Iron Age settlement within the Dedham Vale AONB.
- 8.4.11 A watching brief of ten boreholes undertaken during ground investigations within Dedham Vale AONB (Oxford Archaeology East, 2013b) 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 the two boreholes located in the Box Valley and one borehole located in the Stour Valley. Overall, there is the potential for further deposits of palaeoenvironmental interest focused predominantly within the river valleys.
- 8.4.12 Initial assessment of the HER data indicates that the study area has high potential for the survival of buried archaeology, particularly dating from the Bronze Age, Iron Age, Roman, medieval, and post-medieval periods. The potential is high throughout the study area, apart from areas previously disturbed by quarrying and some agricultural and horticultural activities.
- 8.4.13 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. 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*' (Oxford Archaeology East, 2013a).
- 8.4.14 Initial assessment of all non-designated heritage assets indicates that they range from negligible to medium value. Changes to this valuation may result from further assessment of the baseline.

Historic Landscape

- 8.4.15 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). The landscape

in this area of south Suffolk and eastern Essex, also has important cultural associations that exist with artists such as Constable, Gainsborough, Nash, and the East Anglian School of Painting and Drawing under the direction of Sir Cedric Morris. These are primarily associated with the Dedham Vale AONB and the Stour Valley Project Area.

- 8.4.16 The historic landscape subtopic 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 HLT are described in the Essex Historic Landscape Characterisation Project (Dyson-Bruce and Bennet, 2013) and the Suffolk Historic Landscape Characterisation Project (Suffolk County Council Archaeological Service, 2012). For consistency, registered parks and gardens and protected lanes are also included under the heading of HLTs.

Future Baseline

- 8.4.17 No significant changes to the future cultural heritage baseline are anticipated.
- 8.4.18 Further heritage assets may be recorded and/or current records may be updated during field investigation works and will be added to the assessment where relevant.

8.5 Embedded and Good Practice Measures

- 8.5.1 The project has avoided sensitive features such as designated heritage assets through the options appraisal. In addition, the Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures relating to cultural heritage including the following key commitments:
- H01: Locations of known archaeological interest/value, or areas where archaeological work is planned, would be signposted/fenced off to avoid unintentional damage.
 - H02: Where a previously unknown heritage asset is discovered, or a known heritage asset proves to be more significant than foreseen at the time of application, the project would inform the local planning authority and would agree a solution that protects the significance of the new discovery, so far as is practicable within the project parameters.
- 8.5.2 Other good practice measures are related to maintaining elements such as vegetation and hedgerows (commitments LV01 and B07), reinstating hedgerows, fences and walls (commitment GG07), and controlling nuisance from traffic, noise, dust and visual intrusion during construction (including commitments GG10, GG11, GG13 and NV01). Each of these good practice measures has implications for reducing impacts to the setting of heritage assets.

8.6 Likely Significant Effects

- 8.6.1 This section sets out the likely significant effects of the project on cultural heritage. It assumes that the relevant embedded measures and good practice measures outlined within the Outline CoCP are in place before assessing potential effects.
- 8.6.2 The potential impacts of the project on the historic environment are divided into two categories:
- physical – the loss of, or damage to, the fabric of a heritage asset occurring during the construction or operation of the project; and
 - setting – impacts on the setting of a heritage asset occurring during the construction or operation of the project.

8.6.3 The potential impacts resulting from the project can be either adverse or beneficial.

Archaeological Remains

Direct Effects to Archaeological Remains During Construction

8.6.4 No designated archaeological remains (scheduled monuments) will be physically affected by the project. There is the potential for direct adverse physical impacts on known and previously unrecorded non-designated archaeological remains during construction of the project, comprising:

- damage or destruction through removal of archaeological deposits during construction;
- damage through compaction and/or removal of topsoil during construction; and
- damage through changes in groundwater flow and quality during dewatering activities during construction or through changes to groundwater due to underground structures during operation, resulting in the desiccation of waterlogged archaeological deposits. These are likely to be focused in areas where trenchless crossings are proposed or deep foundations such as at the GSP substation and the CSE compounds (see Chapter 10: Geology and Hydrogeology).

8.6.5 All below ground works including, but not limited to, the construction of pylon bases, the underground cables, the GSP substation, CSE compounds and any temporary working areas, such as access tracks, crane bases and compounds, could affect buried archaeology. Embedded measures, such as avoiding known sensitive sites, will avoid significant effects on buried archaeology of identified high importance, but inevitably, and in common with any project of this type, direct physical effects on buried archaeological remains are likely to occur during construction. Therefore, physical effects on archaeological remains during construction are scoped into the ES.

Direct Effects to Archaeological Remains During Operation

8.6.6 There are no physical effects on archaeological remains anticipated during normal operation. If routine inspections identify the need to undertake maintenance or repairs on sub-surface features (such as an underground cable), this would be restricted to areas of ground previously disturbed and mitigated during construction activities. Therefore, physical effects on archaeological remains during operation are scoped out of the ES.

Effects on the Setting of Archaeological Remains

8.6.7 There is the potential for adverse impacts on the setting of designated and non-designated archaeological remains during construction as a result of noise or visual intrusion caused by construction activities. There is also the potential for effects on the setting of archaeological remains during operation and these are scoped into the ES.

Historic Buildings

Physical Effects to Historic Buildings During Construction

8.6.8 No direct physical impact on designated or non-designated historic buildings is anticipated, however, there may be the potential for adverse physical impacts on historic buildings through vibration or subsidence caused by changes to groundwater which may result in areas of trenchless crossing (see Chapter 14: Noise and Vibration, and Chapter 10: Geology and Hydrogeology, respectively). Any such effects are likely to be very localised (associated with piling or trenchless crossings) and potential effects will be controlled through good practice measures within the Outline CoCP. These are therefore unlikely to result in significant effects; however, any potential impact, or lack thereof, will

be confirmed within the ES taking into account further assessment undertaken by the relevant specialists.

Physical Effects to Historic Buildings During Construction

- 8.6.9 No physical impacts on designated or non-designated historic buildings is anticipated during operation and this is scoped out of the ES.

Effects on the Setting of Historic Buildings During Construction and Operation

- 8.6.10 There is the potential for adverse impacts on the setting of designated and non-designated historic buildings during construction and operation of the project, comprising:
- changes caused by noise, dust, or visual intrusion during construction or operation; and
 - changes caused by visual severance of associated heritage assets and/or their setting during construction and operation.
- 8.6.11 In particular, there is the potential for effects on the setting of Grade I listed Hintlesham Hall (NHLE 1036917) and the Grade II* listed group of associated designated outbuildings (NHLE 1036918). A site-specific assessment of the interim alignment was produced prior to the project pause (Heritage Collective LLP, 2012), which concluded that an impact to the setting of Hintlesham Hall would occur, but that the effect would be less than significant. Further assessment of the setting of this designated historic building group and the potential for impacts resulting from the construction and operation of the project will be undertaken in order to ensure that this assessment remains valid and that any design measures work to effectively mitigate the potential for impact.
- 8.6.12 There is also the potential for beneficial impacts to the setting of designated and non-designated historic buildings in areas where the current overhead line would be removed.
- 8.6.13 Overall, there is the potential for significant adverse effects during construction and significant adverse or beneficial effects during operation, to historic buildings. Therefore effects on the setting of historic buildings are scoped into the ES.

Historic Landscapes

Physical Effects to Historic Landscapes During Construction

- 8.6.14 No registered parks and gardens are situated within 2km of the Scoping Boundary. Therefore there will be no physical impacts on designated HLT. There is the potential for adverse physical impacts on non-designated HLT through damage or removal of historic landscape elements (such as hedgerows) during construction. Therefore, physical effects to historic landscapes are scoped into the assessment.

Physical Effects to Historic Landscapes During Operation

- 8.6.15 There are no anticipated physical effects on HLT during normal operation and this is scoped out of the ES.

Effects on the Setting of Historic Landscapes During Construction and Operation

- 8.6.16 There is the potential for adverse effects on the setting of HLT during construction and operation of the project through changes to the setting through noise, dust, or visual intrusion (including the potential for effects on the setting of protected lanes from construction-related traffic) and changes to the setting through severance of associated heritage assets.

- 8.6.17 There is also the potential for beneficial effects on the setting and cultural associations of designated and non-designated HLT in areas where the project would be undergrounded and the current 132kV overhead line would be removed, for example within the Dedham Vale AONB and the Stour Valley.
- 8.6.18 Overall, there is the potential for adverse effects on the setting of HLT during construction, and adverse or beneficial impacts during operation, which may be significant. Therefore, effects on the setting on historic landscapes are scoped into the ES for both construction and operation.

8.7 Proposed Assessment Methodology

- 8.7.1 This section sets out the proposed methodology for the cultural heritage assessment. This is based on guidance set out in DMRB LA 104 Environmental assessment and monitoring (Highways England *et al.*, 2020b), and LA 106 Cultural heritage assessment (Highways England *et al.*, 2020c), and the assessment will be guided by Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (Historic England, 2008), Standard and Guidance for Historic Environment Desk-based Assessment (Chartered Institute for Archaeology, 2014, updated 2020), and professional judgement.
- 8.7.2 The contribution of the setting to the value of heritage assets will be 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 will be informed through a combination of desk-based assessment of online mapping and aerial imagery, the LVIA including wirelines and photomontages, and targeted site inspections.
- 8.7.3 The Dedham Vale AONB is recognised as a nationally significant landscape with cultural heritage associations. The Stour Valley Project Area, although not designated (see Chapter 6: Landscape and Visual), also has important cultural associations that exist with artists such as Constable, Gainsborough, Nash, and the East Anglian School of Painting and Drawing under the direction of Sir Cedric Morris. Cultural associations will be considered within the historic landscape assessment within the ES.

Desk-based Survey

- 8.7.4 A desk-based survey will be produced which will be presented as a technical appendix to the ES. This will focus on:
- detailing the baseline for the historic environment;
 - capturing the extent of any likely significant effects on heritage assets which may result from the project;
 - providing a robust assessment of the value of all heritage assets within the baseline;
 - assessing the baseline setting of key heritage assets within the ZTV and to what degree the setting makes a contribution to the value of the heritage asset; and
 - presenting the cultural heritage baseline in the form of an appended cultural heritage Gazetteer supported by figures and photographs where appropriate.
- 8.7.5 A 250m study area will be used to identify all heritage assets in the desk-based survey. In addition, a wider study area will be used for designated heritage assets, whose setting may be affected. The wider study area will be used to assess the following:

- All designated heritage assets within 2km from the proposed Order Limits, where significant effects are most likely. Initial assessment will identify the extent of setting for these assets. The setting will be compared with the ZTV to determine which heritage assets would potentially be affected, although it is recognised that setting may include non-visual effects and these will also be assessed within the ES.
- Designated heritage assets situated within areas of the ZTV beyond 2km (up to 5km, see Chapter 6: Landscape and Visual) where there is a reasonable potential for visual impacts on their settings, will be identified on a case-by-case basis based on professional judgement. This is designed as a precautionary approach to capture any outlying heritage assets which may experience potentially significant impacts to their settings.
- Designated heritage assets situated within the ZTV (up to a maximum of 10km from the Scoping Boundary) will be considered within the cumulative effects assessment when considering the interactions with other proposed developments (see Chapter 18: Cumulative Effects).

Non-intrusive Evaluation

- 8.7.6 A targeted cultural heritage walkover survey will be undertaken where a need for supporting information has been identified. This may comprise walkover survey and/or site inspections at the location of specific heritage assets.
- 8.7.7 The Geophysical Survey in the underground cable sections (Oxford Archaeology East, 2013a) and the Aerial Photographic Assessment (Essex County Council, 2012) cover the majority of the Scoping Boundary, with the exception of the works associated with the new GSP substation. Further supplementary geophysical survey is to be undertaken at the GSP substation. The combined results of the previous geophysical survey, the Aerial Photographic Assessment, and the supplementary geophysical survey is considered sufficient to inform both the scope of intrusive evaluation and the ES.

Assessment of Palaeoenvironmental and Geoarchaeological Potential

- 8.7.8 A watching brief of ten boreholes during ground investigations within Dedham Vale AONB was undertaken prior to the project pause (Oxford Archaeology East, 2013b). This work predominantly recorded typical valley floor sequences of silty clays and gravels. Overall, there is the potential for further deposits of palaeoenvironmental and geoarchaeological interest across the project, primarily focused within the river valleys.
- 8.7.9 The majority of the underground cables will be installed using open cut methods with the cables buried at a depth of approximately 1.1m below ground level. This shallow depth is unlikely to affect palaeoenvironmental or geoarchaeologically significant deposits. In areas where the extent of impact during construction is likely to be deep enough to affect such deposits, for example at pits associated with trenchless crossings or deeper foundations, the records of site investigation works undertaken for geotechnical purposes will be reviewed by an appropriately qualified specialist to determine the potential for deposits of this nature to be present at these locations. The results of this work will inform the need for a programme of further evaluation or mitigation during construction.

Intrusive Archaeological Surveys

- 8.7.10 In some cases, the desk-based survey or the non-intrusive surveys may be considered insufficient to properly assess the archaeological potential of specific locations physically

affected by the project. In these cases, a programme of pre-construction intrusive survey would be implemented, as part of a staged assessment of the archaeological potential.

Outline Written Scheme of Investigation (WSI)

- 8.7.11 An Outline WSI will be prepared as a technical appendix to the ES which will include:
- the principles of the mitigation strategy;
 - the scope and overarching methodology of mitigation to be undertaken post determination;
 - commitments for proportionate post-excavation analysis, assessment, reporting and dissemination of results; and
 - commitments for preparation and deposition of the site archive.

Ascribing Value/Sensitivity

- 8.7.12 The term ‘value’ has been used in this assessment to describe the importance of a heritage asset, in preference to the term ‘significance’, in order to avoid confusion with the similar terminology, in particular, ‘significant effects’ as commonly used in EIA.
- 8.7.13 The criteria used to determine the value and sensitivity of receptors specific to cultural heritage are set out in Table 8.1. These values are based on DMRB LA 104 (Highways England *et al.*, 2020b) and have been guided by Policies and Guidance for the Sustainable Management of the Historic Environment (Historic England, 2008) as well as professional judgement.

Table 8.1: Criteria for Determining Value of Heritage Assets

Value	Criteria
Very high	Very high importance and rarity, international scale and very limited potential for substitution
	For example: <ul style="list-style-type: none"> • World Heritage Sites (including nominated sites) • Heritage assets of acknowledged international importance • Heritage assets that can contribute significantly to acknowledged international research objectives • Historic landscapes of international value, whether designated or not • Extremely well-preserved historic landscapes with exceptional coherence, time-depth or other critical factors
High	High importance and rarity, national scale, and limited potential for substitution

Value	Criteria
	<p>For example:</p> <ul style="list-style-type: none"> • Scheduled monuments (including proposed sites) • Designated historic landscapes of outstanding interest (including registered parks and gardens and AONB) • Designated structures (i.e. listed buildings) • Non-designated heritage assets of schedulable quality and importance • Heritage assets that can contribute significantly to acknowledged national research objectives • Conservation areas containing very important buildings • Non-designated structures of clear national importance • Non-designated landscapes of outstanding interest, high quality or importance and of demonstrable national value • Well-preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factors
Medium	<p>Medium or high importance and rarity, regional scale, and limited potential for substitution</p> <p>For example:</p> <ul style="list-style-type: none"> • Designated or non-designated heritage assets that contribute to regional research objectives • Non-designated historic landscapes that would justify special historic landscape designations, or landscapes of regional value • Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor • Conservation areas containing buildings that contribute significantly to their historic character • Historic built-up areas with important historic integrity in their buildings, settings or built settings
Low	<p>Low or medium importance and rarity, local scale</p> <p>For example:</p> <ul style="list-style-type: none"> • Designated and non-designated heritage assets of local importance • Robust non-designated historic landscapes; and historic landscapes with importance to local interest groups • Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations • Heritage assets compromised by poor preservation and/or poor survival of contextual associations • Heritage assets of limited value, but with potential to contribute to local research objectives • 'Locally listed' buildings • Historic (unlisted) buildings of modest quality in their fabric or historical association • Historic townscapes or built-up areas of limited historic integrity in their buildings or built settings

Value	Criteria
Negligible	Very low importance and rarity, local scale
	For example: <ul style="list-style-type: none"> Heritage assets with very little or no surviving archaeological interest Buildings of no archaeological or historical note, or buildings of an intrusive character Landscapes with little or no significant historical interest

Impact Magnitude

8.7.14 The criteria used to determine the magnitude of change for cultural heritage are set out in Table 8.3. These values are based on DMRB LA 104 (Highways England *et al.*, 2020b).

Table 8.3: Criteria for Determining Magnitude

Magnitude	Description
Large	Loss of resource/receptor and/or its quality and integrity; severe damage to key characteristics, features, or elements. Large scale or major improvement of resource or receptor quality; extensive restoration; major improvement of attribute quality.
Medium	Loss of resource/receptor but not adversely affecting its integrity; partial loss or damage to key characteristics, features, or elements. Benefit to or addition of key characteristics, features, or elements; improvement of attribute quality.
Small	Some measurable change in attributes, quality, or vulnerability; minor loss or alteration to one or more key characteristics, features, or elements. Minor benefit or positive addition to one or more key characteristics, features, or elements; some beneficial impacts on attribute or a reduced risk of negative impact occurring.
Negligible	Very minor loss or detrimental alterations to one or more characteristics, features, or elements. Very minor benefit or positive addition to one or more characteristics, features, or elements.

Significance of Effect

8.7.15 Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5, supplemented by professional judgement. Likely significant effects in the context of the EIA Regulations 2017 will be effects of moderate or greater significance.

Limitations of Assessment

8.7.16 Data provided from the Suffolk and Essex HER offices and downloaded from the National Heritage List for England are assumed to be up to date and accurate at time of writing (February 2021). No limitations have been identified.

8.8 Conclusion

8.8.1 Overall, the key considerations for heritage assets in relation to the project, comprise the potential for physical damage to non-designated archaeological remains within the areas

of underground cable and pylon construction, and the potential for impacts on the settings of designated historic buildings and the historic landscape character of the area. A staged programme of archaeological survey, assessment and recording is proposed and will be agreed with the relevant statutory bodies, including Essex and Suffolk County Councils and Historic England.

- 8.8.2 Initial meetings have been held with Historic England (held on 2 February and 7 April 2021). The purpose of these meetings was to reintroduce the project to the new advisors, outline the data collection being undertaken and outline the potential scope of the assessment. The meetings have also covered where discussions were with regard to the setting of Hintlesham Hall when the project was paused. A technical note has also been issued to Historic England in March 2021. This set out the proposed scope and methodology for the assessment for a comment.
- 8.8.3 Project meetings will be set up with the county archaeologists and the relevant local planning advisors to agree the approach to further survey work, such as trial trenching.
- 8.8.4 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 8.4.

Table 8.4: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Archaeological remains	Damage to or destruction of designated archaeological remains.	Construction and operation	Scoped out
Archaeological remains	Damage to or destruction of known or unknown non-designated archaeological remains.	Construction	Scoped in
Archaeological remains	Damage to or destruction of known or unknown non-designated archaeological remains.	Operation	Scoped out
Archaeological remains	Beneficial or adverse impacts to the setting of archaeological remains up to 5km from the proposed Order Limits for designated archaeological remains and up to 250m from the Order Limits for non-designated archaeological remains.	Construction and operation	Scoped in
Historic buildings	Direct damage to or destruction of designated and non-designated historic buildings.	Construction and operation	Scoped out
Historic buildings	Indirect damage to or destruction of designated and non-designated historic buildings through vibration or changes to groundwater levels. The area of potential impact is likely to be localised around specific construction activities such as trenchless crossings and piling works.	Construction	Scoped in
Historic buildings	Beneficial or adverse impacts to the setting of historic buildings up to 5km from the proposed Order Limits for designated historic buildings and up to 250m from the Order Limits for non-designated historic buildings.	Construction and operation	Scoped in

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Historic landscapes	Damage to or destruction of designated historic landscape elements.	Construction and operation	Scoped out
Historic landscapes	Damage to or destruction of non-designated historic landscape elements.	Construction	Scoped in
Historic landscapes	Damage to or destruction of non-designated historic landscape elements.	Operation	Scoped out
Historic landscapes	Beneficial or adverse impacts to the setting of historic landscapes up to 5km from the proposed Order Limits for designated historic landscapes and up to 250m from the Order Limits for non-designated historic landscapes.	Construction and operation	Scoped in

9. WATER ENVIRONMENT

9.1 Introduction

- 9.1.1 This chapter details the proposed approach to assessing the likely significant effects of the project on the water environment.
- 9.1.2 During construction, earth moving and stockpiling of soil and other materials have the potential to cause deterioration of surface water quality through silted or polluted runoff. New crossings of watercourses would be required for temporary access, and can result in channel bed/bank modifications causing disruption to flow regimes and increased flood risk. There would also be changes to land surface permeabilities at the GSP substation and at permanent access tracks which could disrupt the current land drainage regime.
- 9.1.3 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.
- 9.1.4 The aspects included within this chapter comprise:
- effects on surface water features and quality;
 - effects on existing surface water interests (including abstractions and discharges);
 - effects on hydromorphology of affected watercourses;
 - fluvial, surface water and groundwater flood risk effects on the project as well as a result of the project to the surrounding environment; and
 - effects on land drainage.
- 9.1.5 This chapter has links with other topic chapters including Chapter 7: Biodiversity, which assesses the effects on aquatic species such as fish and eels, and Chapter 10: Geology and Hydrogeology, which assesses the effects on groundwater quality and quantity.
- 9.1.6 This chapter is supported by the following figure:
- Figure 9.1: Water Environment Features

9.2 Regulatory and Planning Policy Context

- 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). EN-1 states that energy projects have the potential to have adverse effects on the water environment and prevent objectives set under the Water Framework Directive (WFD) from being achieved.
- 9.2.2 Paragraph 5.15.2 of 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 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'*.

EN-5 contains paragraph 2.4.2 relating to the water environment which has been considered within this chapter. This 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'*.

- 9.2.4 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to the water environment. It also outlined key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to the water environment.

9.3 Study Area

- 9.3.1 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 Scoping Boundary (Figure 9.1). The study area includes reaches of watercourses that will be crossed by, or likely to receive discharges from the project, extending 500m downstream. This is considered an appropriate study area based on technical knowledge of similar schemes 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.

9.4 Existing Baseline

Data Sources

- 9.4.1 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:
- Main River map for England (Environment Agency, 2019);
 - catchment data explorer database of Cycle 2 and 3 Water Framework Directive information (Environment Agency, 2020a);
 - Anglian River Basin Management Plan (Environment Agency, 2015);
 - water quality data archive (Environment Agency, 2021a);
 - long term flood risk map for England (Environment Agency, 2021a);
 - the Flood Map for Planning (Environment Agency, 2021a);
 - the Historic Flood Map (Environment Agency, 2021d); and
 - Flood Estimation Handbook webservice (CEH, 2021) defining surface water catchment areas and hydrological properties (e.g., rainfall, slopes, soil permeability).
- 9.4.2 In addition, data requests have been made to the Environment Agency and the local authorities to provide information on the following to support the future assessment:
- baseline flood risk data, including available modelled flood data for main rivers, and local flood risk data from commissioned studies;
 - data on consented discharges to surface waters and licensed and exempted (private) abstractions from surface waters.

- 9.4.3 All of the further information received from stakeholders will be incorporated into future stages of the assessment.

Baseline Environment

Water Features and their Quality

- 9.4.4 Within the study area there are five watercourses designated as ‘main rivers’, namely the Belstead Brook; River Brett; River Box; River Stour and the Henny Meadow Fleet (Figure 9.1). There are also ordinary watercourses and ditches which drain the study area. The watercourses generally flow in a northwest to southeast direction towards the Stour and Orwell Estuaries. Other water features within the study area include ponds and small reservoirs, such as near Appletree Wood.
- 9.4.5 With the exception of the Henny Meadow Fleet, the main rivers are all included within the Anglian River Basin Management Plan (RBMP) and baseline WFD status data (Environment Agency, 2020a) are summarised in Table 9.1. As the table shows, the watercourses share similar quality characteristics. The Rivers Stour, Box and Brett are classified as heavily modified watercourses, and all share a Moderate overall status and are failing with regard to chemical status. The Belstead Brook, not designated as heavily modified, is currently (Environment Agency, 2020a) achieving Poor overall status and is failing regarding chemical status.
- 9.4.6 Reasons for not achieving good status common to all these watercourses 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. These watercourses support a range of fish species, see Chapter 7: Biodiversity.

Table 9.1: Summary of WFD Baseline Data

WFD Water Body	Ecological Status	Chemical Status
Belstead Brook Overall Status: Poor	Ecological Status: Poor Biological: Poor Hydromorphology: Supports good Physico-chemical: Moderate Specific Pollutants: High	Chemical Status: Fail Priority Hazardous Substances: Fail Priority Substances: Good
River Brett Overall status: Moderate	Ecological Status: Moderate Biological - Moderate Hydromorphology: Supports good Physico-chemical: Moderate Specific Pollutants: High	Chemical Status: Fail Priority Hazardous Substances: Fail Priority Substances: Good
River Box Overall status: Moderate	Ecological Status: Moderate Biological: Moderate Hydromorphology: Supports good Physico-chemical: Moderate Specific Pollutants: High	Chemical Status: Fail Priority Hazardous Substances: Fail Priority Substances: Good
River Stour (Lamarsh to R. Brett)	Ecological Status: Moderate	Chemical Status: Fail

WFD Water Body	Ecological Status	Chemical Status
Overall status: Moderate	Biological: Good Hydromorphology: Supports good Physico-chemical: Moderate Specific Pollutants: High	Priority Hazardous Substances: Fail Priority Substances: Good

Existing Surface Water Interests

9.4.7 The watercourses in the study area receive, transport and dilute consented and informal discharges, for example from wastewater treatment works, and agricultural land drainage systems. They also support abstraction of water for a range of uses. These abstractions and discharges influence the quantity and quality of water within the rivers.

Hydromorphology

9.4.8 Many of the watercourses in the study area have been subject to modifications for the purposes of land drainage and flood defence. Of the main rivers in the study area, as noted above, except for the Belstead Brook, all 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.

Flood Risk and Land Drainage

9.4.9 Based on the online Flood Maps (Environment Agency, 2021b), the main sources of flood risk within the study area are the Rivers Brett, River Box, River Stour and Belstead Brook, with areas of Flood Zones 2 and 3 (medium to high risk) associated with these watercourses. However, the majority of the study area is at low risk of flooding from rivers (in Flood Zone 1) as shown on Figure 9.1.

9.4.10 Flood risk from surface water runoff also varies across the study area, with the majority of areas at low risk from this source. Areas mapped as at higher risk closely align with watercourse corridors. The reservoir flood risk map shows that the project is not at risk of flooding from this source. Given the project's inland location there is no flood risk from the sea and the rural setting corresponds to a low risk of flooding from sewers. Available data also indicate that groundwater poses a low risk as a source of flooding.

9.4.11 The land drainage regime is governed by the topography and the permeability of underlying soils and geology. Formal (piped) drainage systems include those serving roads and areas of urban development. There could also be drainage systems associated with agricultural land (see Chapter 11: Agriculture and Soils).

Future Baseline

9.4.12 With regard to flood risk and drainage, future baseline conditions 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.

9.4.13 The implementation of future cycles of WFD management plans driving future improvements in the ecological and chemical quality of water bodies will also be considered when assigning value to water environment resources and receptors.

9.5 Embedded and Good Practice Measures

- 9.5.1 Through the options appraisal process the project has avoided locating components that are most vulnerable to flooding e.g. the proposed GSP substation and the CSE compounds, within the high or medium risk flood zones (Flood Zones 3 and 2). Overhead lines are proposed across the Belstead Brook and the River Brett. Works to construct these lines are unlikely to cause detriment to any of their existing attributes.
- 9.5.2 A key embedded measure relevant to the water environment included within the design is the use of a trenchless construction method to cross the River Stour. This would avoid physical changes to the river including the bed and banks and would reduce disturbance within the riparian corridor. This would avoid impacts on hydromorphology and water quality within the river.
- 9.5.3 The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures relating to the water environment which will be carried out during construction of the project. These include, but are not limited to the following key commitments:
- GG03: A Construction Environmental Management Plan (CEMP) ... will be produced prior to construction. The CEMP shall include measures to manage ... water ... during construction. The contractor(s) shall undertake daily site inspections to check conformance with the Management Plans.
 - GG14: Fuels, oils and chemicals will be stored responsibly, away from sensitive water receptors. Where practicable, they will be stored >15m from watercourses, ponds and groundwater dependent terrestrial ecosystems. Where it is not practicable to maintain a >15m distance, additional measures will be identified. All refuelling, oiling and greasing of construction plant and equipment will take place above drip trays and also away from drains as far as is reasonably practicable. Vehicles and plant will not be left unattended during refuelling. Appropriate spill kits will be made easily accessible for these activities. Potentially hazardous materials used during construction will be safely and securely stored including use of secondary containment where appropriate. Stored flammable liquids such as diesel will be protected either by double-walled tanks or stored in a bunded area with a capacity of 110% of the maximum stored volume. Spill kits will be located nearby.
 - GG15: Runoff across the site will be controlled by the use of a variety of methods including header drains, buffer zones around watercourses, on-site ditches, silt traps and bunding. There will be no intentional discharge of site runoff to ditches, watercourses, drains or sewers without appropriate treatment and agreement of the appropriate authority (except in the case of an emergency).
 - GG16: Wash down of vehicles and equipment will take place in designated areas within construction compounds. Wash water will be prevented from passing untreated into watercourses and groundwater. Appropriate measures will include use of sediment traps.
 - GG17: Wheel washing will be provided at each main compound access point on to the highway. An adequate supply of water will be made available at these locations at all times. Road sweepers will be deployed on public roads where necessary to prevent excessive dust or mud deposits.
 - GG22: An Emergency Action Plan will be developed for the construction phase which will outline procedures to be implemented in case of unplanned events, including but not limited to site flooding and pollution incidents.

- W01: 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 LLFAs.
- W02: For open cut watercourse crossings and installation of vehicle crossing points, good practice measures will include but not be limited to: where practicable, reducing the working width for open cut crossings of a main or ordinary watercourse whilst still providing safe working; ... and reinstating the riparian vegetation and natural bed of the watercourse, using the material removed when appropriate on completion of the works and compacting as necessary.
- W03: Riverbank and in-channel vegetation will be retained where not directly affected by installation works. Natural substrate will be provided through temporary watercourse crossings box culverts.
- W06: There will be no permanent land raising undertaken in locations identified as Flood Zone 3.

9.6 Likely Significant Effects

- 9.6.1 This section sets out the likely significant effects of the project on the water environment. It assumes that the relevant embedded (design measures) and good practice measures outlined within the Outline CoCP are in place before assessing the effects.

Water Quality Effects on Existing Abstractions and Discharges

Water Quality Effects During Construction

- 9.6.2 Good practice measures within the Outline CoCP would reduce the risk of pollution to the water environment during construction by removing the pathway between the source and the receptors for most of the working environment. Water used for the trenchless crossings is currently assumed to be delivered using tankers and not requiring an abstraction licence.
- 9.6.3 The most sensitive sites with regard to pollution risk are where the underground cables cross watercourses using open cut methods, such as the River Box. There are also locations where temporary crossings would be required for access across watercourses during construction, which could include the locations of overhead line. Works would follow the good practice measures set out within the Outline CoCP. In addition, works within the watercourse and the construction accesses over the top, will need to be undertaken with the conditions set out within the consents and permits from the relevant authorities (Environment Agency for main rivers, and the LLFA for ordinary watercourses). No likely significant effects are therefore anticipated and this aspect is scoped out of the ES.

Water Quality Effects During Operation

- 9.6.4 During operation of the project, pollution impact pathways to surface watercourses would be very limited. This is because land would be reinstated following completion of construction works and there would be no operational discharges to surface watercourses. Physico-chemical elements supporting WFD water body status would therefore be safeguarded. Maintenance activities would generally be undertaken in locations distant from watercourses or other water bodies, for example at the GSP substation site, which would fall under National Grid's operational management

procedures. No likely significant effects are therefore anticipated, and it is proposed that this aspect is scoped out of the ES.

Effects on Abstractions and Discharges

- 9.6.5 Given the nature of the project, there would be no permanent effects on watercourse flow regimes, no new consumptive water uses and no detriment to water quality. Therefore, the potential for likely significant effects on existing water interests (surface water abstractions and discharges) is negligible. Detriment to water interests during construction and operation are also therefore scoped out of the ES.

Effects on Hydromorphology

Effects on Hydromorphology During Construction

- 9.6.6 During construction of the project, there would be potential for temporary physical disturbance to watercourse channels, banks and riparian corridors. Temporary changes to flow regimes may also occur, where overpumping is required during construction of the watercourse crossings along underground cable sections. These effects would only occur during the construction of the crossing and would be short-term in duration (a few weeks for the majority of minor watercourses and ditches). Locations could include the River Box and other minor watercourses. The potential for temporary hydromorphological effects at underground cable crossings are therefore scoped into the ES.

Effects on Hydromorphology During Operation

- 9.6.7 Crossing designs will be agreed with the Environment Agency and LLFAs in advance of construction. Designs would meet with all the requirements of the consenting regimes applicable to main river (Flood Risk Activity Permits) and ordinary watercourse crossings. Watercourses would be reinstated following construction, including reinstatement of the riparian vegetation and natural bed (commitment W02 in the Outline CoCP). Once the watercourses are reinstated, there would be no likely significant effects during operation and therefore this is scoped out of the ES.

Flood Risk and Land Drainage

Flood Risk and Drainage During Construction

- 9.6.8 There is the potential for the project to increase flood risk during construction through the creation of soil stockpiles and temporary works which could result in the temporary loss of floodplain or could impede flood flows. These effects will be reduced due to the good practice measures set out within the Outline CoCP. Therefore, it is unlikely that the project would result in a significant effect on flood risk during construction and this is scoped out of the ES.

Flood Risk and Drainage During Operation

- 9.6.9 The permanent above ground features such as the GSP substation, CSE compounds and permanent access tracks lie outside of existing flood zones, and new hardstanding will be limited. These areas will be designed with permeable surfaces where practicable and will incorporate appropriate surface water drainage measures in accordance with commitment W07 in the Outline CoCP. Therefore, it is unlikely that the project would result in a significant effect on flood risk during operation and this is scoped out of the ES.

Flood Risk Assessment

- 9.6.10 Although there are unlikely to be significant effects on flood risk during either construction or operation, given the size of the project and the requirements set out within the NPS, a Flood Risk Assessment (FRA) will be produced for the project. It will include an

assessment of the fluvial flood risk during construction, as a result of potential working within the floodplain. This will include an assessment of stockpiles of soils to seek to avoid loss of flood storage or deflection of flood flows during construction.

9.6.11 The FRA will also consider changes to surface water flood risk due to new areas of hardstanding (temporary and permanent) and potential changes (although limited) in the land drainage regime.

9.6.12 It is proposed to scope the following aspects out of the FRA for the following reasons:

- Tidal flooding: based on the distance of the site from the sea, the risk of tidal flooding is nil;
- Reservoir flooding: available mapping (Environment Agency, 2021a) shows that there is no risk of flooding on site should large reservoirs fail and release the water they store;
- Sewerage flooding: Given the rural nature of the development area, it is unlikely that many sewerage systems will be crossed by the route, nor will any new connections into the existing sewerage network be required; and
- Groundwater flooding: Available data (Essex County Council, 2011; Suffolk County Council, 2011) indicate a low baseline risk of flooding from groundwater.

9.7 Proposed Assessment Methodology

9.7.1 This section sets out the proposed assessment methodology for those aspects scoped into the water environment assessment. The assessment will be 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.

9.7.2 In addition, various Construction Industry Research and Information Association (CIRIA) publications will be referenced (see Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance, for details). These set out current good practice measures to avoid and reduce construction impacts on surface water resources. Local flood risk management guidelines published by Essex and Suffolk County Councils will also be referenced including:

- The Sustainable Drainage Design Guide for Essex (Essex County Council, 2020); and
- Sustainable Drainage Systems: a local design guide (Suffolk Flood Risk Management Partnership, 2018).

9.7.3 The FRA will be produced in accordance with the NPPF, as well as with reference to 'Flood resilience and resistance for critical infrastructure' (CIRIA, 2010). The FRA will consider flood risk from fluvial and surface water sources during both construction and operation. It will also include details of the measures proposed, to adhere to local drainage and flood risk planning policies.

9.7.4 A WFD Screening Assessment will also be produced for the project guided by Planning Advice Note Eighteen: The Water Framework Directive (Planning Inspectorate, 2017b). The effects of the project on the relevant RBMP and the water bodies (see Table 9.2) therein will be described, and the assessment will set out how the project design has been developed to align with the requirements of the Directive.

9.7.5 A qualitative approach is proposed and the assessment will identify embedded and good practice measures that would avoid water body deterioration, as well as any other mitigation necessary. As the WFD is concerned with non-temporary effects and given the suite of good practice measures included within the Outline CoCP, an appraisal of construction effects is not required and WFD compliance during construction would be scoped out of the WFD assessment.

Ascribing Value/Sensitivity

9.7.6 Water environment receptors have been identified within the study area and the attributes and the services that these water bodies provide have been characterised using the baseline datasets collected to date. This information will be used to assign to receptors one of the value (sensitivity) categories defined in Table 9.1. These values are based on Table 3.70 of LA 113 (Highways England *et al.*, 2019).

Table 9.1: Criteria for Determining Value/Sensitivity

Sensitivity/Value	Criteria
Very high	<p>Nationally significant attribute of high importance. Examples:</p> <p>Watercourse having a WFD classification shown in a RBMP and $Q95 \geq 1.0\text{m}^3/\text{s}$.</p> <p>Site protected under European legislation whose designated interest is dependent on the hydrological/surface water regime e.g. (Special Area of Conservation, Special Protection Area, Ramsar site*</p> <p>Land uses defined as essential infrastructure or highly vulnerable development under the NPPF, for example transport routes, electricity generating power stations and grid and primary substations, emergency services stations and basement dwellings.</p> <p>River supporting a regionally important abstraction for potable water supply.</p>
High	<p>Regionally significant attribute of high importance. Examples:</p> <p>Watercourse having a WFD classification shown in a RBMP and $Q95 < 1.0\text{m}^3/\text{s}$.</p> <p>Site protected under UK legislation whose designated interest is dependent on the hydrological/surface water regime e.g. SSSI, NNR, Local Wildlife Site, salmonid waters*.</p> <p>Land uses defined as 'More vulnerable' under the NPPF, e.g. residential dwellings, educational establishments.</p> <p>River supporting a locally important abstraction for potable water supply.</p>
Medium	<p>Locally significant, of moderate quality and rarity. Examples:</p> <p>Watercourses not having a WFD classification shown in a RBMP and having a $Q95 > 0.001\text{m}^3/\text{s}$.</p> <p>Land uses defined as 'Less vulnerable' under the NPPF e.g. buildings used for shops, offices and general industry.</p> <p>River supporting abstraction for non-potable water supply at the local scale.</p>
Low	<p>Lower quality Examples:</p> <p>Watercourses not having a WFD classification shown in a RBMP and $Q95 \leq 0.001\text{m}^3/\text{s}$.</p> <p>Land uses defined as water compatible e.g. docks, marinas and water transmission infrastructure.</p>

*Groundwater dependent terrestrial ecosystems are assessed in Chapter 10.

Impact Magnitude

- 9.7.7 The criteria for assigning impact magnitude, summarised in Table 9.2 (drawn from Table 3.71 of LA 113 (Highways England, 2019a), consider the scale/extent of the predicted change and the nature and duration of the impact. Whilst examples of each category of impact magnitude are provided in the guidance, professional judgement will be applied in assigning a magnitude of impact.

Table 9.2: Criteria for Determining Magnitude

Magnitude	Description
Large	Loss or extensive change to a fishery. Loss of regionally important public water supply. Reduction in water body WFD classification. Increase in peak flood level (>100mm).
Moderate	Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/ industrial/agricultural supplies. Contribution to reduction in water body WFD classification. Increase in peak flood level (>50mm).
Small	Potential for a low risk of pollution Increase in peak flood level (>10mm)
Negligible	No measurable change to baseline surface water quality or WFD water body status. Negligible change to peak flood level ($\leq \pm 10$ mm).

Significance

- 9.7.8 Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This may be supplemented by technical judgement, which will be explained to give the rationale behind the values assigned. Likely significant effects, in the context of the EIA Regulations 2017 will be effects of moderate or greater significance.
- 9.7.9 Overall significance will also be concluded for each aspect of the water environment, taking into consideration the potential for the project to affect more than one attribute of a particular water body.

Limitations of Assessment

- 9.7.10 It has been assumed that there are sufficient data available from the Environment Agency and LLFAs to inform a site-specific FRA and that no quantitative assessments (modelling) will be needed. No water-quality sampling and analysis is proposed as it is considered that sufficient baseline data are available to generally characterise the water quality of surface water receptors.

9.8 Conclusion

- 9.8.1 The assessment of effects on the water environment will be focused on flood risk from rivers and surface water changes caused by the project. The potential for temporary changes to hydromorphology and the land drainage regime during construction is also

scoped in, as well as an assessment of the project's compliance with the objectives of the WFD during its operation. All other aspects are scoped out.

9.8.2 Initial consultation has been undertaken with the Environment Agency (28 January and 8 March 2021) and the LLFAs at Essex and Suffolk County Councils (10 March 2021). The purpose of these discussions was to gather baseline data and to provisionally set out the approach to, and scope of the assessment of significant effects. The meetings discussed the proposed study area, use of existing published datasets to inform the assessments going forward, and the aspects to be scoped in and out, summarised above. Comments raised during these meetings have been considered when preparing the Scoping Report.

9.8.3 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 9.3.

Table 9.3: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Flood risk from rivers and surface water	Potential flood risk due to construction works within the floodplains of the Rivers Stour and Brett.	Construction and operation	Scoped in
Flood risk from sewers, the sea and reservoirs and groundwater	No likely significant effects	Construction and operation	Scoped out
Temporary changes to the land drainage regime/surface water flood risk	Potential for changes to rainfall infiltration and runoff patterns due to earthworks and introduction of new areas of hardstanding.	Construction	Scoped in
Effects on surface water quality	No likely significant effects	Construction and operation	Scoped out
Watercourse crossings – temporary effects on hydromorphology	Potential for temporary physical disturbance to watercourse channels, banks and the riparian corridor in the underground cable sections, as well as temporary changes to flow regimes where overpumping is needed to construct watercourse crossings e.g. at the River Box.	Construction	Scoped in
Watercourse crossings – permanent changes to hydromorphology	No likely significant effects	Operation	Scoped out
Detriment to existing water interests (surface water abstractions and discharges)	No likely significant effects	Construction and operation	Scoped out

10. GEOLOGY AND HYDROGEOLOGY

10.1 Introduction

10.1.1 This chapter sets out the proposed approach to assessing the effects of the project on geology and hydrogeology (groundwater) during construction and operation. The project has the potential for effects to geology and hydrogeology through construction such as excavation or disturbance of soil that could be contaminated and through the installation of features, such as foundations that disrupt natural groundwater movements. Construction works, particularly associated with deeper excavations such as at trenchless crossings, can require dewatering which can affect groundwater levels.

10.1.2 The receptors included within this chapter comprise:

- sites designated for their geological importance, which might be damaged by the project;
- designated mineral reserves, which might be sterilised by construction within or across them;
- groundwater bodies and groundwater receptors, which are subject to potential effects from pollution or reduction in groundwater levels;
- surface water receptors where their quality or flows are potentially impacted by changes to groundwater conditions; and
- groundwater-dependent terrestrial ecosystems, which again may be subject to potential effects from pollution or reduction in groundwater levels.

10.1.3 This chapter has links with other chapters, in particular Chapter 9: Water Environment, which considers effects on surface water; Chapter 7: Biodiversity, which considered effects on GWDTs and Chapter 11: Agriculture and Soils, which considers the effects of the project on soil.

10.1.4 This chapter is supported by the following figure:

- Figure 10.1: Geological and Hydrogeological Features

10.2 Regulatory and Planning Policy Context

10.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which states in paragraph 5.10.9 that *'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'*.

10.2.2 Paragraph 5.10.22 also states *'Where a proposed development has an impact upon a Mineral Safeguarding Area, the IPC should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources'*.

10.2.3 EN-1 is supported by NPS EN-5, which contains paragraph 2.8.9 relating to geology and hydrogeology, *'the environmental and archaeological consequences (undergrounding a 400kV line may mean disturbing a swathe of ground up to 40 metres across, which can disturb sensitive habitats, have an impact on soils and geology, and damage heritage assets, in many cases more than an overhead line would)'*.

10.2.4 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to geology and hydrogeology. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to geology and hydrogeology.

10.3 Study Area

10.3.1 The study area for geology and hydrogeology comprises the area directly affected by the project (currently assumed to be the Scoping Boundary) as the focus for the detailed assessment. The 'wider study area' extends to 1km around the Scoping Boundary in order to provide environmental context and identify potential receptors (Figure 10.1). This is considered an appropriate study area based on technical knowledge of similar projects.

10.4 Existing Baseline

Data Sources

10.4.1 The baseline assessment has been informed 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, 2021b);
- Defra mapped information, via MagicMap (Defra, 2021c) for Source Protection Zones, aquifer designations, hydrological features and designated habitat sites;
- Landfill site locations for historical and active landfill sites (Environment Agency, 2020c; 2020e);
- Local Minerals Plan (Suffolk County Council, 2020) for mineral reserves;
- Information provided from local authorities, including contaminated land sites and private water supply information;
- Information provided by the Environment Agency on groundwater abstraction licences; and
- Sites of geological conservation interest from UK Government (2021).

Baseline Environment

10.4.2 Land in the wider study area is dominated by arable farmland with occasional orchards and juvenile woodland. Other features of note include several large sand and gravel pits (particularly Layham Quarry), and a landfill site, detailed below. There are no sites designated for geological importance (e.g. SSSIs designated for their geological importance) within the Scoping Boundary.

10.4.3 A number of surface watercourses cross the Scoping Boundary, generally flowing from north to south. These include the River Stour, River Box, River Brett and Belstead Brook. Further details can be found in Chapter 9: Water Environment and on Figure 9.1.

10.4.4 The geology of the wider study area comprises superficial Glacial Till (Boulder Clay) overlying undifferentiated Glacial and Fluvial Sands and Gravels (BGS, 2021b). Where river valleys cross the Scoping Boundary, Alluvium and River Terrace Deposits are present, occasionally underlain by Glacial Till deposits but generally underlain by the local bedrock where the river valleys are incised through the superficial geology.

10.4.5 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. The hydrogeology is classified by the Environment Agency (Defra, 2021c) as follows:

- Principal aquifers: Red Crag and underlying White Chalk subgroup;
- Secondary A aquifers: The Woolwich and Reading Formations; Alluvium, River Terrace Deposits and Glacial and Fluvial Sands and Gravels; and
- Unproductive strata: Glacial Till and the London Clay Formation.

10.4.6 The Scoping Boundary traverses several groundwater bodies (Environment Agency, 2020a), which are shown in Table 10.1.

Table 10.1: Groundwater Bodies Traversed by the Scoping Boundary

Groundwater Body	Areas Encountered	Chemical Class	Overall Class
Essex Gravels	Extensive areas between Twinstead and Hadleigh, including the valleys of the Rivers Stour, Box and Brett	Poor	Poor
North Essex Lower London Tertiaries	Narrow bands in the main river valleys	Good	Poor
North Essex Chalk	River Stour valley, around Leavenheath, River Brett valley, and east of Hadleigh	Poor	Poor
Waveney and East Suffolk Chalk and Crag	From Hintlesham to Bramford	Poor	Poor

10.4.7 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 any contaminative industrial sites. Some small pieces of contaminated land are noted within the wider study area, including historical quarries and the former rail line south of Hadleigh (which also crosses the Scoping Boundary).

10.4.8 One existing landfill lies in the wider study area – this is Layham Quarry Landfill, which is a non-hazardous waste landfill (Environment Agency, 2020e). The Scoping Boundary crosses this landfill as an overhead line.

10.4.9 The Scoping Boundary crosses two public water supply source protection zones (SPZ), in the Brett Valley near Upper Layham and in the Stour Valley near Lamarsh. In both cases the Indicative Alignment lies within SPZ2, although it passes within 40m of SPZ1 in the Brett Valley.

10.4.10 Groundwater vulnerability is mapped as low or medium across much of the wider 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.

- 10.4.11 Initial data for GWDTEs indicate that six sites lie within the wider study area. These sites, which include four CWSs and two LWSs, incorporate wet flushes, grassland, meadow or woodland (see Chapter 7: Biodiversity, for details).
- 10.4.12 Initially available data suggest that a small number of private water supplies fall within the wider study area. The baseline will be updated as part of the ES as data are received from local authority sources.
- 10.4.13 Mineral deposits for sand and gravel are plentiful in Essex, however the Scoping Boundary crosses only one specific reserve (Minerals Safeguarding Area) identified in the Minerals and Waste Local Plan (Suffolk County Council, 2020), where it is denoted M5. The Scoping Boundary crosses this reserve at Layham, south of Hadleigh, where the existing 132kV overhead line is.
- 10.4.14 Ground Investigation was undertaken and reported prior to the project pause, and further investigation will be undertaken to inform the design prior to application. Relevant data will be reviewed and taken into account in the future assessment.

Future Baseline

- 10.4.15 There are no anticipated changes to the baseline expected over the design life of the project in relation to geology and hydrogeology.

10.5 Embedded and Good Practice Measures

- 10.5.1 The project has, wherever possible, avoided sensitive features, such as groundwater inner SPZs, through the options appraisal. In addition, the Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to geology and hydrogeology:
- GG14: Fuels, oils and chemicals will be stored responsibly, away from sensitive water receptors. Where practicable, they will be stored >15m from watercourses, ponds and GWDTEs. Where it is not practicable to maintain a >15m distance, additional measures will be identified ... Potentially hazardous materials used during construction will be safely and securely stored including use of secondary containment where appropriate. Stored flammable liquids such as diesel will be protected either by double walled tanks or stored in a bunded area with a capacity of 110% of the maximum stored volume. Spill kits will be located nearby.
 - GG16: Wash down of vehicles and equipment will take place in designated areas within construction compounds. Wash water will be prevented from passing untreated into watercourses and groundwater. Appropriate measures will include use of sediment traps.
 - GG21: A SWMP will be developed prior to construction. The contractor(s) will maintain and monitor the SWMP throughout the construction phase and oversee that any sub-contractor(s) adhere to the SWMP. The SWMP will set out, in an auditable manner, how waste will be reduced, reused, managed and disposed of in accordance with the waste hierarchy. Dedicated areas will be identified on the construction plans to allow materials and wastes to be segregated at source, reducing the risk of damage or contamination.

- GH01: For areas where potential contamination is known or strongly suspected to be present as a result of past activities, ground investigation will be undertaken where further information is required on the level of contamination. This will inform the assessment of the risks to receptors, and good practice measures and working methods to control those risks will be developed. The results will be discussed with the Environment Agency and/or relevant planning authority, as appropriate. Made ground and materials known or strongly suspected of being contaminated will be segregated from natural and inert materials; and ground arisings deemed unsuitable for reuse within the project will be disposed of appropriately for example to a soil treatment centre or landfill.
- GH02: Excavation materials identified by the watching brief as being potentially contaminated and unsuitable for reuse within the project will be segregated from other material and transported off-site in suitable vehicles for off-site testing and subsequent disposal. Vehicles will contain and cover the materials to prevent loss of leachate, dust or other material during transport.
- GH03: Where the route passes through areas where there are active Environmental Permits (for example authorised landfill sites), the contractor(s) will work with the permit holder to comply with the permit requirements.
- GH05: Measures related to discharge of water from dewatering activities and management of any contaminated soils will be described in the CEMP.

10.6 Likely Significant Effects

10.6.1 This section sets out the likely significant effects of the project on Geology and Hydrogeology. It assumes that the relevant embedded and good practice measures outlined within the Outline CoCP are in place before assessing the effects.

Effects of Dewatering and Discharge

Effects of Dewatering and Discharge During Construction

- 10.6.2 Dewatering has the result of reducing groundwater levels as nearby groundwater drains into the dewatered excavation. Lowering of groundwater levels has the potential to impact on nearby abstractions, habitats that rely on shallow groundwater, and surface water bodies (ponds, lakes, drains or watercourses) in hydraulic continuity with groundwater. However, the short-term and shallow nature of any dewatering required for construction means that such impacts are very unlikely. Therefore, effects related to groundwater lowering in the locations associated with new or removed overhead lines, or where open cut methods are proposed for underground cables, are scoped out of the ES.
- 10.6.3 Where temporary works requiring dewatering are relatively deep and within 500m of a potential receptor that is likely to be in hydrological continuity with the groundwater, assessment may be required. Scoping hydrogeological calculations using the methods set out in Hydrogeological Impact Appraisal for Dewatering Abstractions (Environment Agency, 2007a) indicate that no significant impact is likely to occur when:
- dewatering is to less than 1.5m below rest water level;
 - dewatering lasts for 100 days or less; and
 - there are no groundwater-sensitive receptors within 500m.

- 10.6.4 Temporary works would be assessed to see if they meet the above criteria for scoping out significant effects. Where these criteria are met, groundwater effects would be scoped out of the assessment: i.e. no further assessment would be undertaken. Where temporary works do not meet the above criteria (i.e. there is the potential for a significant effect to sensitive receptors within 500m), further assessment work will be undertaken, using groundwater calculations, to identify whether a significant effect would occur. The value of the groundwater level reduction to produce a significant effect will vary according to the nature of the receptor.
- 10.6.5 Any discharge of pumped groundwater will be managed in accordance with the provisions of the Outline CoCP and the CEMP and direct discharge of untested water to water bodies will be avoided. The small scale and temporary nature of pumping means that the relatively small volumes of water that may arise can be dealt with appropriately either on site or off site. Water discharges will be disposed of in accordance with any agreements made with the relevant authorities. Therefore effects relating to discharge of pumped groundwater are scoped out of the ES.

Effects of Dewatering and Discharge During Operation

- 10.6.6 There would be no dewatering during operation, and any operational discharges (e.g. at substations) will be regulated by the discharge consents process; therefore operational effects are scoped out of the ES.

Effects on Water Quality from Construction

- 10.6.7 Spills or accidents involving construction plant can be effectively managed using standard good practice measures set out in the Outline CoCP (e.g. commitment GG15). Therefore, effects on water quality in relation to construction plant are scoped out of the ES.
- 10.6.8 Trenchless crossings are proposed beneath the River Stour and the Sudbury Branch Line. The depth to the underground cables would be deeper at these locations than the open cut sections and this could interact with the aquifers. Deeper penetration is more likely to introduce new transport pathways, and there is a risk of introducing new contaminants such as drilling fluids. The CEMP will provide for controls on the nature and quantity of additives used to facilitate drilling, but they cannot be eliminated entirely. Therefore, trenchless crossings and the effects to aquifers are scoped into the ES.

Effects of Ground Disturbance on Flow

- 10.6.9 Ground disturbance during construction has the potential to 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.
- 10.6.10 The scale and nature of the planned works are such that no significant barriers to flow are envisaged. The same is true for the creation of flow pathways during the shallow works involved in the majority of the construction, including open cut underground sections and overhead line installation.
- 10.6.11 Deeper workings carry a greater risk of pathway creation by penetrating low-permeability deposits between aquifers. Therefore, trenchless crossings that go deeper than 2m below ground level are scoped into the ES. All other effects relating to ground disturbance on flow pathways are scoped out of the ES.

Effects of Ground Disturbance on Water Quality

10.6.12 New groundwater flow pathways can potentially provide new routes to mobilise contaminants from contaminated land or landfill. This can create significant effects to nearby receptors such as aquifers, watercourses and habitats. Any landfill or contaminated land that is likely to be physically disturbed during construction are scoped into the ES. The effects of ground disturbance in non-contaminated land are scoped out of the ES, as it will be addressed by the measures in the Outline CoCP.

Effects on Infiltration and Recharge During Operation

10.6.13 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 this would be designed to meet existing drainage standards (see Chapter 9: Water Environment). Therefore, any such effects will be insignificant, and infiltration and recharge of groundwater are scoped out of the ES.

10.6.14 Similarly, the potential for significant quantities of recharge to be re-routed from one groundwater catchment to another (e.g. by construction of sustainable drainage) is judged to be insignificant given the scale of works and the small amount of impermeable surface that will be constructed and are therefore scoped out of the ES.

Effects on Mineral Deposits

10.6.15 If the sections of underground cable were to pass through any designated mineral reserves or Minerals Safeguarding Areas, there would be the potential for these materials to be effectively sterilised. There is one reserve (at Layham) within the Scoping Boundary. However, this is a section where the existing 132kV overhead line would be replaced with a 400kV overhead line. Therefore, there would be no change to the status of this mineral reserve compared to the baseline and effects on mineral deposits are scoped out of the ES.

10.7 Proposed Assessment Methodology

10.7.1 This section sets out the proposed methodology for the geology and hydrogeology assessment. The assessment of significance will be based on the risk assessment process and will take account of the different sensitivities of the identified receptors, as discussed above.

10.7.2 Further desk-based geo-environmental assessment will be undertaken for those potential impacts that are scoped in, to refine baseline data already collated.

10.7.3 The assessment will be based on government guidelines appropriate to the geological and hydrogeological environment, which promote the protection of water bodies and related receptors from potential impact of development activities. Specific guidance referenced when undertaking the assessment will include:

- The Environment Agency's approach to groundwater protection (Environment Agency, 2018);
- Remedial Targets Methodology for contaminated land (Environment Agency, 2006);
- Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA, 2001); and
- Guidance on land contamination risk management (Environment Agency, 2020d).

- 10.7.4 A walkover survey will be undertaken to identify important geological features and evaluate the existing wider study area setting, surface watercourses and hydrogeology and any potentially contaminated land.
- 10.7.5 Based on the findings of the desk-based assessment and walkover survey, it may be necessary to undertake intrusive and/or non-intrusive ground investigation works, in ground suspected to be contaminated, with a view to clarifying mitigation measures. Risks associated with land that is not suspected of contamination will be managed through the good practice measures identified within the Outline CoCP.

Effects of Dewatering

- 10.7.6 An assessment of the groundwater depression caused by planned dewatering will be undertaken for trenchless crossing locations. This will follow the approach and methodology described in Environment Agency (2007a).

Effects on Water Quality from Construction of Trenchless Crossings

- 10.7.7 Designs and methodology for trenchless crossings will be reviewed for their potential to introduce contaminants to the subsurface or to provide transport pathways for existing contamination.
- 10.7.8 Materials and chemicals to be used in the construction process will be assessed for their potential impact on aquifer quality, considering the quantities to be used and the sensitivity of the aquifer to any specific contaminants identified. The effects will be quantified using hydrogeological risk assessment processes described in Environment Agency guidance (2006).
- 10.7.9 Geological cross sections along the route of the crossing will be produced to determine the potential for new pathway creation and potential sources of contamination will be assessed to determine whether a plausible linkage exists to the receptor. If a plausible linkage exists the potential magnitude of effect will be quantitatively assessed and compared to relevant environmental standards and regulation, using the precautionary principles embedded in Environment Agency guidance (2018).

Effects of Ground Disturbance on Flow

- 10.7.10 The same geological cross-sections for trenchless crossing locations 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 will impact significantly on receptors. In the event that a potentially significant effect is identified this will feed back to the design and proposed mitigation measures will be set out within the ES.

Effects of Ground Disturbance on Water Quality

- 10.7.11 Where construction works are likely to disturb known areas of contaminated land or landfill, site investigation will be required to identify potential contaminants. Locations to be examined may include:
- where the Indicative Alignment crosses landfill listed by the Environment Agency;
 - land on the contaminated land register; or

- sites with a known history of potentially contaminative land use (based on a search of Environment Agency and local planning authority datasets, as well as historical Ordnance Survey maps).

10.7.12 These locations will be discussed with project engineers to confirm whether they are likely to be disturbed during construction. If they are likely to be disturbed, site investigation will be undertaken to characterise the on-site contaminants. Geological cross sections of relevant sites will be drawn to assess the existence of pathways to receptors, and where source-pathway-receptor linkages are identified, approaches described in Environment Agency guidance (2020d) will be applied to appropriately control the risks identified.

Ascribing Value/Sensitivity

10.7.13 The criteria used to determine the value and sensitivity of receptors specific to Geology and Hydrogeology are set out in Table 10.2. These values are based on Highways England *et al.* (2020a-e).

Table 10.2: Criteria for Determining Value/Sensitivity

Sensitivity/Value	Criteria
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance e.g. Principal aquifers, areas with high groundwater vulnerability, inner groundwater SPZ1.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance e.g. outer groundwater (SPZ2) and total catchment areas (SPZ 3), Secondary aquifers, areas with intermediate groundwater vulnerability, licensed groundwater abstractions (not for public supply) and private water supplies, mineral resources planned for extraction.
Low	The receptor is tolerant of change without detriment to its character, is of low environmental value, or local importance, e.g. local nature reserves with minor groundwater dependence.
Negligible	The receptor is resistant to change or is of little environmental value, e.g. unproductive strata, areas with low groundwater vulnerability.

Impact Magnitude

10.7.14 The criteria used to determine the magnitude of effect for geology and hydrogeology are set out in Table 10.3. These values are based on Highways England *et al.* (2020a-e).

10.7.15 Effects can be positive as well as negative, for example removal or reduction in contaminated ground as a result of the project would constitute a positive effect.

Table 10.3: Criteria for Determining Magnitude of Effect

Magnitude	Description
Large	Total loss or substantial alteration to key elements or features of the baseline (pre-development) conditions such that the post-development character, composition or attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character, composition or attributes of the baseline will be materially changed.

Magnitude	Description
Small	A minor shift away from baseline conditions. Change arising from the loss or alteration will be discernible but not material. The underlying character, composition or attributes of the baseline condition will be similar to the pre-development circumstances or situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Significance

10.7.16 Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method, supplemented by technical judgement, which will be explained to give the rationale behind the values assigned. Likely significant effects in the context of the EIA Regulations 2017 will be effects of moderate or greater significance.

10.7.17 Overall significance will also be concluded for each aspect of the geological and hydrogeological environment, taking into consideration the potential for the project to affect more than one attribute of a particular receptor.

Limitations of Assessment

10.7.18 The assessment will rely on data provided by the sources listed in Section 10.4 and any limitations in the data provided will be reflected in the results of the assessment.

10.7.19 Knowledge of geological and hydrogeological features is necessarily imperfect, due to its hidden nature, and some relevant information may therefore remain unrecorded.

10.8 Conclusion

10.8.1 The likely significant effects for geology and hydrogeology are mainly associated with trenchless crossing locations which will involve deeper working than in other construction areas. There is the potential for contaminated land to be present during construction and this risk is also scoped into the assessment.

10.8.2 A meeting with the Environment Agency took place on 8 March 2021 to discuss the approach to scoping and general methodology for hydrogeological risk assessment. Environment Agency staff subsequently reviewed information presented at the meeting. No specific additional matters were raised by Environment Agency staff during this consultation.

10.8.3 Similarly, a meeting was held with the Environmental Health Officer and other departments of the local planning authority on 4 March 2021. National Grid presented the proposed approach for contaminated land assessment and no specific additional matters were raised during this meeting.

10.8.4 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 10.4.

Table 10.4: Proposed Scope of the Assessment

Type of Impact	Potential Significant Effects	Timing	Scoped In/Out
Dewatering and discharge – effects to groundwater levels	Trenchless crossing locations would be deeper and could create effects during construction as a result of dewatering and discharge.	Construction	Scoped in for trenchless crossings only
Dewatering and discharge – pumped discharge	None likely because of small scale and temporary nature of works, coupled with good practice measures in the Outline CoCP.	Construction	Scoped out
Dewatering and discharge during operation	No dewatering or discharges anticipated	Operation	Scoped out
Groundwater quality during construction	Potential for the creation of new pathways to aquifer at trenchless crossings only	Construction	Scoped in for trenchless crossings only
Ground disturbance on flow (general)	Potential for the creation of new pathways to aquifer at trenchless crossing locations	Construction and operation	Scoped in for trenchless crossings only
Ground disturbance on receptors	Potential for new pathways to be created between contaminated land and sensitive receptors	Construction and operation	Scoped in
Infiltration and recharge	No likely significant effects	Construction and operation	Scoped out
Restriction of access to mineral reserves	No likely significant effects	Construction and operation	Scoped out

11. AGRICULTURE AND SOILS

11.1 Introduction

- 11.1.1 This chapter details the proposed approach to assessing the likely significant effects (during both construction and operation) on agriculture and soils.
- 11.1.2 The effects on agriculture and soils may result from land being taken out of agricultural production and from the 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).
- 11.1.3 The receptors included within this chapter comprise:
- the presence and potential impact on best and most versatile (BMV) land (as defined by the Agricultural Land Classification (ALC) system), including land affected temporarily during construction and the land required permanently;
 - the nature and potential impacts on landholdings in agricultural use, including land affected temporarily during construction and the land required permanently. This will cover issues of potential fragmentation, biosecurity risks and impacts on any land under agri-environmental, woodland or forestry schemes.
- 11.1.4 This chapter has links with other chapters, in particular, Chapter 7: Biodiversity; Chapter 9: Water Environment; Chapter 10: Geology and Hydrogeology; and Chapter 15: Socio-Economics, Recreation and Tourism.
- 11.1.5 This chapter is supported by the following figures (Volume 3):
- Figure 11.1: Soils Mapping;
 - Figure 11.2: Provisional Agricultural Land Classification; and
 - Figure 11.3: Agri-Environment and Forestry Schemes.

11.2 Regulatory and Planning Policy Context

- 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). EN-1 contains paragraphs relating to agriculture and soils which have been considered within this chapter.
- 11.2.2 Paragraph 5.10.8 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 states that the Secretary of State (formerly the Infrastructure Planning Commission) 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 EN-1 is supported by NPS EN-5 (DECC, 2011b), which contains paragraphs relating to agriculture and soils which have been considered within this chapter. Paragraph 1.7.5

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 (third bullet point).

- 11.2.5 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to agriculture and soils. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to agriculture and soils.

11.3 Study Area

- 11.3.1 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 Order Limits at the next stage but for the purposes of Scoping the study area extends 1km around the Indicative Alignment in order to provide context within which to assess the information. This is considered an appropriate study area based on technical knowledge of similar projects. The study area is shown on Figures 11.1 to 11.3.
- 11.3.2 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.

11.4 Existing Baseline

Data Sources

- 11.4.1 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:
- Ordnance Survey mapping and aerial photography to establish land use and settlement patterns;
 - Soilscape mapping showing the distribution of main soil types was assessed on the Land Information System website (Cranfield University/Defra, 2021);
 - ALC mapping, including provisional and (where available) detailed ALC mapping from the MAGIC website (Defra, 2021c);
 - climatic data and Land Information System Soil Site Report, purchased from the National Soil Resources Institute (2021a-d); and
 - extent of agri-environmental schemes from the MAGIC website (Defra, 2021c).

Baseline Environment

Soils

- 11.4.2 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).

11.4.3 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; and
- 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

11.4.4 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.

11.4.5 There is no detailed ALC mapping available for the study area. A small area of detailed mapping lies just outside the study area boundary to the southeast of Polstead Heath, where land in Grades 2 and 3a has been confirmed.

11.4.6 Climatic data interpolated for a point within the study area (National Grid Reference TL98543993) are shown in Table 11.1 (purchased from the National Soil Resources Institute).

Table 11.1: Climatic Data (Interpolated)

Climate Parameter	Value
Altitude (m)	60
Annual Average Rainfall (mm)	597
Accumulated Temperature (the measure of the relative warmth of a locality) (day degrees)	1397
Moisture Deficit for Wheat (mm)	117
Moisture Deficit for Potatoes (mm)	112
Field Capacity Days (the duration of the period when the soil moisture deficit is zero) (days)	107

11.4.7 Climate does not impose an overall limitation on ALC grade in relation to the criteria set out in the ALC Guidelines (MAFF, 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.

Land Use

- 11.4.8 A desk-based study using aerial photographs has shown that the land use appears to be 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

- 11.4.9 It is considered that the baseline in relation to soils and ALC grades will not change from that described. There are potential changes in relation to climate change, including forecast wetter winters and drier summers, that could affect soil conditions, land grade and farming practices.
- 11.4.10 There could potentially be changes to land management practices and business approaches across the landowners/land managers.

11.5 Embedded and Good Practice Measures

- 11.5.1 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, the Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to agriculture and soils:
- GG03: A CEMP, an LEMP and an CTMP will be produced prior to construction. The CEMP shall include measures to manage dust, waste, water, noise, vibration and soil during construction. The contractor(s) shall undertake daily site inspections to check conformance to the Management Plans.
 - GG18: Earthworks and stockpiled soil will be protected by covering, seeding or using water suppression where appropriate.
 - AS01: Soil management measures will be included within the CEMP. Measures would include but not be limited to the following:
 - the soil resources present;
 - how the topsoil and subsoil will be stripped and stockpiled;
 - suitable conditions for when soil handling will be undertaken, for example avoiding handling of waterlogged soil;
 - indicative soil storage locations;
 - how soil stockpiles will be designed taking into consideration site conditions and the nature/composition of the soil;
 - specific measures for managing sensitive soils;
 - suitable protective surfacing where soil stripping can be avoided, based on sensitivity of the environment and proposed works;

- approach to reinstating soil that has been compacted, where required; and
- details of measures required for soil restoration.
- AS02: Where land is being returned to agricultural use, the appropriate soil conditions (for example through the replacement of stripped layers and the removal of any compaction) will be recreated. This will be achieved to a depth of 1.2m (or the maximum natural soil depth if this is shallower) except over the buried cables where the reinstated soil depth will be approximately 1.1m.
- AS03: Access to and from residential, commercial, community and agricultural land uses will be maintained throughout the construction period or as agreed through landowner discussions. This may require signed diversions or temporary restrictions to access. The means of access to affected properties, facilities and land parcels will be communicated to affected parties at the start of the project, with any changes communicated in advance of the change being implemented. Where field-to-field access points require alteration as a result of construction, alternative field access will be provided in consultation with the landowner/occupier.
- AS04: Existing water supplies for livestock will be identified pre-construction. Where supplies will be lost or access compromised by construction works, temporary alternative supplies will be provided. Water supplies will be reinstated following construction.
- AS05: Consultation with affected landowners will be carried out to investigate the current extent of land drainage. A scheme of pre-construction land drainage will be designed with the intent of maintaining the efficiency of the existing land drainage system and to assist in maintaining the integrity of the working area during construction. The project may include a system of 'cut-off' drains which feed into a new header drain and the project will also take into account surface water runoff measures.
- AS06: Should animal bones be discovered during construction, which may indicate a potential burial site, works will cease, and advice will be sought from the Animal Health Regional Office on how to proceed, relevant to the origin and age of the materials found.
- AS07: All movement of plant and vehicles between fields will cease in the event of a notification by Defra of a disease outbreak in the vicinity of the site that requires the cessation of activities. Advice will be sought from Defra in order to develop suitable working methods required to reduce the biosecurity risk associated with the continuation of works.
- AS08: Clay bungs or other vertical barriers will be constructed within trench excavations where deemed necessary by a suitably experienced person, to prevent the creation of preferential drainage pathways.

11.6 Likely Significant Effects

11.6.1 This section sets out the likely significant effects of the project on agriculture and soils. It assumes that the relevant embedded measures and good practice measures outlined within the Outline CoCP are in place before assessing the effects.

Soils and ALC

Soils and ALC During Construction

- 11.6.2 During construction there would be a potential loss of BMV land (ALC Grades 1, 2 and 3a) from agricultural productivity. There would also be disturbance to soils, either from access for overhead line installation/removal or due to the excavation and soil stripping from associated working areas for the underground cable trenches, GSP substation and the CSE compound footprints. There would also be the potential for impacts on the ecosystem services the soils provide. The good practice measures set out within the Outline CoCP and the good practice soil management measures set out within the CEMP for soil handling, storage and reinstatement, would reduce the effects on soils.
- 11.6.3 By the end of construction, all land required temporarily would be reinstated and there would be no significant effects on soils or ALC. Therefore, construction effects on soils and ALC are scoped out of the ES.

Soils and ALC During Operation

- 11.6.4 During operation, there would be a permanent loss of small areas of agricultural land and associated soils for the CSE compounds, GSP substation and associated access routes. It is unlikely that this would give rise to a significant effect; however, the land grades and soil types affected would be confirmed through the assessment process and as such permanent impacts on soils and ALC will initially be scoped into the assessment. This would be informed by a survey following published guidelines (MAFF, 1988). However, if the site survey confirms that the permanent land affected is not BMV land or that the cumulative loss is below the magnitude threshold for a likely significant effect, then permanent loss of agricultural land during operation would be scoped out of the ES.
- 11.6.5 Any maintenance or repair works required which would result in disturbance to soils during operation of the project would be undertaken in accordance with good practice soil handling methods. No likely significant effects on soils or ALC during operational maintenance or repair activities are therefore concluded and this aspect is scoped out of the ES.

Land Use

Land Use During Construction

- 11.6.6 During construction there would be potential impacts on agricultural operations due to disturbance (in particular where livestock are present), fragmentation, access restrictions or disruption to water supplies or land drainage. The measures set out within the Outline CoCP, including AS03, to maintain access throughout construction, would reduce the effects to agricultural land use. Effects on land drainage are covered in Chapter 9: Water Environment.
- 11.6.7 By the end of the construction phase, all land required temporarily would be reinstated. As the footprint of the permanent infrastructure is limited and as impacts on agricultural operations will be dealt with through compensation agreements (which lies outside of the EIA process) it is considered that, on completion of the reinstatement of land required temporarily, there would be no significant effects on agricultural landholdings. Therefore, construction effects on land use are scoped out of the ES.

Land Use During Operation

- 11.6.8 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 adjacent to buried cables; however, these 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.

- 11.6.9 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.
- 11.6.10 During operation, there can be landowner concerns that electric and magnetic fields (EMFs) can affect land use. However, paragraph 2.10.8 of EN-5 states that, in relation to EMFs, *'there is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMFs has any agriculturally significant consequences'*. National Grid will be undertaking a walkover of the Indicative Alignment to identify land use and activities that may require additional clearance of the conductors. Land uses include intensive activities involving horses, such as riding schools, stud farms and areas habitually used for loading or unloading horse boxes. With these measures in place, there would be no likely significant effects during operation on land use from EMF or microshocks, and this is therefore scoped out of the ES. National Grid will provide the relevant information on EMFs in a separate document submitted as part of the application for development consent. This document will demonstrate compliance in accordance with the ICNIRP guidelines and paragraph 2.10.9 of EN-5.

11.7 Proposed Assessment Methodology

- 11.7.1 This section sets out the proposed methodology for the agriculture and soils assessment. Published guidance relating to soils and land grade (as defined by the ALC system) is limited and therefore the approach which will be followed is based on technical knowledge and previous experience. This will take account of highways guidance as set out in the DMRB, LA 109 (Highways England, 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.
- 11.7.2 Agricultural and soils receptors will be identified within the study area through a review of existing available information. A site walkover and targeted soil and ALC surveys will be undertaken at the location of the GSP substation and the CSE compounds. The ALC survey will be undertaken in accordance with the published guidelines (MAFF, 1988) at a density of at least one auger per hectare.

Ascribing Value/Sensitivity

- 11.7.3 The criteria used to determine the value and sensitivity of receptors specific to agriculture and soils are set out in Table 11.2. These values are based on technical knowledge and previous experience.

Table 11.2: Criteria for Determining Value/Sensitivity

Sensitivity/Value	Criteria
Very high	Soils directly supporting an EU designated site (e.g. SAC, SPA, Ramsar).

Sensitivity/Value	Criteria
High	<p>Soils supporting nationally designated sites like NNR/SSSI.</p> <p>ALC grade 1, 2 and 3a land (i.e. BMV land).</p> <p>Soils with low or no wetness limitation affecting workability (wetness class I or II), where drought is not also a limitation.</p> <p>Soils with a high susceptibility to structural damage and soil erosion throughout the year, including heavily textured, poorly structured soils.</p>
Medium	<p>Soils supporting non-statutory designated sites (e.g. LNR, CWS, Sites of Nature Conservation Importance).</p> <p>ALC Grade 3b land.</p> <p>Soils with low wetness limitation affecting workability (wetness class II), where drought is not also a limitation.</p> <p>Soils with some seasonal susceptibility to structural damage and soil erosion.</p>
Low	<p>Soils supporting non-designated notable or priority habitats.</p> <p>ALC grade 4 land.</p> <p>Soils with moderate wetness limitation affecting workability (wetness class III or IV).</p> <p>Soils with medium to coarse textures and some resistance to structural damage for most of the year.</p>
Negligible	<p>ALC grade 5 land.</p> <p>Soils with high wetness limitation affecting workability (wetness class V or VI).</p> <p>Soils in which susceptibility to drought is a limitation to crop growth.</p> <p>Coarse textured and stony soils with little potential for structural damage.</p>

Impact Magnitude

11.7.4 The criteria used to determine the magnitude of change for agriculture and soils are set out in Table 11.3. These values are based on DMRB LA 109 (Highways England, 2019b) and professional judgement.

Table 11.3: Criteria for Determining Magnitude

Magnitude	Description
Large	Physical removal of soil resources or permanent covering of subsoil over an area of >20ha.
Medium	Physical removal of soil resources or permanent covering of subsoil over an area of 5 – 20ha. Permanent loss/reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).
Small	Physical removal of soil resources or permanent covering of subsoil over an area of 1 – 5ha. Temporary loss/reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource).
Negligible	Physical removal of soil resources or permanent covering of subsoil over an area of <1ha. No discernible loss/reduction of soil function(s) that restrict current or approved future use.

Significance

11.7.5 Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. This may be supplemented by technical judgement which, where used, will be explained to give the rationale behind the values assigned. Likely significant effects in the context of the EIA Regulations 2017 will be effects of moderate or greater significance. Overall significance will also be concluded for each aspect of agriculture and soils, taking into consideration the potential for the project to affect more than one attribute of soils or a landholding.

Limitations of Assessment

11.7.6 There are no identified limitations associated with undertaking the assessment as set out in this chapter.

11.8 Conclusion

11.8.1 Temporary effects on agricultural land use and on soils are proposed to be scoped out. The measures included within the Outline CoCP will reduce effects as far as practicable and any remaining impacts on agricultural operations will be dealt with through compensation agreements. Permanent effects on soils and BMV land will be assessed further through targeted ALC surveys of the GSP substation and the CSE compounds; should these surveys confirm there is no impact on BMV land, operational effects on soils will be scoped out of the ES.

11.8.2 Initial meetings have been held with Natural England on 14 January 2021 and 27 February 2021. The purpose of these meetings was to introduce the project and to present the initial scope of assessment for comment. National Grid presented a summary of the topics to be considered and the potential to scope out agriculture and soils based on the good practice measures set out within the Outline CoCP.

11.8.3 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 11.4.

Table 11.4: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Temporary loss of BMV land	No likely significant effect	Construction	Scoped out
Permanent loss of BMV land	Potential for permanent loss of BMV land at the GSP substation, CSE compounds and access tracks.	Operation	Scoped in
Agricultural landholdings	No likely significant effect	Construction and operation	Scoped out
Soil quality and associated ecosystem services	No likely significant effect	Construction and operation	Scoped out
Economic effects on landowners	No likely significant effect	Construction and operation	Scoped out

12. TRAFFIC AND TRANSPORT

12.1 Introduction

- 12.1.1 This chapter sets out the proposed approach for the Traffic and Transport Assessment for the project. The scope and method of assessment have been developed using qualitative professional judgements on the potential significant traffic and transport effects of the project, based on the assessment that was undertaken before the project was paused in 2013 and benchmarks from other similar projects developed more recently.
- 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. The additional vehicle movements may have an adverse impact on traffic and transport receptors, such as people and businesses. 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 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 PRowS which could affect walkers, cyclists, and horse riders (WCH).
- 12.1.3 It is not anticipated that there would be adverse effects on transport networks during operation of the project, as traffic generated during this phase would be limited (see Chapter 4: Project Description). Therefore, it is proposed that operational effects are scoped out of the assessment – further details are provided in Section 12.7.
- 12.1.4 This chapter has links to other topics including Chapter 6: Landscape and Visual and Chapter 7: Biodiversity, which will assess the potential impacts of vegetation loss along potential construction access routes. It also links with Chapter 15: Socio-Economics, Tourism and Recreation, which considers potential effects on recreation and navigation.

12.2 Regulatory and Planning Policy Context

- 12.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including the NPS EN-1. Paragraph 5.13.6 of 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*'.
- 12.2.2 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.*'
- 12.2.3 EN-1 is supported by the NPS EN-5, which does not contain any specific policy relating to traffic and transport.
- 12.2.4 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to traffic and transport. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to traffic and transport.

12.3 Study Area

- 12.3.1 The study area for the traffic and transport assessment will include 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; and/or
 - likely to be significantly affected by temporary road restrictions and traffic management measures required to construct the project.
- 12.3.2 The absence of traffic flows and routes means that the study area has not been identified at the Scoping stage. Construction traffic routes will be determined as the design for the project is developed and will be identified in the ES.
- 12.3.3 Roads affected are expected to be located within the area bounded 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 B1113 (Claydon to Bramford), 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 study area for traffic and transport in order to describe the key baseline features.
- 12.3.4 The study area for the assessment of potential for effects to PRow is the Scoping Boundary.

12.4 Existing Baseline

Data Collection

- 12.4.1 The baseline assessment has been informed by a desk-based study which has drawn on the following information sources:
- Historic traffic count data (Department for Transport (DfT), 2019a and 2019b);
 - Information on the road network (Ordnance Survey, 2021 and Google, 2021);
 - Bus routes and frequencies (Suffolk County Council, 2021a and Essex County Council, 2021a);
 - Information on PRowS (Ordnance Survey, 2021);
 - Information on the cycling network, including NCN routes (Sustrans, 2021);
 - Information on protected lanes in Essex (Essex County Council, 2013 and 2015a);
 - Information on quiet lanes in Suffolk (East Suffolk Council, 2021); and
 - Information on quiet lanes in Essex (Essex County Council, 2015b).

Baseline Environment

Road Network

- 12.4.2 The A120, the A12 and the A14 are all part of the strategic road network (SRN), managed by Highways England and providing strategic connections between the study area and the rest of the east of England and beyond. Of the other roads in the vicinity of 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 and in turn connects with the A131, which also runs north-south to the west of Twinstead.

- 12.4.3 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.
- 12.4.4 Initial consultation with the highways authorities at Essex and Suffolk County Councils highlighted some issues that will be considered when determining construction access routes for the project, including:
- 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.
- 12.4.5 Physical constraints and the sensitivity of receptors adjacent to the road network in the study area will be reviewed prior to identifying construction access routes to avoid the potential for significant effects as far as is reasonably practicable.

Public Transport

Buses

- 12.4.6 Suffolk and Essex bus services currently operating in the study area are summarised in Table 12.1. Bus services shown, cross the study area on an average weekday, and so exclude weekend services and seasonal/school bus services.

Table 12.1: Bus services (Suffolk County Council, 2021 and Essex County Council, 2021)

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, time of day varies depending on day of the week

Bus Service	Operator	Route	Typical Daytime Frequencies (Monday – Saturday)
750, 753, 754	Chambers	Colchester - Sudbury - Bury St Edmunds	Five times an hour
F315	A Demand Responsive Transport operates between Sudbury - Gestingthorpe - Pebmarsh - Gt 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 operates in the northeast Braintree area.		

Rail Network

- 12.4.7 The Great Eastern Main Line between London and Norwich lies approximately 10km to the south of the Scoping Boundary, and broadly follows the same alignment as the A12. It includes stations at Ipswich, Manningtree, Colchester and Marks Tey.
- 12.4.8 The Sudbury Branch 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 & Wakes Colne). Current service provision consists of one train per hour in each direction during the day on a typical weekday.

Walking, Cycling and Horse-Riding Routes

- 12.4.9 The study area includes two routes on the NCN, which include both on-road and off-road sections (Figure 15.2). NCN 1 is 1,264 miles in length running indirectly between the south of England and Scotland. It passes broadly east-west using unclassified roads between Hadleigh and Ipswich, crossing the Scoping Boundary at the Hadleigh Railway Walk. NCN 13 runs 136 miles from London to Fakenham. This crosses the Scoping Boundary in a north-south direction to the north of Lamarsh using unclassified roads.
- 12.4.10 There are numerous other PRoWs (footpaths, bridleways and byways) in the area, and horse-riding is a popular leisure activity around Bramford, Hintlesham, Shelley and Layham in Suffolk; and around Twinstead. Other recreation features are described within Chapter 15: Socio-Economics, Recreation and Tourism.

Future Baseline

- 12.4.11 In the absence of the project, the future transport baseline in the study area is not expected to change significantly from the current baseline, which will include forecasted traffic growth. 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.
- 12.4.12 Initial consultation with the highways 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.
- 12.4.13 In addition, Highways England is developing a project to widen the A12 between junction 19 (Chelmsford) and junction 25 (A120 interchange, Marks Tey) – construction is currently anticipated to commence in 2023/4 with completion in 2027/8 (Highways England, 2021a).
- 12.4.14 Highways England 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 committed at this stage.
- 12.4.15 A review of committed development (defined in line with DfT Transport Analysis Guidance) will be undertaken to update the future baseline prior to the development of the traffic and transport assessment.

12.5 Embedded and Good Practice Measures

- 12.5.1 The project has avoided sensitive features, such as urban areas, through the options appraisal. In addition, a trenchless crossing beneath the Sudbury Branch Line has been embedded into the design of the project, which would reduce impacts on the railway line and rail users. The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to traffic and transport:
- TT01: The CTMP will set out measures to reduce route and journey mileage to and from and around site, prevent nuisance to the residents, businesses and the wider community caused by parking, vehicle movements and access restrictions. It will also provide suitable control for the means of access and egress to the public highway and set out measures for the maintenance and upkeep of the public highway. The plan will also identify access for emergency vehicles. It will also set out measures to reduce safety risks through construction vehicle and driver quality standards and measures to manage abnormal loads.
 - TT02: The contractor(s) will implement a monitoring and reporting system to check compliance with the measures set out within the CTMP. This will include the need for a GPS tracking system to be fitted to Heavy Goods Vehicles to check for compliance with authorised construction routes. The contractor(s) will also be expected to monitor the number of construction vehicles between the site and the SRN. Deviations from either the authorised routes or changes to traffic levels that are higher than the CTMP assumptions will require discussion of the need for additional mitigation measures with highways authorities.

- TT03: All designated PRowWs will be identified, and any potential temporary closures applied for/detailed in the DCO. All designated PRowWs crossing the working area 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 concern.

12.5.2 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. The development of an Outline CTMP prior to the application will facilitate engagement with statutory consultees on proposed construction traffic management measures that may be included in the final CTMP.

12.5.3 The Outline CTMP will consider the use of Suffolk County Council's and Essex County Council's permit schemes to obtain approval for any required road works due to the project.

12.6 Likely Significant Effects

12.6.1 This section sets out the likely significant effects of the project on traffic and transport. It assumes that the relevant embedded measures and good practice measures outlined within the Outline CoCP are in place before assessing the likely significant effects.

Traffic and Transport Effects During Construction

12.6.2 The construction of the project would require the delivery of materials, plant and equipment and the removal of waste, such as that associated with the removal of the 132kV overhead line. Temporary haul roads would also be required along the underground cables working areas, and connecting each pylon location to facilitate the movement of construction vehicles. Permanent access roads would be required to the GSP substation and CSE compounds.

12.6.3 There would also be a requirement for abnormal indivisible loads (AIL) movements on the highway network for the delivery of the super grid transformers to the new GSP substation. An AIL access study is being undertaken to assess the suitability of the road network and to agree the proposed AIL route with the highways authorities. The outputs of this study, including any alterations required to the road network and the timing of the AIL movements, are scoped into the ES.

12.6.4 The activities listed above could have an adverse effect on traffic and transport because of the following:

- temporary increases in traffic flows on roads in the study area due to construction vehicles and construction workers travelling to and from the construction site;
- interactions between any proposed haul roads, the public highway, and PRowWs;
- temporary road closures (mainly short overnight closures) and diversions in the study area;
- temporary restrictions and diversions of PRowWs in the study area;
- a requirement to widen roads; and
- the provision of bellmouths and site entrances for access to construction areas.

12.6.5 The impacts described above may result in significant effects on:

- walkers, cyclists and horse riders; and
- vehicle occupants.

12.6.6 Once construction is complete, the transport network would be reinstated to its original condition unless the relevant local highway authority agreed to retain works permanently (for example, minor carriageway widening).

Road Network Performance and Safety

12.6.7 Although construction traffic volumes are generally expected to be low across much of the study area, the potential exists for significant adverse effects in certain areas on the local road network. In particular, the A1071 connecting the A134 with the A12/A14 via Hadleigh and the Copdock Interchange is likely to be identified as a key construction access route for the project. The traffic and transport assessment will consider impacts and effects on road users along all identified construction access routes and at relevant connecting SRN junctions.

12.6.8 However, the SRN itself is proposed to be scoped out of the assessment on the basis that construction traffic volumes are expected to be negligible in the context of baseline traffic flows on these roads. On both the A12 and the A14 in the vicinity of the project, recent historic traffic flows have exceeded 50,000 vehicles per day (DfT, 2019a, 2019b).

12.6.9 In addition, temporary road restrictions and traffic management measures are only proposed to be included within the scope of the traffic and transport assessment if they meet or exceed the following criteria:

- for roads carrying fewer than 3,000 vehicles per day (measured in terms of annual average daily traffic (AADT)) or less than 600 Heavy Duty Vehicles (HDVs) per day, restrictions or management measures that would result in the diversion of the majority of traffic using the road for a consecutive period of 16 weeks or more in any 52-week period;
- for roads carrying between 3,000 and 6,000 vehicles per day (AADT) or between 600 and 1,200 HDVs per day, restrictions or management measures that would result in the diversion of the majority of traffic using the road for a consecutive period of 12 weeks or more in any 52-week period; and
- for roads carrying more than 6,000 vehicles per day (AADT) or more than 1,200 HDVs per day, restrictions or management measures that would result in the diversion of the majority of traffic using the road for a consecutive period of eight weeks or more in any 52-week period.

12.6.10 The criteria above have been defined based on EIA requirements for assessing air quality impacts of road schemes, where an assessment is typically required if the AADT change on a road is expected to exceed 200 HDVs or 1,000 vehicles. For example, the complete diversion of a road carrying 3,000 vehicles per day onto a single alternative route for a period of 16 weeks in any given year would hypothetically result in an effective AADT change on the alternative route of 923 vehicles ($3,000 * 16 / 52$), close to the 1,000 threshold.

12.6.11 The criteria therefore represent a conservative approach to scoping, since it is very unlikely that traffic management associated with the project would result in all vehicles on an affected road diverting (this would only occur during full road closures, and not temporary lane or carriageway closures). In some circumstances diverting vehicles would

also use a range of alternative routes, reducing the impact of the diversion on individual routes.

- 12.6.12 Appropriate procedures for temporary road restrictions and traffic management measures that do not meet the criteria defined above will be set out in the Outline CTMP.

Journey Length and Severance

- 12.6.13 The potential also exists for significant adverse effects on journey length and severance for WCH using the public highway in certain areas on the local road network. This is because impacts in the case of these topics will be influenced to a large degree by changes in traffic flow associated with the project, as referenced in the section above.
- 12.6.14 Impacts on PRowWs are proposed to be scoped out of the assessment on the grounds that the project is very unlikely to result in any significant changes to PRowWs. Such changes that are required are likely to consist of very minor restrictions and diversions that would only be in place for short periods of time. In addition, wherever temporary haul roads interact with PRowWs, the design will incorporate appropriate crossing facilities and other safety measures to avoid significant effects on WCH.
- 12.6.15 As with the requirement for temporary traffic management measures, appropriate procedures for managing changes to PRowWs will be set out in the Outline CTMP for the project.

Traffic and Transport Effects During Operation

- 12.6.16 Further details on the operation and maintenance of the project are provided in Chapter 4: Project Description. This would include annual inspections of the overhead line (using a small van) or by helicopter, and monthly routine site visits to visually inspect the GSP substation. The GSP substation would be unmanned during operation, and routine maintenance would be undertaken approximately every three years.
- 12.6.17 Maintenance and refurbishment of components of the project would typically require temporary access tracks, with vans used to carry workers in and out of site and trucks used to bring new materials and equipment to site and remove old equipment. There would also be a potential requirement for scaffolding to protect roads and other features during the work in certain instances. However, the long life expectancy of the equipment means that the traffic and transport impacts of such works would be infrequent and would typically only occur for very short periods. As a result, it is not anticipated that there would be significant adverse effects on transport networks during operation and this is scoped out of the ES.

12.7 Proposed Assessment Methodology

- 12.7.1 This section sets out the proposed methodology for the construction traffic and transport assessment. The combined effects between the traffic generated on the project and other proposed developments will be considered within the cumulative effects assessment (see Chapter 18: Cumulative Effects).

Construction Traffic Assessment

Desk-Based and Site Surveys

- 12.7.2 The assessment will draw together existing baseline data on the transport network (see Section 12.4) and will also include:

- historic traffic count data sourced from National Grid, the DfT, Suffolk County Council, Essex County Council, and recent planning applications;
 - historic traffic collision data sourced from Suffolk County Council and Essex County Council; and
 - information on road layouts, including the location of height, weight and width restrictions and protected lane/quiet lane designations from Ordnance Survey mapping, Suffolk County Council and Essex County Council.
- 12.7.3 If the assessment results in a requirement for additional mitigation to address road network performance issues at junctions, Suffolk County Council and Essex County Council would also be approached for information on junction layouts and signal cycle information.
- 12.7.4 Historic traffic counts were gathered by the project in 2013. National Grid is intending to supplement these counts with new traffic data collected for the project. These data have not been collected to date due to the ongoing COVID-19 pandemic which means that traffic surveys undertaken at present are likely to be unreliable and unrepresentative of longer-term traffic trends.
- 12.7.5 National Grid is intending to draw on historic traffic data collected in the study area before March 2020, with 2019 targeted as the most up-to-date pre-COVID baseline year. If necessary and appropriate, earlier count data would be factored up to a 2019 baseline using growth factors derived from the DfT National Trip End Model.
- 12.7.6 The impact of the COVID-19 pandemic on road traffic volumes will be reviewed periodically during the development of the project, and in discussion with the relevant highways authorities. It may be possible to undertake new surveys in the autumn of 2021, if lockdown restrictions have been fully lifted by then.
- 12.7.7 In addition, site visits will be undertaken to inform the review of baseline conditions in the study area. These visits will focus on understanding any physical constraints on the public highway (for example the presence of overgrown vegetation that may need to be cut back to allow access by Heavy Goods Vehicles (HGVs)), and activity levels and conditions (for example the availability and condition of footways and crossings) for WCH on sections of roads likely to be affected, as this information is not readily available from other sources.

Defining Construction Access Routes

- 12.7.8 The project construction access points and routes will be 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. This exercise will be undertaken in discussion with the project engineering team, other EIA disciplines, and the relevant highway authorities to identify appropriate construction routes, avoiding as far as reasonably practicable the following:
- high sensitivity receptors, including Dedham Vale AONB, Air Quality Management Areas (AQMAs) and protected lanes;
 - sections of road susceptible to traffic collisions;
 - roads with existing, high-frequency bus services;
 - roads with height, weight, and width restrictions;
 - roads with extensive on-street parking; and
 - the requirement for temporary river crossings during construction.

12.7.9 The characteristics, layout and geometry of the proposed routes will be reviewed using swept path analysis (the simulation of a vehicle moving on a digital representation of the road, to assess whether specific vehicles can manoeuvre through specific routes) to identify any requirements for physical changes to accommodate construction HGVs and AIL movements.

Calculating and Assigning Construction Traffic Volumes to the Road Network

12.7.10 A forecast of peak daily and peak hourly construction traffic volumes will be generated from vehicle-requirement estimates produced by the project engineering team. Peak daily traffic volumes will be produced in line with requirements for the air quality and noise and vibration assessments (24-hour AADT and 18-hour Annual Average Weekday Traffic).

12.7.11 The assessment will focus on forecasts for a single future year coinciding with the peak vehicle requirement for the project, although vehicle requirements throughout the construction phase will be reviewed to avoid overlooking any localised impacts in other years.

Calculating and Assigning Construction Worker Traffic to the Network

12.7.12 A forecast of peak daily and peak hourly construction worker traffic volumes commuting to and from each construction site will be generated from staff resource profiles produced by the project engineering team, detailing the number of workers who will be involved in various construction activities and their expected shift patterns.

12.7.13 The 'Travel to Work' dataset (Office of National Statistics, 2011) 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 sites and origins/destinations using resources such as Google Maps to identify the most direct/quickest logical routes. Peak daily traffic volumes will be produced in line with requirements for the air quality and noise assessments (24-hour AADT and 18-hour Annual Average Weekday Traffic).

12.7.14 As with the construction vehicle assessment, the focus for worker trips to and from each site will be on a single future year, although worker vehicle trip generation throughout the construction phase will be reviewed to avoid overlooking any localised impacts in other years. The identification of the peak year will consider the cumulative effect of construction vehicles (including AILs) and construction worker commuting trips on the road network at the same time, to avoid overlooking any cumulative impacts caused by different types of construction traffic.

12.7.15 The methodology described above reflects the fact that the project contractor would not be able to exercise the same degree of control over construction worker commuting trips as it would over HGV trips and AILs, particularly with regard to route choice. It is also likely, given the location of the project and the characteristics of the transport network in the vicinity, that most workers would choose to commute by private car.

12.7.16 Peak construction worker requirements for the project will be confirmed in due course following further development of the design. If necessary based on these requirements, mitigation measures will be considered during the development of the traffic and transport assessment to reduce potential traffic impacts through encouraging construction workers to use appropriate traffic routes, and by increasing vehicle occupancy, and promoting the use of sustainable transport.

Ascribing Value/Sensitivity

12.7.17 The assessment will consider effects on transport users and people living near the road network based on a categorisation of sensitivity to changes in traffic flow. The criteria used to determine the value and sensitivity of receptors specific to traffic and transport are set out in Table 12.2 and are based on DMRB LA 112 (Highways England *et al.*, 2020e).

12.7.18 Receptor sensitivity will relate to impacts on pedestrians and vulnerable pedestrians (children, the elderly and those with mobility impairments), cyclists, horse riders, bus users, and vehicle travellers. It will be relevant to impacts experienced on or adjacent to roads, footways, and cycleways. WCH sensitivity will be defined as per the table below. Vehicle occupants will be assumed to have low sensitivity.

Table 12.2: Criteria for Determining the Sensitivity of Receptors (based on DMRB LA 112)

Value (Sensitivity)	Criteria
Very high	<p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> Existing complete severance between communities and their land/assets, with little/no accessibility provision. Alternatives are only available outside the local planning authority area. The level of use is very frequent (daily). The land and assets are used by 50% or more in the community. <p>Walkers, cyclists and horse riders:</p> <ul style="list-style-type: none"> National trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little/no potential for substitution. Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. Rights of way for WCH crossing roads at grade with over 16,000 vehicles per day.
High	<p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> There is substantial existing severance between community and assets, with limited accessibility provision. Alternative facilities are only available in the wider local planning authority area. The level of use is frequent (weekly). The land and assets are used by 50% or more in the community. <p>Walkers, cyclists and horse riders:</p> <ul style="list-style-type: none"> Regional trails and routes likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution. Rights of way for WCH crossing roads at grade with between 8,000 and 16,000 vehicles per day.
Medium	<p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> There is existing severance between communities and their land/assets but with existing accessibility provision.

Value (Sensitivity)	Criteria
	<ul style="list-style-type: none"> Limited alternative facilities are available at a local level within adjacent communities. The level of use is reasonably frequent (monthly). The land and assets are used by 50% or more in the community. <p>Walkers, cyclists and horse riders:</p> <ul style="list-style-type: none"> PRoWs and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys. Rights of way for WCH crossing roads at grade with between 4,000 and 8,000 vehicles per day.
Low	<p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> Limited existing severance between community and assets, with existing full Disability Discrimination Act 1995 [Ref 2.N] compliant accessibility provision. Alternative facilities are available at a local level within the wider community. The level of use is infrequent (monthly or less frequent). The land and assets are used by the minority of the community. <p>Walkers, cyclists and horse riders:</p> <ul style="list-style-type: none"> Routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes. Rights of way for WCH crossing roads at grade with under 4,000 vehicles per day. All motorised vehicle occupants on the public highway.
Negligible	<p>Community land and assets where there is a combination of the following:</p> <ul style="list-style-type: none"> No or limited existing severance or accessibility issues. Alternative facilities are available within the same community. The level of use is very infrequent (a few occasions yearly). The land and assets are used by the minority of the community. <p>Walkers, cyclists and horse riders:</p> <ul style="list-style-type: none"> Not applicable

Impact Magnitude

Road Network Performance and Safety

12.7.19 Following the construction traffic assessment described above, magnitude of impact on affected roads will be defined based on the following categories related to the forecast change in future baseline traffic flow due to the project during a peak day or peak hour (noting that all increases due to construction traffic would be temporary in nature):

- increase of less than 30%: Negligible;
- increase of between 30% and 60%: Small;
- increase of between 60% and 90%: Medium; and
- increase of over 90%: Large.

- 12.7.20 This categorisation of impacts is based on guidance in the DMRB Volume 11, Section 3, Part 8 (Pedestrians, Cyclists, Equestrians and Community Effects) (Highways Agency, 1993), which has now been withdrawn. It has been referred to here, as DMRB LA 112 (Highways England *et al.*, 2020e) which replaced it does not include quantified thresholds for assessing the magnitude of impact of changes in traffic volumes.
- 12.7.21 The categorisation of impacts will be reviewed qualitatively to check that it is appropriate, accounting for factors such as the length of time that impacts would be expected to occur, the type of construction vehicles causing the impact (with greater emphasis placed on impacts caused specifically by HGVs), and the characteristics of the roads affected.
- 12.7.22 The need for more detailed assessment to determine any necessary requirements for mitigation on sections of the road network will be based on this initial categorisation of magnitude of impact in combination with a review of the location of identified sensitive receptors.
- 12.7.23 In addition, forecast increases in traffic flow due to the project, particularly due to HGVs, will be cross-referenced with the baseline review of traffic collisions to determine if any mitigation is required to reduce the risk of the project exacerbating an existing road safety issue.

Journey Length and Severance

- 12.7.24 An 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. Severance is defined in the DMRB (Highways England *et al.*, 2020e) as the extent to which members of communities are able (or not able) to move around their community and access services/facilities.
- 12.7.25 The criteria that will be used to determine the magnitude of impact regarding WCH journey length and severance impacts are set out in Table 12.3. These values are based on DMRB LA 112 Population and human health (Highways England *et al.*, 2020e). The guidance on severance covers impacts on private property and housing, community land and assets, development land and businesses, and agricultural land holdings.

Table 12.3: Magnitude of Impact – Journey Length for Walkers, Cyclists and Horse Riders

Magnitude of Impact	Change in WCH Journey Length	Change in Severance
Large	Increase or decrease of more than 500m	Introduction of complete severance with no accessibility provision.
Medium	Increase or decrease of more than 250m and less than 500m	Introduction of severe severance with limited or moderate accessibility provision.
Small	Increase or decrease of more than 50m and less than 250m	Introduction of severance with adequate accessibility provision.
Negligible	Increase or decrease of less than 50m	Very minor introduction or removal of severance with ample accessibility provision.
No change	No change from baseline conditions	No change from baseline conditions

- 12.7.26 As indicated in Table 12.3, LA 112 does not include any quantifiable definitions for the magnitude of impact categories for severance. Consequently, reference will be made to guidance in the now-withdrawn DMRB Volume 11, Section 3, Part 8 chapter on ‘relief

from existing severance' to define appropriate quantifiable thresholds for impacts occurring on the public highway related to traffic flow increases caused by the project.

- 12.7.27 The overall impact on severance on each road will be reviewed qualitatively based on other 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.

Significance

- 12.7.28 The significance of traffic and transport effects will be assessed using a matrix approach, as set out in Illustration 5.1 in Chapter 5: Environmental Impact Assessment Approach and Method. This will consider the sensitivity or value of receptors and the magnitude of the potential impact on those receptors. Professional judgement will also be used when allocating significance. Explanatory text will be provided to explain how professional judgement, where used, determined the significance assigned. Likely significant effects in the context of the EIA Regulations 2017 will be effects of moderate or greater significance.
- 12.7.29 Following the assessment of likely effects from the project, additional mitigation measures may be developed for traffic and transport. These could include works at road junctions to increase capacity and allow easier throughflow for HGVs, increasing the effective width of some road sections on identified construction access routes to allow access by construction vehicles and AIL movements, and the provision of new WCH crossing points and other targeted measures to improve safety and reduce severance on local roads.

Limitations of Assessment

- 12.7.30 The ongoing impact of the COVID-19 pandemic means it has not been possible to obtain reliable, up-to-date traffic data in the study area. This could potentially remain a challenge throughout 2021 and into 2022 and the feasibility of new data collection will be kept under review during the development of the traffic and transport assessment.

12.8 Conclusion

- 12.8.1 This chapter has summarised the scoping of the traffic and transport assessment for the project and has been informed by initial consultation with the highways authorities at Essex and Suffolk County Councils. The purpose of this consultation was to provisionally set out the approach to and scope of the assessment. The scoping proposals summarised in the remainder of this section broadly reflect those discussions.
- 12.8.2 The elements of the project most likely to result in traffic and transport effects include goods vehicles transporting construction materials; construction workers travelling to and from construction sites; and significant temporary road restrictions and traffic management measures. The impact of these elements on all users of local roads in the study area (including bus users and WCH) is proposed to be scoped into the assessment.
- 12.8.3 However, minor temporary road restrictions and traffic management measures that do not meet the criteria defined in Section 12.7 are proposed to be scoped out, with procedures set out in the Outline CTMP. The SRN itself is also proposed to be scoped out on the basis that construction traffic volumes are expected to be negligible in the context of baseline traffic flows.
- 12.8.4 Impacts on PRowWs are proposed to be scoped out on the grounds that the project is very unlikely to result in any significant changes to PRowWs. Wherever temporary haul roads

interact with PRowS, the design will incorporate appropriate crossing facilities and other safety measures to avoid significant effects on WCH. Appropriate procedures for managing changes to PRowS will also be set out in the Outline CTMP.

12.8.5 It is also not anticipated that there would be any adverse effects on transport networks during the operational phase of the project, as traffic generated during this phase would be negligible. The operational phase is consequently also proposed to be scoped out of the assessment.

12.8.6 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 12.4.

Table 12.4: Proposed Scope of the Assessment

Topic	Description	Timing	Scoped In/Out
Construction traffic impacts on network performance and safety on the local highway network and local bus services	Adverse effects could occur due to temporary increases in traffic flow on local roads due to the project.	Construction	Scoped in
Construction traffic impacts on network performance and safety at junctions with the SRN identified as part of construction access routes	Adverse effects could occur due to temporary increases in traffic flow on local roads due to the project.	Construction	Scoped in
Construction traffic impacts on the SRN	No likely significant effects	Construction	Scoped out
Impacts on WCH journey length on the public highway	WCH who use the public highway would be highly sensitive receptors to temporary increases in traffic flow due to the project.	Construction	Scoped in
Impacts on severance	Temporary increases in traffic flow could increase severance affecting private property and housing, community land and assets, development land and businesses, and agricultural land holdings.	Construction	Scoped in
Impacts on PRowS in the study area	No likely significant effects	Construction	Scoped out
Operational impacts	No likely significant effects	Operation	Scoped out

13. AIR QUALITY

13.1 Introduction

- 13.1.1 This chapter sets out the proposed approach to assessing the likely significant air quality effects resulting from construction and operation of the project on human receptors. Chapter 7: Biodiversity assesses the potential for air quality effects on ecological receptors. However, this chapter sets out the study area and methodology for ecological receptors alongside human receptors as they draw on the same guidance documents.
- 13.1.2 During the construction phase, there is the potential for particulate matter and oxides of nitrogen to be emitted by construction machinery and vehicle exhausts. During the operational phase, there is limited potential for emissions of air pollutants to be generated by the project, associated with inspection and maintenance purposes.
- 13.1.3 The aspects included within this chapter comprise:
- dust generated during construction; and
 - emissions from machinery and vehicles during construction and operation.
- 13.1.4 This chapter has links with other chapters, in particular Chapter 7: Biodiversity, which as noted above assesses the potential for air quality effects on ecological receptors.
- 13.1.5 This chapter is supported by the following figure (Volume 3):
- Figure 14.1: Noise and Air Quality Baseline

13.2 Regulatory and Planning Policy Context

- 13.2.1 Chapter 2 Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which states in paragraph 5.2.7 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;*
 - *the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;*
 - *existing air quality levels and the relative change in air quality from existing levels; and*
 - *any potential eutrophication impacts.'*
- 13.2.2 NPS EN-5 makes no specific reference to air quality.
- 13.2.3 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to air quality. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to air quality.

13.3 Study Area

- 13.3.1 The air quality study area is defined by the screening criteria from the IAQM Construction Dust Guidance (IAQM, 2016):

- a human receptor within the Scoping Boundary 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; and
- an ecological designated site within the Scoping Boundary 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.

13.3.2 At this time, only data for the location of the Scoping Boundary are available. Construction routes and site entrances are not currently defined so cannot be included at this stage but will be considered as part of the assessment within the ES. Where an assessment of emissions from traffic on the public highway is undertaken, the Affected Road Network (ARN) is defined according to the predicted changes in traffic volumes according to the IAQM Planning Guidance (Moorcroft *et al.*, 2017):

- 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 (HDVs) >3.5 tonnes of 25 AADT within or adjacent to an AQMA or 100 AADT elsewhere.

13.3.3 In areas where the above criteria are met, ecological and human receptors within 200m of the road would be scoped into the assessment.

13.4 Existing Baseline

Data Sources

13.4.1 The baseline 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, 2019);
- Ordnance Survey AddressBase Plus dataset (Ordnance Survey, 2021).

Baseline Environment

Local Air Quality Management

13.4.2 Under Part IV of the Environment Act 1995, local authorities are required to report to Defra on local air quality and local air quality management within their local authority area. This also requires an assessment of compliance with the relevant limit or objective values. The report includes a presentation of the most recent, ratified monitoring data and a description of actions to improve air quality in the local authority area.

Babergh and Mid Suffolk District Councils Annual Status Report

13.4.3 The 2019 Annual Status Report (ASR) has been reviewed as part of the data collection for the Scoping Report (Babergh and Mid Suffolk District Councils, 2019). The 2020 ASR is still at draft stage, so is not available for review but will be considered during the future assessment once available.

- 13.4.4 An AQMA was declared in November 2008 on Cross Street in Sudbury, for exceedance of the NO₂ objective and limit value of 40µg/m³ due to heavy traffic queueing on a narrow, high-sided street. This is shown on Figure 14.1. Continued elevated concentrations are recorded in the AQMA, with the 2018 value being 51.4µg/m³. Measures to improve air quality include re-routing HGVs around the town.
- 13.4.5 There are no continuous automatic monitors within the local authority areas, and monitoring is undertaken using passive NO₂ diffusion tubes at 16 locations. Fourteen locations are within Sudbury near to potential construction traffic routes. The relevant 2018 monitoring from the 2019 ASR is detailed in Table 13.1. This shows some gradual improvements in NO₂ concentrations at the locations monitored, though there are some locations where concentrations are persistently high.

Table 13.1: Babergh District Council NO₂ Diffusion Tubes

ID	Location	NO ₂ Concentration (µg/m ³)				
		2014	2015	2016	2017	2018
BDC 1*	9 Cross Street, Sudbury*	34.7	32.8	32.0	30.2	31.0
BDC 2*	17 Cross Street, Sudbury	34.2	33.1	32.8	30.7	30.3
BDC 3*	30 Cross Street, Sudbury	41.2	38.7	39.9	37	37.7
BDC 4	36 Cross Street, Sudbury	32.1	31.5	30.7	28.8	30.6
BDC 5*	58 Cross Street, Sudbury	39.8	42	40.9	41.3	38.1
BDC 6*	70 Cross Street, Sudbury	34.7	34.7	36.7	34.5	34.0
BDC 7*	78 Cross Street, Sudbury	50.0	53.2	53.7	52.7	51.4
BDC 8*	82 Cross Street, Sudbury	52.8	53.8	54.8	55.1	49.7
BDC 9*	87 Cross Street, Sudbury	52.7	52.7	52.7	54.5	46.3
BDC 10	5 Ballingdon Street, Sudbury	36.0	35.1	33.4	30.6	29.4
BDC 11	7 Ballingdon Street, Sudbury	38.5	36.4	37.1	33.4	32.4
BDC 12	54 Church Street, Sudbury	24.3	24.6	24.3	24.4	22.2
BDC 13	7 Gainsborough Street, Sudbury	33.2	33.3	31.5	31.3	29.8
BDC 14	31 Friars Street, Sudbury	20.7	20.1	18.7	18.0	18.0

* In AQMA

Bold values indicate an exceedance of the limit and objective value for NO₂ of 40µg/m³

Braintree District Council Annual Status Report

- 13.4.6 The 2020 ASR states that there are no AQMAs within Braintree District (Braintree District Council, 2020). Monitoring is undertaken through a passive diffusion tube network for NO₂ at 18 locations. No automatic monitoring is undertaken. Whilst a number of the diffusion tubes record concentrations for 2019, either in excess of the limit value of 40µg/m³ or within 10% of the limit value (indicating the potential for an exceedance), all of these tubes

are sufficiently remote from the project that they cannot be considered to represent local air quality. The nearest locations are in Halstead approximately 5.5km from the Scoping Boundary.

Background Pollutant Concentrations

- 13.4.7 The background concentrations of NO₂ are generally considered to be low (between 6.6µg/m³ and 8.2µg/m³) within the Scoping Boundary, as the values are 30% or less than the limit value of 40µg/m³.
- 13.4.8 The background concentrations of NO_x (relevant to ecological receptors) are generally low within the Scoping Boundary. The maximum background NO_x concentration is 10.5µg/m³ and the minimum is 8.4µg/m³, against a limit value for the protection of vegetation of 30µg/m³.
- 13.4.9 The background concentrations of PM₁₀ are not exceeding 50% of the limit value of 40µg/m³, allowing substantial emissions headroom. The highest modelled concentration within the Scoping Boundary is 16.0µg/m³ and the lowest is 14.0µg/m³. Background concentrations of PM_{2.5} are also not exceeding 50% of the relevant limit value, in this case 25µg/m³, where the maximum concentration within the Scoping Boundary is 9.3µg/m³ and the minimum concentration 8.8µg/m³.
- 13.4.10 There are elevated concentrations of NO₂, NO_x, PM₁₀ and PM_{2.5} in Sudbury and along the A12 as a result of road traffic emissions. These areas are principal traffic routes in the area and are highly likely to be used by project related vehicles during construction.

Human Receptors

- 13.4.11 Human receptors include residential receptors; commercial receptors, e.g. places of work; and community receptors, e.g. churches, community centres. Receptors that merit particular attention due to the relative vulnerability of people who may occupy them include medical institutions, hospices, residential care homes or sheltered accommodation and schools, nurseries, and other places of education where children or young people are present. Human receptors within the study area are shown in Table 13.2.

Table 13.2: Cumulative Receptor Counts

Receptor Type	Distance Banding from Scoping Boundary				
	0-20m	0-50m	0-100m	0-200m	0-350m
Residential	197	259	370	592	977
Community	1	2	3	4	11
Commercial	19	20	36	60	83
Total	217	281	409	656	1071

- 13.4.12 Of the identified human receptors within 350m, there are four that merit particular attention due to the potential vulnerability of their occupants. These are:

- Yanas House Nursery;
- Hintlesham and Chattisham Primary School;
- Pump Farm School; and

- Daws Hill Education Centre.

13.4.13 Remaining community receptors within 350m comprise:

- Holy Innocents Church, Lamarsh;
- Wickham St. Paul Village Hall;
- Woodland at Twinstead;
- St. Andrews Church, Layham;
- Assington Village Hall;
- Layham Village Hall; and
- Little Cornard Village Hall.

Future Baseline

13.4.14 Background air pollutant concentrations are currently available using a 2018 base year for projections (Defra, 2021b). These are predicted to improve over time due to reductions in emissions resulting from:

- reductions in transport emissions resulting from improvements in fuel efficiency and uptake in low emission vehicles;
- general reduction in the use of fossil fuels;
- reductions in pollutant emissions from agricultural sources due to improvements in management envisaged in the 2019 Clean Air Strategy (Defra, 2019b); and
- improved emission standards for Non-Road Mobile Machinery and static generators.

13.4.15 The modelled concentrations for the year 2025 show reductions in both NO₂ and NO_x levels within the Scoping Boundary compared to the 2021 forecast. The forecast shows negligible improvements in concentrations of PM₁₀ and PM_{2.5} between 2021 and 2025. The data show that concentrations of NO₂, NO_x, PM₁₀ and PM_{2.5} in Sudbury and along the A12 will remain elevated compared to the Scoping Boundary as a result of road traffic emissions.

13.5 Embedded and Good Practice Measures

13.5.1 The project has sought to avoid sensitive features such as larger residential areas and ecologically designated sites through the options appraisal. The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to air quality:

- GG10: Any activity carried out or equipment located within a construction compound that may produce a noticeable nuisance, including but not limited to dust, noise, vibration and lighting, will be located away from sensitive receptors such as residential properties or ecological sites where practicable.
- GG12: Plant and vehicles will conform to relevant applicable standards for the vehicle type as follows:
 - Euro 4 (NO_x) for petrol cars, vans and minibuses;
 - Euro 6 (NO_x and PM) for diesel cars, vans and minibuses; and

- Euro VI (NO_x and PM) for lorries, buses, coaches and Heavy Goods Vehicles (excluding specialist AIL).

Vehicles will be correctly maintained and operated in accordance with manufacturer's recommendations and in a responsible manner. All plant and vehicles will be required to switch off their engines when not in use and when it is safe to do so.

- GG13: Materials and equipment will not be moved or handled unnecessarily. When loading and unloading materials from vehicles, including cable drums and excavated materials, drop heights will be limited.
- GG17: Wheel washing will be provided at each main compound access point on to the highway. An adequate supply of water will be made available at these locations at all times. Road sweepers will be deployed on public roads where necessary to prevent excessive dust or mud deposits.
- GG18: Earthworks and stockpiled soil will be protected by covering, seeding or using water suppression where appropriate.
- GG19: Bonfires and the burning of waste material will be prohibited.
- TT01: The CTMP will set out measures to reduce route and journey mileage to and from and around site, and prevent nuisance to the residents, businesses and the wider community caused by parking, vehicle movements and access restrictions. It will also provide suitable control for the means of access and egress to the public highway and set out measures for the maintenance and upkeep of the public highway. The plan will also identify access for emergency vehicles. It will also set out measures to reduce safety risks through construction vehicle and driver quality standards and measures to manage abnormal loads.

13.5.2 The Outline CEMP will also set out detailed management measures in relation to dust (see Outline CoCP commitment GG03).

13.6 Likely Significant Effects

13.6.1 This section sets out the likely significant effects of the project on air quality. It assumes that the relevant embedded and good practice measures outlined within the Outline CoCP are in place before examining the potential for likely significant effects.

Air Quality Effects During Construction

Dust

13.6.2 Dust is generated from construction activities from the handling of waste, movement of earth, the handling of materials, and the tracking of vehicles on unpaved/unsurfaced haul roads and on the public highway. The effects of fugitive dust from construction are generally experienced through the suspension of dust particles in the air and deposition of dust and detritus on surfaces. Dust can affect human health, local amenity or ecological receptors (through deposition) within the locality of the activities being undertaken. The concentrations of suspended dust particles reduce with increased distance from the construction works.

13.6.3 The Outline CoCP includes a number of good practice measures that will reduce the generation of dust during construction. Further details will also be set out within the Outline CEMP submitted as part of the ES. With these measures in place, the project is unlikely to result in significant effects as a result of construction related dust, and this is

scoped out of the ES. A dust risk assessment will be appended to the CEMP, to document the compliance assessment and to identify any further good practice measures. This will follow the approach set out in the IAQM (2016) Construction Dust Guidance.

Generator Use

- 13.6.4 Emissions to air can be generated through the use of generator equipment such as that related to trenchless crossing operations. Such operations would be short-lived when considered on an annual basis. In addition, the good practice measures described in the Outline CoCP would reduce the effects resulting from these operations. With such control measures in place, it is not expected that the emissions from generator use during construction will result in a likely significant effect, and this is scoped out of the ES.

Traffic

- 13.6.5 During construction, there is the potential to change traffic flows on the local road network. Construction vehicles and plant would generate emissions from vehicles delivering materials and construction workers to and from the construction site. Emissions could affect receptors located close to the working area and also along construction routes along the local road network.
- 13.6.6 Whilst the emissions from the operation of construction plant are generally considered not significant given their short-term use at any given location within the construction period, the potential for emissions from construction traffic on the public highway to combine with existing emissions in areas of high sensitivity has the potential to create a significant effect.
- 13.6.7 Air emissions from the project will be reduced through the implementation of good practice measures outlined within the Outline CoCP. With these measures in place, construction traffic related emissions will be reduced. However there are areas, such as Sudbury, where concentrations of traffic-based pollutants are already in exceedance of the limit of $40\mu\text{g}/\text{m}^3$ for NO_2 . The addition of construction traffic in this area will result in a further deterioration of pollutant concentrations which may be considered to be a significant effect and is scoped into the ES.
- 13.6.8 National Grid is not anticipating the need for any long duration (greater than four weeks) road closures or diversions. Given the rural nature of the study area and the commensurate low vehicle flows on potentially affected roads, it is not expected that the changes in traffic flows will meet the criteria for change described in the IAQM guidance (Moorcroft *et al.*, 2017), and therefore this aspect is scoped out of the ES.

Air Quality During Operation

- 13.6.9 There are very small numbers of vehicles associated with operation and maintenance of the project (see Chapter 4: Project Description), and no dust sources have been identified. Therefore, there are no likely significant effects in relation to air quality (including dust), and this is scoped out of the ES.

13.7 Proposed Assessment Methodology

Ascribing Value/Sensitivity

- 13.7.1 Sensitive receptors include locations where people are likely to be exposed to air pollutants for an averaging time commensurate with the pollutant objective or limit value being assessed against. Receptors include:

- residential receptors;
 - commercial receptors, e.g. places of work;
 - community receptors, e.g. churches, community centres; and
 - ecological Receptors (statutory, non-statutory and locally designated sites).
- 13.7.2 Receptors that merit particular attention due to the relative vulnerability of people who may occupy them include:
- medical institutions;
 - hospices;
 - residential care homes or sheltered accommodation; and
 - schools, nurseries, and other places of education where children or young people are present.
- 13.7.3 Whilst the legal limit and objective values for air pollutants are established in law, it is widely recognised that the air pollutants identified in the Air Quality Standards Regulations 2007 are considered to be non-threshold pollutants, i.e. there is no safe exposure limit below which there are no health impacts. Therefore, all receptors that are exposed to air pollutants for a time period relevant to the limit or objective value for a given pollutant are considered to be highly sensitive receptors.
- 13.7.4 The criteria used to determine the value and sensitivity of the receiving environment to air quality effects can be found in the tables in Section 7 of the Dust Risk Assessment Guidance (IAQM, 2016). These tables take account of the number of receptors within a given distance of construction works, the sensitivity of receptors and the background PM₁₀ concentration through a semi-quantitative method to establish the sensitivity according to dust soiling impacts, human health impacts and ecological impacts.

Construction Traffic

- 13.7.5 The proposed traffic flows using the public highway as a result of construction of the project could meet the assessment criteria from the IAQM guidance (Moorcroft *et al.* 2017). Where flows meet the criteria for assessment, detailed dispersion modelling will be undertaken on the relevant road links to assess the changes in concentrations of air pollutants. The screening criteria are:
- a change in Light Duty Vehicle flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere; and
 - a change in HDV (>3.5 tonnes) flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere.
- 13.7.6 The screening criteria will identify the ARN. Road links that do not meet the criteria will not be subject to assessment.
- 13.7.7 Sensitive receptors within 200m of the ARN will be considered. Beyond this distance concentrations are expected to have dispersed to concentrations equivalent to background levels and will not be assessed.
- 13.7.8 If the screening criteria are met or exceeded then calculation of emissions from traffic will be undertaken using the latest available version of the Defra Emissions Factor Toolkit (currently v10.1). Dispersion modelling will be undertaken using the Air Dispersion Modelling System-Roads dispersion modelling program.

13.7.9 The conversion of road NO_x to NO₂ will be undertaken using the latest version of the Defra NO_x to NO₂ Calculator (currently v8.1).

Impact Magnitude

Construction Traffic

13.7.10 The magnitude of change for construction traffic emissions will be assigned based on the criteria from IAQM Land-use Planning and Development Control: Planning for Air Quality. v1.2 (Moorcroft *et al.*, 2017) as shown in Table 13.3.

Table 13.3: IAQM Impact Magnitude Criteria

Long-term Average Concentration at Receptor in Assessment Year	% Change in Concentration Relative to the Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Significance

Construction Traffic

13.7.11 Significance will be derived using the matrix set out in Illustration 5.1 in Chapter 5: EIA Approach and Method. Unlike the process set out in Chapter 5, the air quality assessment may consider effects with a slight or negligible magnitude to be significant, where there is a risk that these could combine to create a cumulative effect on human health. This may be supplemented by technical judgement, which will be explained to give the rationale behind the values assigned.

Limitations of Assessment

13.7.12 Receptor numbers are currently quantified using the AddressBase dataset points and do not necessarily represent worst-case building outline exposure locations. More detailed OS MasterMap data will be used at the assessment stage to accurately quantify numbers of affected receptors.

13.7.13 Background air pollutant concentrations are currently taken from the Defra archive maps using the 2018 base year maps (pre-COVID-19 levels). It is anticipated new modelling will be undertaken by Defra on an annual or bi-annual basis according to previous data releases. The most recently available maps will be used in any eventual assessment.

13.7.14 Calculation of emissions from traffic is undertaken with the most recently available local air quality management tools and background air quality concentrations from Defra. These are periodically updated, and this may occur during the course of the project. Where this occurs, the tools and data used will be stipulated to maintain continuity, where appropriate, throughout the project.

13.8 Conclusion

- 13.8.1 Operational impacts to air quality have been scoped out of the ES due to no likely significant effects expected due to the low numbers of vehicle movements.
- 13.8.2 The assessment of the risk of impacts from construction dust has been scoped out of the ES on the basis that no likely significant effects are expected following the implementation of good practice measures set out in the Outline CoCP. A dust risk assessment will be appended to the CEMP. Assessment of emissions from construction generators has also been scoped out of the ES due to highly localised and temporary operation and good practice measures in the Outline CoCP.
- 13.8.3 If the screening criteria are met or exceeded, then an assessment of the effects of the emissions of construction traffic using the public highway will be scoped into the ES. Road links that do not meet the criteria, will not be subject to assessment and will be scoped out of the ES. Assessment of emissions from diverted traffic has been scoped out due to low expected changes in traffic flows.
- 13.8.4 An initial meeting was held with Babergh, Mid Suffolk and Braintree district councils 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 stakeholders during the meeting.
- 13.8.5 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 13.5.

Table 13.5: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Construction dust	No likely significant effects.	Construction	Scoped out
Construction generators	No likely significant effects.	Construction	Scoped out
Construction traffic	Potential for deterioration in local air quality (NO ₂ , NO _x , PM ₁₀ and PM _{2.5}) at local human and ecological receptors. Potential for likely significant effects on the local road network, including at Sudbury AQMA. This will be scoped out if the screening criteria are not met. Diverted traffic is scoped out as there are no likely significant effects.	Construction	Scoped in, if the screening criteria are met or exceeded
Operational vehicle emissions	No likely significant effects.	Operation	Scoped out

14. NOISE AND VIBRATION

14.1 Introduction

- 14.1.1 This chapter sets out the proposed approach to assessing the likely significant noise and vibration effects on noise and vibration sensitive receptors (NSRs) associated with the construction and operation of the project.
- 14.1.2 Noise is generated during construction through the use of machinery, particularly trenchless crossing methods, piling and use of generators. Noise is also generated due to increased traffic on the road network. Operational noise can be experienced from overhead lines (crackle associated with corona discharge) or due to equipment such as at the GSP substation. Embedded measures will reduce the level of operational noise. The underground cables and CSE compound would not generate noise during operation.
- 14.1.3 This chapter has links to other chapters, in particular Chapter 6: Landscape and Visual, which considers tranquillity; 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 details about traffic routes and numbers to inform the noise assessment relating to construction traffic.
- 14.1.4 This chapter is supported by the following figure (Volume 3):
- Figure 14.1 Noise and Air Quality Baseline.

14.2 Regulatory and Planning Policy Context

- 14.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which states that *'where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment'* including a description of the noise generating aspects leading to noise impacts, noise sensitive properties that may be affected, an assessment of the effect of predicted changes in the noise environment at noise sensitive properties and measures to be employed in mitigating noise.
- 14.2.2 NPS EN-1 is supported by NPS EN-5, which contains the following guidance relating to noise, specifically from overhead lines, which has been considered within this chapter:
- 'The IPC should ensure that relevant assessment methodologies have been used in the evidence presented to them, and that the appropriate mitigation options have been considered and adopted. Where the applicant can demonstrate that appropriate mitigation measures will be put in place, the residual noise impacts are unlikely to be significant.'*
- 14.2.3 In addition, Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to noise and vibration. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to noise and vibration.

14.3 Study Area

- 14.3.1 Residential and non-residential NSRs within 1km of the project have been identified and are shown on Figure 14.1.

- 14.3.2 The construction traffic routes are not currently defined at this stage. However, the study area for construction noise impacts within the ES will consider NSRs within 300m of the construction locations associated with the project, excluding construction traffic on the public highway which is assessed separately. This is based on guidance in British Standard 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (BS 5228-1), 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, 2020d).
- 14.3.3 Noise from construction traffic on the existing road network will be assessed for each applicable road. The assessment principally considers the change in Basic Noise Level (BNL) at 10m from the road, calculated in line with the methodology described in technical memorandum Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988), with a subsequent assessment of the impacts on NSRs beyond 10m where potential significant effects are identified.
- 14.3.4 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) and DMRB LA 111 (Highways England, 2020d), is 100m from the closest construction activity with the potential to generate vibration impacts at NSRs.
- 14.3.5 No operational study area has been defined, as significant adverse noise effects are not expected from the operation of the project (see Section 14.6).

14.4 Existing Baseline

Data Sources

- 14.4.1 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:
- Defra strategic noise mapping (2017);
 - Ordnance Survey AddressBase Plus data (2021); and
 - 2012 National Grid noise survey data.

Baseline Environment

- 14.4.2 NSRs near the project are predominantly isolated dwellings. There are, however, settlements at Burstall, Hintlesham, Hadleigh, Layham, Polstead Heath, Polstead, Hegmore Green, Leavenheath, Assington, Lamarsh, Alphamstone, Henry Street, Great Henny, Twinstead, Twinstead Green, and Wickham St Paul, within approximately 1km of the project. Residential and non-residential NSRs are shown on Figure 14.1.
- 14.4.3 Existing ambient and background noise levels along the Scoping Boundary are expected to be 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 noise survey data undertaken by National Grid in 2012, indicating that background noise levels are in the order of 20dB L_{A90} during night-time periods.
- 14.4.4 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 Scoping Boundary but may be applicable when identifying potential construction traffic. The NIAs near the project and potential construction traffic routes are shown on Figure 14.1 and are as follows:

- NI_11345 – A1072 southeast of Burstall;
- NI_11346 – A1071 in Hintlesham;
- NI_11347 – A1071 northwest of Hintlesham;
- NI_12012, NI_12013 and NI_12014 – A134 in Newton; and
- NI_12016 – A131 southwest of Twinstead Green.

14.4.5 There are additional NIAs in the wider area on main transport routes (e.g. A13, A14 and A131) which are not likely to be significantly affected by the project.

14.4.6 With regards to the vibration baseline, it is assumed that existing vibration levels are negligible in the Scoping Boundary.

Future Baseline

14.4.7 The future baseline is not expected to materially change in the reasonably foreseeable future with regards to noise and vibration.

14.5 Embedded and Good Practice Measures

14.5.1 The project has avoided NSRs, such as settlements, through the options appraisal. In addition, the design includes a number of embedded measures relevant to the noise assessment, for example the GSP substation at Butler's Wood assumes noise enclosures around the transformers to reduce operational noise (see Chapter 4: Project Description).

14.5.2 The overhead line system is a 'triple Araucaria' conductor bundle on a lattice pylon, which is regarded as practically quiet during all weather conditions. In addition, pylon fittings, such as insulators, dampers, spacers and clamps, are designed and procured in accordance with a series of National Grid Technical Specifications and must be type registered (rigorously tested) to ensure the fitting conforms to the specification. These processes reduce the potential for audible noise and tones to occur from all types of fittings, including insulators. This is a further embedded measure included within the project design (see Chapter 4: Project Description).

14.5.3 The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to noise and vibration:

- GG03: A CEMP, a Landscape and Ecological Management Plan (LEMP) and a CTMP will be produced prior to construction. The CEMP shall include measures to manage dust, waste, water, noise, vibration and soil during construction. The contractor(s) shall undertake daily site inspections to check conformance with the Management Plans.
- GG04: A suitably experienced Environmental Manager will be appointed for the duration of the construction phase. In addition, a qualified and experienced Environmental Clerk of Works will be available during the construction phase to advise, supervise and report on the delivery of the mitigation methods and controls outlined in the CEMP. The Environmental Clerk of Works will monitor that the works proceed in accordance with relevant environmental DCO requirements and adhere to the required good practice and mitigation measures. The Environmental Clerk of Works will be

supported as necessary by appropriate specialists, including ecologists and arboriculturalists.

- GG05: Construction workers will undergo training to increase their awareness of environmental issues as applicable to their role on the project. Topics will include but not be limited to:
 - pollution prevention and pollution incident response;
 - dust management and control measures;
 - location and protection of sensitive environmental sites and features;
 - adherence to protected environmental areas around sensitive features;
 - working hours and noise and vibration reduction measures;
 - working with potentially contaminated materials;
 - waste management and storage;
 - flood risk response actions; and
 - agreed traffic routes, access points, etc.
- GG10: Any activity carried out or equipment located within a construction compound that may produce a noticeable nuisance, including but not limited to dust, noise, vibration and lighting, would be located away from sensitive receptors such as residential properties or ecological sites where practicable.
- GG12: Plant and vehicles will conform to relevant applicable standards for the vehicle type... Vehicles will be correctly maintained and operated in accordance with manufacturer's recommendations and in a responsible manner. All plant and vehicles will be required to switch off their engines when not in use and when it is safe to do so.
- GG13: Materials and equipment will not be moved or handled unnecessarily. When loading and unloading materials from vehicles, including cable drums and excavated materials, drop heights will be limited.
- GG24: Working areas will be appropriately fenced. The type of fencing to be installed will be dependent on the area to be fenced and will take into consideration the level of security required in relation to the surrounding land and public access, rural or urban environment and arable or stock farming. For some locations the fence used may also serve to provide acoustic and visual screening of the work sites and reduce the potential for disturbance of users in the surrounding areas. Fencing will be regularly inspected and maintained and removed as part of the demobilisation unless otherwise specified.
- NV01: Construction working will be undertaken within the agreed working hours set out within the DCO. Best practicable means to reduce construction noise will be set out within the CEMP.

14.5.4 Contractors will 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. Compliance with the good practice

noise and vibration requirements stated therein became a statutory obligation under the Act.

- 14.5.5 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.

14.6 Likely Significant Effects

- 14.6.1 This section sets out the likely significant effects of the project on noise and vibration receptors. It assumes that the relevant embedded measures and good practice measures in the Outline CoCP (including BPM) are in place before assessing the effects.

Effects During Construction

Noise Effects from Construction Activities

- 14.6.2 There are potential significant effects due to construction noise at NSRs within the study area. However, this depends on the nature and the duration of activities, the distance between the noise source and the NSR, and the good practice measures employed to reduce noise.
- 14.6.3 Construction activities associated with pylons, conductors, trenchless crossings and underground cables are generally transient and of a relatively short duration at any one location, and together with the implementation of good practice measures, significant effects from such works are not expected. There is a greater likelihood of significant adverse effects from construction noise at static sites, such as construction compounds where the duration of works may be medium to long term, although these can generally be avoided with the implementation of the good practice measures set out within the Outline CoCP.
- 14.6.4 Although significant adverse effects from construction noise are not expected, an assessment of construction noise impacts is scoped in for further assessment to highlight any potential construction noise 'hotspots' that will require further consideration during the construction phase. Construction noise hotspots are likely to include areas where piling may be required and at the trenchless crossing locations where night-time working may be required where certain operations such as cable pulling cannot be stopped once started. This is scoped into the ES.

Noise Effects from Construction Traffic

- 14.6.5 There is the potential for significant effects at NSRs close to construction traffic routes. Noise from construction traffic on the public highway is therefore scoped into the ES.

Vibration Effects from Construction Activities

- 14.6.6 Sources of construction vibration include piling and vibratory compaction. Construction vibration would not be expected to cause damage to buildings or structures unless very high levels of vibration are generated. Such levels would only be expected to occur where vibration generating activities occur very close to structures, within approximately 10m. Such distances between vibration generating activities and structures are not expected during the project, and construction vibration effects on structures are therefore scoped out of the ES.
- 14.6.7 There are potential significant effects on human receptors (i.e. nuisance) due to construction vibration at NSRs within the study area. The level of significance will depend

on the nature and the duration of activities, the distance between the source of vibration and the NSR, and the good practice measures employed to reduce vibration. However, the duration of such activities would be expected to be relatively short at any one location, and, together with the implementation of good practice measures, significant effects from such works are not expected.

- 14.6.8 Although significant adverse effects from construction vibration are not expected, an assessment of construction vibration impacts is scoped in for further assessment to highlight any potential construction vibration 'hotspots', in terms of human receptors and structures, for further consideration during the construction phase.

Vibration Effects from Construction Traffic

- 14.6.9 Vibration from traffic on the public highway is caused by irregularities in the road surface. Where the road surface is free from irregularities, such as potholes, significant vibration effects would not be expected, even at relatively short distances. For this reason, vibration from operational roads is scoped out of the ES.

- 14.6.10 Initial calculations, based on 'Traffic induced vibration in buildings' (Transport and Road Research Laboratory, 1990) and reasonable assumptions, indicate that vibration levels from construction traffic would be expected to be less than 0.3mm/s peak particle velocity (PPV) beyond 1m from the road. Vibration from construction traffic would therefore not be expected to be perceptible at NSRs beyond 1m from the road and would be far below the level at which cosmetic damage to buildings may occur. Additionally, the CTMP will set out measures to prevent nuisance caused by vehicle movements. Vibration effects from construction traffic on the public highway are therefore scoped out of the ES.

During Operation

Noise Effects from the GSP Substation

- 14.6.11 The proposed GSP substation at Butler's Wood includes noise enclosures around the transformer as an embedded measure to reduce noise. The nearest NSRs are located approximately 300m away. Although the existing background noise levels are expected to be low (based on 2012 National Grid survey data), significant adverse effects from noise are not expected from the operation of the GSP substation with the embedded measures in place, and operational noise at the substation is scoped out of the ES.

- 14.6.12 A technical note will be produced as standard practice, to demonstrate that the noise at nearby NSRs is reduced to an acceptable level. This will be submitted as part of the application for development consent to support scoping out substation noise from the ES.

Noise Effects from Overhead Lines

- 14.6.13 The proposed overhead line system is a 'triple Araucaria' conductor bundle on a lattice pylon (embedded measure) which is regarded as practically quiet. Operational noise from the overhead line is therefore not likely to be significant at nearby NSRs under any weather conditions and is therefore scoped out of the ES.

- 14.6.14 Pylon fittings, such as insulators, dampers, spacers and clamps, are designed and procured in accordance with a series of National Grid Technical Specifications and must be type registered. These processes reduce the potential for audible noise and tones to occur from all types of fittings, including insulators. Where noise does occur, it is likely to be localised and of short duration. If this is due to a fault, actions can be taken to rectify it. Where noise from fittings does occur which results in a complaint, appropriate actions can be taken to seek to remedy the cause of the noise, usually through cleaning or

replacing the relevant fitting. Noise from fittings is therefore not expected to be significant under normal operation and is scoped out of the ES.

- 14.6.15 A technical note will be submitted as part of the application for development consent to support scoping out noise associated with overhead lines from the ES.

Noise Effects from Cable Sealing End Compounds

- 14.6.16 CSE compounds are located where an overhead line terminates and continues via an underground cable. The source of operational noise is the same as that from an overhead line (i.e. the conductors) which would also be practically quiet during operation. Operational noise from CSE compounds is therefore scoped out of the ES.

Noise Effects from Underground Cables

- 14.6.17 Underground cables are practically quiet. Operational noise from underground cables is scoped out of the ES.

Operational Vibration

- 14.6.18 There are no sources of operational vibration proposed as part of the project. Operational vibration is therefore scoped out of the ES.

Maintenance Activities

- 14.6.19 Maintenance of the overhead line and GSP substation would be infrequent and localised. Therefore, it is not a significant source of noise or vibration. Noise and vibration associated with operational maintenance is therefore scoped out of the ES.

14.7 Proposed Assessment Methodology

- 14.7.1 This section sets out the proposed methodologies for the noise and vibration assessment.

- 14.7.2 Baseline noise levels will be determined by reviewing desk-based information, including reviewing Defra strategic noise maps and using existing survey data undertaken prior to the 2013 project pause, which is proportionate to the assessment of construction noise impacts in a relatively quiet rural setting.

Ascribing Value/Sensitivity

- 14.7.3 NSRs are determined partly on property type, for example residential properties are of a higher sensitivity than factories and offices. The sensitivity of residential NSRs is factored into the assessment criteria for noise and vibration impacts.

- 14.7.4 Although all residential NSRs are sensitive to noise and vibration, there are also cases where the sensitivity of an NSR may depend on the pre-existing noise climate. For example, NSRs falling within NIAs (existing high noise areas) may be more sensitive to increases in noise than those outside NIAs. Consideration will be given to such instances as part of the assessment of construction impacts.

- 14.7.5 Additional consideration of sensitivity may be required in certain cases for non-residential NSRs. The criteria used to determine the value and sensitivity of non-residential NSRs specific to noise and vibration are set out in Table 14.1. These values are based on standard practice.

Table 14.1: Criteria for Determining Value/Sensitivity (Non-Residential NSRs)

Sensitivity/Value	Criteria
High	Schools and education premises, hospitals, clinics, care homes, places of worship, community centres, libraries.
Medium	Areas primarily used for leisure activities including PRowS, sports facilities and sites of historic or cultural importance, camp sites, hotels, gardens, parks.
Low	Offices, cafes/bars with external areas.
Negligible	Industrial or retail premises

Assessment Methodology

Construction Noise

- 14.7.6 Construction noise impacts will be assessed in accordance with BS 5228-1 and with the guidance of DMRB LA 111 (Highways England, 2020d).
- 14.7.7 Construction noise levels will be calculated at NSRs within the study area in accordance with the methodology described in Annex F of BS 5228-1. The predicted construction noise levels at NSRs will be compared against the lower noise thresholds (Category A) as detailed in Section E.3.2 of BS 5228-1 (the 'ABC' method). The Category A construction noise thresholds are suitable for quiet rural locations.
- 14.7.8 The lowest observed adverse effect level (LOAEL) and the significant adverse effect level (SOAEL) will be established in accordance with Table 14.2.

Table 14.2: Construction Noise LOAELs and SOAELs at Residential Receptors

Time Period	LOAEL	SOAEL
Weekdays 7:00am to 7:00pm, and Saturdays 7:00am to 1:00pm	50dB L _{Aeq,T}	65dB L _{Aeq,T}
Weekdays 7:00pm to 11:00pm, Saturdays 1:00pm to 11:00pm, and Sundays 7:00am to 11:00pm	50dB L _{Aeq,T}	55dB L _{Aeq,T}
Night-time 11:00pm to 7:00am	40dB L _{Aeq,T}	45dB L _{Aeq,T}

Construction Traffic Noise

- 14.7.9 Noise from construction traffic on the public highway will be calculated in accordance with CRTN and assessed against the criteria detailed in DMRB LA 111 (Highways England, 2020d). The BNL from roads within the construction traffic study area will be calculated in accordance with CRTN for the do-nothing and do-something scenarios in the construction year. The calculated BNL values will be compared to determine the magnitude of the impact.

Construction Vibration

- 14.7.10 Construction vibration levels will be calculated and assessed in accordance with the methodologies described in BS 5228-2. No vibration baseline study is proposed.
- 14.7.11 Vibration levels from construction activities will be calculated in accordance with the methodology described in Annex E of BS 5228-2. Construction vibration effect threshold levels, including applicable LOAEL and SOAEL, are shown Table 14.3.

Table 14.3: Construction Vibration Effect Magnitudes at Residential Receptors

Vibration Level mm/s PPV*	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration
0.3	Vibration might be just perceptible in residential environments (LOAEL)
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents (SOAEL)
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments

* Peak Particle Velocity

Impact Magnitude**Construction Noise**

14.7.12 The magnitude of impact of construction noise will be determined against the criteria specified by DMRB LA 111 (Highways England, 2020d), as detailed in Table 14.4.

Table 14.4: Magnitude of Impact from Construction Noise at Residential Receptors

Magnitude	Construction Noise Level
Large	Above or equal to SOAEL +5dB
Medium	Above or equal to SOAEL and below SOAEL +5dB
Small	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Construction Traffic Noise

14.7.13 The calculated BNL values for the do-minimum and do-something scenarios in the construction year will be compared to determine the magnitude of the impact in accordance with criteria specified by DMRB LA 111 (Highways England, 2020d) as detailed in Table 14.5.

Table 14.5: Magnitude of Impact from Construction Traffic at Residential Receptors

Magnitude	Increase in BNL of Closest Public Road Used for Construction Traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

Construction Vibration

14.7.14 The magnitude of impact of construction vibration will be determined against the criteria specified by DMRB LA 111 (Highways England, 2020d), as detailed in Table 14.6.

Table 14.6: Magnitude of Impact of Construction Vibration at Residential Receptors

Magnitude	Construction Vibration Level
Major	Above or equal to 10mm/s PPV
Moderate	Above or equal to SOAEL and below 10mm/s PPV
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Significance

14.7.15 Noise from construction activities, construction traffic and construction vibration will constitute a significant adverse effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; or
- a total number of days exceeding 40 in any six consecutive months.

Limitations of Assessment

14.7.16 The assessment of noise and vibration will be based on the best available data with regards to proposed construction methods at the time of assessment. Where there is uncertainty in the assessment, this will be stated and precautionary principles will be applied, such as assuming the shortest distance between construction noise sources and NSRs, typical worst-case plant selection, and high percentage 'on-times'.

14.8 Conclusion

14.8.1 With regards to noise and vibration impacts associated with the project, the assessment of construction noise and vibration together with construction traffic noise, are scoped into the assessment. No significant adverse effects are expected from operational noise sources associated with the project, including overhead lines and the GSP substation, due to the embedded measures applied as part of the project design. Operational noise is therefore scoped out of the assessment. However, evidence will be provided as part of the application for development consent to justify scoping out operational noise.

14.8.2 A meeting was held on 3 March 2021 with representatives from Braintree, Babergh and Mid Suffolk district councils and Suffolk and Essex county councils. The purpose of the meeting was to outline the proposed scope and method for the noise and vibration assessment. The noise and vibration assessment will focus on construction related impacts, with a particular focus on noisy activities (such as piling and trenchless crossings) and longer duration activities (such as those associated with site compounds and the construction of the GSP substation).

14.8.3 National Grid proposed in the meeting to not undertake further baseline noise surveys as part of the construction noise assessment, noting that the area is rural and baseline noise levels are low, and that the lower construction noise thresholds detailed in BS 5228-1 will therefore be used in the assessment of construction noise. No comments were received.

14.8.4 National Grid stated in the meeting that operational noise from the overhead lines and the GSP substation would be scoped out the assessment. Additional evidence would be provided to support the scoping out of noise from overhead lines and the GSP substation as part of the application for development consent, but that this would not be reported within the ES as it was unlikely to result in a significant effect. No comments were received.

14.8.5 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 14.7.

Table 14.7: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Construction noise	Potential significant effects from construction noise from static sites such as the GSP substation and construction compounds.	Construction	Scoped in
Construction traffic noise	Potential significant effects at NSRs close to construction traffic routes.	Construction	Scoped in
Construction vibration	Potential significant effects from construction vibration due to piling and compaction activities associated with the construction of the GSP substation, pylons and construction compounds.	Construction	Scoped in
Construction traffic vibration	No likely significant effects.	Construction	Scoped out
Operational noise from GSP substation, overhead lines, CSE compounds and underground cables	No likely significant effects. Separate technical note submitted with the application for development consent to support scoping out noise effects.	Operation	Scoped out
Operational vibration	No likely significant effects.	Operation	Scoped out
Operational noise associated with maintenance activities	No likely significant effects.	Operation	Scoped out

15. SOCIO-ECONOMICS, RECREATION AND TOURISM

15.1 Introduction

- 15.1.1 This chapter sets out the proposed approach to assessing the likely significant effects on socio-economic, recreational and tourism receptors as a result of the construction and operational phases of the project.
- 15.1.2 During construction, the project could cause direct effects to the local economy and local businesses, through severance or disruption to the accesses to businesses or due to traffic congestion caused by construction vehicles. There could also be indirect effects due to loss of business.
- 15.1.3 There could be direct effects to parts of Dedham Vale AONB and the Stour Valley and other visitor attractions during construction, where part of the areas or access to those areas may be unavailable during construction. These areas could also experience loss of amenity value through construction noise, dust and visual effects.
- 15.1.4 There is unlikely to be a significant effect on socio-economic, recreational and tourism receptors during operation as the project is predominantly a replacement line. In addition, the project involves undergrounding within the Dedham Vale AONB and the Stour Valley, which are sensitive landscapes and the focus of tourism and recreation activities.
- 15.1.5 The aspects included within this chapter comprise:
- socio-economic aspects including effects on the local economy, employment and job creation, planning and development, and community service providers; and
 - tourism and recreation including effects on users of visitor attractions, tourist accommodation and water-based recreation (including boating).
- 15.1.6 This chapter links with a number of other chapters including:
- Chapter 6: Landscape and Visual – considers the potential effects of the project on the landscape and views during construction. It also considers potential effects on Dedham Vale AONB as a designated landscape and on its setting and also on the Stour Valley and its setting. This could affect the local economy and also affect people’s enjoyment of tourism and recreation sites.
 - Chapter 7: Biodiversity – considers the potential effects of the project on areas of statutory and non-statutory designated sites, many of which are woodland and nature reserves, that could be used by visitors.
 - Chapter 11: Agriculture and Soils – considers the potential for effects on agricultural land and businesses from the project, which has links to the local economy.
 - Chapter 12: Traffic and Transport – considers severance and effects on PRowWs from the project. It also considers potential effects from construction related traffic movements, which could affect people’s enjoyment of tourism and recreation sites.
 - Chapter 13: Air Quality – considers the potential for construction dust and emissions, which could affect people’s enjoyment of tourism and recreation sites.
 - Chapter 14 Noise and Vibration – considers the potential for construction and operational noise from the project, which could affect people’s enjoyment of tourism and recreation sites.

- Chapter 16: Health and Wellbeing – considers the potential effects on health, which could affect people’s ability to enjoy tourism and recreation sites.
- 15.1.7 There could also be cumulative effects between the different topic chapters (noise, traffic and visual) to impact overall amenity. These effects will be considered within the Intra-Project Cumulative Effects Assessment (see Chapter 18).
- 15.1.8 This chapter does not consider the financial effects on individual businesses, as this would be the subject of the landowner negotiations and may result in compensation payments to offset effects on landowners and businesses. In addition, this chapter does not consider the effects of the project on property prices as this is not a matter for assessment under the EIA Regulations 2017.
- 15.1.9 Overhead lines can generate electromagnetic disturbance (electromagnetic compatibility), which can cause TV or radio interference and therefore could affect local businesses. National Grid is required to comply with the European Council Directive on electromagnetic compatibility 89/336/EEC (Electromagnetic Compatibility Directive) and its amendments, which are enacted into UK law. This compliance is demonstrated through a Certificate of Conformity, and no further assessment is required within the EIA.
- 15.1.10 This chapter is supported by the following figures (Volume 3):
- Figure 15.1: Administrative Boundaries; and
 - Figure 15.2: Socio-economic, Tourism and Recreation Features.

15.2 Regulatory and Planning Policy Context

15.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which states in paragraph 4.2.2 that *‘the applicant should set out information on the likely significant social and economic effects of the development, and shows how any likely significant negative effects would be avoided or mitigated. This information could include matters such as employment, equality, community cohesion and well-being’*.

15.2.2 In addition, paragraphs 5.12.2 and 5.12.3 of EN-1 state:

‘Where the project is likely to have socio-economic impacts at local or regional levels, the applicant should undertake and include in their application an assessment of these impacts as part of the ES [Environmental Statement].

This assessment should consider all relevant socio-economic impacts, which may include:

- *the creation of jobs and training opportunities;*
- *the provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;*
- *effects on tourism;*
- *the impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure. This could change the local population dynamics and could alter the demand for services and facilities in the settlements nearest to the construction work (including community facilities and physical infrastructure such as energy, water, transport and waste). There could also be effects on social cohesion depending on how populations and service provision change as a result of the development; and*

- *cumulative effects – if development consent were to be granted to for a number of projects within a region and these were developed in a similar timeframe, there could be some short-term negative effects, for example a potential shortage of construction workers to meet the needs of other industries and major projects within the region.'*

15.2.3 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to Socio-economics, Recreation and Tourism. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to Socio-economics, Recreation and Tourism.

15.3 Study Area

15.3.1 The baseline has been considered at two spatial levels: the Scoping Boundary and the wider study area. The Scoping Boundary is considered to be the extent at which direct effects of the project on socio-economic, tourism and recreational receptors are likely to occur. The wider study area encompasses the Scoping Boundary and a further 2km extent around this. These are shown on Figures 15.1 and 15.2. This is considered to be a suitable extent for gathering baseline data and is also used to identify the wider context of the baseline environment. It is used to consider potential indirect effects on socio-economic, recreation and tourism receptors that may occur as a result of the project.

15.3.2 The exception is the effect of construction workers on accommodation, which is considered at a district/county level, as the workers are likely to seek accommodation over a wider area to benefit from wider market availability and proximity to the wider transport network.

15.3.3 The study area crosses the counties of Essex and Suffolk and the local planning authorities of Mid Suffolk, Babergh and Braintree districts (Figure 15.1). Baseline data are referenced at a county, district and in some cases a ward level, where the data are available and provide context to the existing baseline environment.

15.4 Existing Baseline

Data Sources

15.4.1 The baseline assessment has been informed by a desk study which has drawn on the following key information sources:

- Office for National Statistics (ONS) 2011 Census data and annual population, business and employment surveys (Nomis, 2011 and 2021);
- Indices of Deprivation data (MHCLG, 2019a);
- District council business, tourism and recreation plans (Braintree, Babergh and Mid Suffolk District Council websites, accessed 2021);
- Visitor economy and tourism reports (VisitEngland and VisitBritain, 2021);
- Dedham Vale AONB and Stour Valley Project Management Plan (current plan 2016 and consultation draft 2021); and
- Online mapping applications including Google Maps, Google Earth, Defra MAGIC Map, AddressBase Plus mapping (various, 2021).

15.4.2 In some cases, baseline data are not available at a local (e.g. ward) level; therefore, the assessment is limited by the granularity of the data available, with most data available for the districts and counties within the wider study area. In addition, some data are not

updated or recorded regularly. For example, the current available version of the Census data is from 2011 (Nomis) and this may not reflect the current baseline accurately. However, the data are considered to be sufficient for the conclusions of this chapter.

Baseline Environment

15.4.3 This section summarises the current baseline regarding the socio-economic characteristics of the wider study area and describes features of tourism or recreational value, with a focus on the Scoping Boundary. Not all of the information presented here is used for the purposes of assessment; some is provided for additional context.

15.4.4 It is recognised that the description of baseline conditions does not list all socio-economic and land uses (including tourist and recreation features) within the study area exhaustively. However, the description includes features identified from the review of third-party data and is considered representative of the socio-economic, tourism and recreation conditions in the area.

Socio-economics

Characteristics of the Population

15.4.5 Population and population density data are provided in Table 15.1. This also includes a breakdown based on the wards that make up the extent of the wider study area. The Scoping Boundary crosses all wards, except Sproughton and Pinewood.

Table 15.1: Population and Population Density (Nomis, 2011)

Geographical Area	Population	Population Density (People/Hectare)
England	53,012,456	4.1
East of England (Region)	5,846,965	3.1
Suffolk (County)	728,163	1.92
Mid Suffolk (District)	96,731	1.1
Bramford and Blakenham (Ward)	3,950	1.9
Babergh (District)	87,740	1.5
Hadleigh South (Ward)	3,732	5.3
Copdock and Washbrook (Ward)	1,114	1.2
Sproughton and Pinewood (includes outskirts of Ipswich) (Ward)	5,718	10.9
Brett Vale (Ward)	2,181	0.7
Box Vale (Ward)	2,170	0.7
Bures St Mary and Nayland (Ward)	3,544	0.6
Assington and Leavenheath (Ward)	1,772	1.0
Essex (County)	1,393,587	4

Geographical Area	Population	Population Density (People/Hectare)
Braintree (District)	147,084	2.4
Stour Valley South (Ward)	2,180	0.5

- 15.4.6 In 2011, the total population for the wards listed in Table 15.1 was estimated to be 26,361 (Nomis, 2011). The population density for the same wards is generally lower than the East of England (3.1) and national (4.1) averages, with the exceptions being Sproughton and Pinewood, and Hadleigh South. The populations of the Babergh, Mid Suffolk and Braintree districts have grown by approximately 5%, 7% and 4% respectively, between 2011 and 2019. This is roughly in line with population growth estimates for Essex (6%), Suffolk (4%), the East of England (6%), and England (6%) for the same years (ONS, 2020a).
- 15.4.7 The age distribution for the districts within the wider study area is broadly in line with the regional and national age distributions (Nomis, 2011). Similarly, the proportion of male and female residents in the wards and districts is in line with the regional and national distributions (approximately 49% male, 51% female).
- 15.4.8 The Indices of Deprivation measure relative deprivation in small areas (Lower-layer Super Output Areas (LSOAs)), using deprivation indicators (domains) such as income, employment, health and disability, education, skills and training, barriers to housing and services, crime, and the living environment. The Index of Multiple Deprivation (IMD) combines information from the indicators in weighted proportions to measure the overall relative deprivation for an area. Areas are ranked from 1 (most deprived area) to 32,844 (least deprived area). The LSOAs are shown on Figure 15.1.
- 15.4.9 There are 20 LSOAs within the wider study area comprising two in Mid Suffolk (012A and 012B), 15 within Babergh (002C, 004A-E, 005A, 005C, 006A, 008E, 009A-D, 010G) and three within Braintree (002A-C). These are all ranked among the top 30% least deprived neighbourhoods, with the exception being Babergh 004A (Hadleigh), which is amongst the top 40% most deprived. Between 2015 and 2019, the relevant LSOAs either became marginally less deprived relative to other small areas (i.e. their rank value increased) or stayed the same (MHCLG, Indices of Deprivation Explorer, 2019a).
- 15.4.10 At a district level, the three districts are among the top 40% least deprived districts (out of 317 districts nationally). Mid Suffolk is the least deprived district in the study area and is among the top 30% least deprived districts with an IMD score of 233 (out of 317). Braintree and Babergh are among the top 40% least deprived districts with IMD scores of 203 and 212 (out of 317), respectively.
- 15.4.11 In summary, the population growth and age distribution are similar to the UK as a whole. The wider study area is less deprived than the UK average.

Local Businesses, Jobs and Employment

- 15.4.12 The wider study area is predominantly rural. Ipswich and the market town of Sudbury both lie outside of the wider study area, as they lie approximately 6km to the east and 4km to the north of the Scoping Boundary respectively. Hadleigh is the largest settlement within the wider study area and lies approximately 1km north of the Scoping Boundary. Other smaller settlements within the wider study area include Burstall, Hintlesham, Upper and Lower Layham, Polstead, Leavenheath, Assington, and Twinstead.

15.4.13 The proportion of economically active residents in the Babergh District (79.4%) is slightly lower than the Suffolk county (80.7%), the regional (81.2%) and national (79.8%) averages. Mid Suffolk district has a slightly higher proportion of economically active residents (81.7%) than the Suffolk county, regional and national averages. Braintree district has a significantly higher proportion of economically active residents at 88.3%, 8.1% higher than the Essex county average (80.2%) (Nomis, 2011).

15.4.14 Job density measures the ratio of total jobs to the total population aged 16-64. The jobs density in Suffolk county (0.86) is in line with the regional (0.86) and national (0.87) averages. Essex county has a lower job density (0.79) than the regional and national averages. The job density in Mid Suffolk is the highest of the three districts, at 0.79, though this is lower than the Suffolk county average. Job density in Braintree (0.73) and Babergh (0.69) are both lower than the respective county, regional and national averages (Nomis, 2011).

Tourism (General)

15.4.15 Tourism forms a significant proportion of the regional economy in Essex and Suffolk, generating an estimated total value of £3.4 billion and £2.1 billion to the respective economies (Table 15.2). Tourism-related employment totals approximately 66,300 in Essex (9.6% of all employment in the county) (Destination Research, 2018) and 44,500 in Suffolk (14.2% of all employment in the county) (Destination Research, 2019). The detail at a district level is provided in Table 15.2.

Table 15.2: Estimated Contribution of Tourism to District Economies

Geographical Area	Estimated Value of Tourism (£M)	Number of Full Time Equivalent Jobs	Share of all Employment in the District
Suffolk (County)	2,143.8	44498	14.2%
Mid Suffolk (District)	177	2,927	9.5%
Babergh (District)	200	3,262	11.7%
Essex (County)	3,402.7	661	9.6%
Braintree (District)	185.7	2,984	5.2%

Sources: Babergh and Mid Suffolk figures (Babergh and Mid Suffolk District Council website, 2016). Braintree figures (Braintree Tourism Plan for the District 2019-2021, 2017)

15.4.16 Tourism in the Dedham Vale AONB (parts of which lie in the Scoping Boundary) was worth an estimated £68 million in 2019 and supported 1,490 jobs. Tourism in the Stour Valley Project Area (parts of which lie in the Scoping Boundary) was worth an estimated £49 million and supported 1,283 jobs (Dedham Vale AONB, 2021). The 'natural environment', 'peace and quiet', and 'walking opportunities' are considered to be the top three most valued features of the AONB by visitors surveyed (LUC, 2019).

15.4.17 There are also businesses within the Scoping Boundary that relate to the tourism sector. These include accommodation facilities within the wider study area including Hintlesham Hall Hotel, College Farm, Claremont Cottage, Sprotts Farm, Assington Mill Farm and Anells Farm.

Tourist Accommodation

15.4.18 The dominant accommodation types in Babergh and Mid Suffolk are holiday dwellings and hotels. Hotels account for 75% of the accommodation stock in Braintree district, while in Ipswich the proportion is even higher (84% of the accommodation stock is hotels) (VisitBritain, 2016).

15.4.19 Table 15.3 summarises the number of bedspaces available at the district and county level. Babergh has the highest number of bedspaces available (2,336). Serviced accommodation, including hotels, account for approximately 85% of all bedspaces available in the four districts. Bed space occupancy rates were at 60% for the East of England during August 2019 (VisitEngland, 2019).

Table 15.3: Number of Bedspaces (VisitBritain survey of accommodation stock, 2016)

Type of Accommodation	Babergh	Mid Suffolk	Ipswich	Braintree	Suffolk	Essex
Hotels and similar	1,871	1,201	1,884	1,769	12,233	24,315
Total serviced accommodation	1,871	1,201	1,884	1,769	12,233	24,315
Holiday dwellings	360	450	21	82	5,302	784
Tourist campsites	85	138	0	0	2,989	30,208
Other collective accommodation	20	13	0	0	96	61
Total non-serviced accommodation	465	601	21	82	8,387	31,053
Total accommodation	2,336	1,802	1,905	1,851	20,620	55,368

15.4.20 There are 12 accommodation facilities within the Scoping Boundary. Hintlesham Hall Hotel is the largest accommodation facility. The remaining accommodation facilities comprise bed and breakfasts and small self-catered facilities, including College Farm, Claremont Cottage, Sprotts Farm, Assington Mill Farm and Ansell's Farm.

Other Businesses

15.4.21 There are records of 175 addresses within the Scoping Boundary (AddressBase Plus data, 2021), as shown in Table 15.4. Reflecting the predominantly rural character, economic activity in the wider study area is largely characterised by agriculture.

Table 15.4: Property Types Within the Scoping Boundary (AddressBase Plus, 2021)

Property Type	Number	Notes
Residential	147	Approximately 50% of residential properties lie within Hintlesham (45 properties) and Layham (31 properties).
Commercial	5	Layham processing plant, a caravan storage site, two garages and an incinerator unit
Tourism and recreation	8	Five holiday cottages, two camp sites and a recreation/education centre
Agricultural	13	Including a farm shop and café.
Development land	2	Two development sites

Property Type	Number	Notes
Community	0	None within Scoping Boundary

15.4.22 Large employers include Boxford Farm and Copella fruit juice business. These own established orchards to the northeast of Leavenheath. Brett's Aggregates own Layham Quarry, which lies within Section C: Brett Valley and is an important business in terms of the local economy.

15.4.23 In summary, this shows that the local and regional economy is strong and has an active workforce. However, as for the UK as a whole, the economy is still likely to be affected by the impacts of the COVID-19 pandemic.

Planning and Development

15.4.24 There is an application for development consent that would tie into Bramford Substation, and falls within the Scoping Boundary (EN010056: East Anglia Three Offshore Windfarm. There are also 11 major planning applications identified within the Scoping Boundary (submitted since 2014, ten years prior to the proposed start of construction date) and one site allocation. These are shown on Figure 18.1 and further details are provided in Table 15.5. Five of the proposed developments are related to energy projects (wind and solar farms) and two (one application and one allocation) are related to Layham Quarry.

Table 15.5: Proposed Developments and Allocations within the Scoping Boundary (Extracted from the Long List in Appendix 18.1)

Location	Application Reference and Description	Application Status	Date of Application
This ties into Bramford Substation	EN010056: East Anglia Three Offshore Windfarm – construction and operation of up to 172 wind turbine generators with associated onshore and offshore development. Although this is generally located outside of the Scoping Boundary, it includes a connection into Bramford Substation.	Decided – Approved	07/08/2017
Lies to the northwest of Bramford Substation	DC/20/05895: Installation of renewable energy generating station, comprising ground-mounted photovoltaic solar arrays and battery-based electricity storage containers together with substation, inverter/transformer stations, site accesses, internal access tracks, security measures, access gates, other ancillary infrastructure, landscaping and biodiversity enhancements including Nature Areas. This is located on land to the northwest of Bramford Substation	Submitted – Not Yet Determined	23/12/2020
Lies to the northwest of Bramford Substation	DC/21/00060: Installation of renewable led energy generating station comprising ground-mounted photovoltaic solar arrays and battery-based electricity storage containers together with substation, inverter/transformer stations, site accesses, internal access tracks, security measures, access gates, other ancillary infrastructure, landscaping and biodiversity enhancements including Nature Areas. This is located on land to the northwest of Bramford Substation	Submitted – Not Yet Determined	05/01/2021

Location	Application Reference and Description	Application Status	Date of Application
Lies to the northwest of Bramford Substation	DC/17/02746: Erection and operation of battery storage unit. This is located on land to the northwest of Bramford Substation.	Approved	16/11/2017
This ties into Bramford Substation	DC/19/04299: Installation of water pipes to supply East Anglia Windfarm. Although the wind farm is distant from the project, the water pipeline lies 400m to the north of Bramford Substation.	Approved	07/11/2019
Immediately to the east of Bramford Substation	DC/19/03008: Installation and operation of a 49.9MW Battery Storage Facility, with associated infrastructure including inverters, transformers, switchgear, spares container, fencing, CCTV cameras and access road immediately to the east of Bramford Substation.	Approved	23/09/2019
Hintlesham Hall Park, Hintlesham	DC/17/04737: Change of use of land for the erection of 4no. 'Safari tent' type holiday units with associated parking and landscaping.	Approved	19/12/2017
Benton End Farm, Hadleigh	DC/17/03633: Change of use of existing grazing area to dog running and exercise fields	Approved	13/12/2017
Layham Quarry	Minerals allocation: MP2: Proposed Sites for Sand and Gravel Extraction, M5, Suffolk Minerals and Waste Local Plan (July 2020), Sand and Gravel Extraction.	Adopted	
Layham Quarry	Variation of conditions 3 (Cessation), 25 (Details of working and restoration) and 48 (Cessation of mineral working) of permission B/01/00045 to provide additional time periods for the completion of extraction and restoration.	Approved	31/10/2019
Konings Juices and Drinks UK Ltd (Leavenheath)	DC/18/02836: Erection of extension to existing production premises, associated car parking, landscaping and drainage infrastructure.	Approved	15/03/2019
Boxford Farm (Leavenheath)	Construction of a fourth clamp adjacent to existing three clamps at the Boxford Anaerobic Digester plant.	Approved	01/08/2016
Cotton Wood Barracks Road (Assington)	B/17/01119: Erection of decontamination building (retention of)	Approved	04/07/2017

Community Service Providers

15.4.25 Community service providers include health centres, education facilities (such as colleges and schools) and community facilities (such as village halls). Other businesses are also considered to be community facilities because they provide an essential community service, for example a private day nursery or care home. No community facilities are

identified within the Scoping Boundary, but there are educational and health facilities within the wider study area. These include:

- health centres: Hadleigh Health Centre;
- schools: Hintlesham and Chattisham voluntary controlled Church of England Primary School, Beaumont Community Primary School, Hadleigh Community Primary School, Hadleigh High School, St Mary's Church of England Primary School; and
- nurseries: Birch Farm Day Care Nursery.

Tourism and Recreation

Tourism and Recreation Assets

15.4.26 Sudbury is a large market town which lies 0.5km outside of the wider study area. Hadleigh is a market town within the wider study area that provides a focus of tourist accommodation, services and facilities. The town provides a venue for the annual (during May) Hadleigh Agricultural Show, which is a traditional agricultural show celebrating aspects of country living.

15.4.27 Great Cornard is a country park that lies on the southern edge of Sudbury at a distance of approximately 100m outside of the of the wider study area (Figure 15.2). There are no National Trust properties or Countryside and Rights of Way Act Section 15 land within the wider study area or Scoping Boundary. There are no National Trails within the Scoping Boundary or the wider study area.

15.4.28 Dedham Vale AONB and Stour Valley are key visitor attractions, parts of which lie within the Scoping Boundary. These have a strong cultural heritage due to their association with the artists John Constable, Alfred Munnings and Thomas Gainsborough (see Chapter 6: Landscape and Visual and Chapter 8: Historic Environment). Dedham Vale AONB and Stour Valley also cater for a wide range of recreation activities including walking, riding, boating, wildlife watching, countryside sports and visiting historical sites and buildings.

15.4.29 Visitor attractions and areas of informal recreation within the Scoping Boundary or immediately adjacent to it include:

- Recreation activity locations such as Hintlesham Golf Course, commercial coarse fishing lakes at Kate's Hill, Hadleigh Railway Walk, Stoke by Nayland Hotel Golf Course and Spa, and Daws Hall Centre for Environmental Education (which offers regular public and educational events).
- General green spaces for walking and enjoying the countryside, including Ramsey and Hintlesham Woods (an SSSI and RSPB reserve). LNRs comprise Hadleigh Railway Walk, Arger Fen and Tiger Hill. Non-designated sites include Raydon Great Wood, Layham Pit Woodland and Meadow, Millfield Wood, Dollops Wood, Bushy Park Wood, Broom Hill Wood, Assington Thicks and Loshes Meadows (Figure 7.2)

Public Rights of Way and the National Cycle Network

15.4.30 There is an extensive network of PRoWs and walking trails within the Scoping Boundary and wider study area (Figure 15.2). There are approximately 49 PRoWs located within the Scoping Boundary (estimated, as some cross the Scoping Boundary more than once and some split into two). There are four long distance paths/promoted walks within the wider study area; these also cross the Scoping Boundary (Figure 15.2):

- Hadleigh Railway Walk: a two-mile heritage walk along a disused railway which crosses the Scoping Boundary to the south of Hadleigh;

- The Stour Valley Path: a 96km route which crosses the Scoping Boundary to the north of Lamarsh;
- St Edmunds Way: a 126km route between Manningtree and Brandon via Bury St Edmunds. This follows the Stour Valley Path through the Scoping Boundary; and
- The Suffolk Way: a 182km route between Flatford and Lowestoft. This crosses the Scoping Boundary to the south of Boxford.

15.4.31 There are two NCN routes situated within the wider study area. These also cross the Scoping Boundary. NCN 1 runs east-west between Copdock and Hadleigh and follows the route of Hadleigh Railway Walk through the Scoping Boundary. NCN 13 runs north-south between Sudbury and Bures and crosses the Scoping Boundary to the north of Lamarsh. A regional cycle route (no. 48) runs through the hamlet of Flowton, approximately 1.5km to the northwest of Bramford Substation.

Water-based Recreation and Navigation

15.4.32 The River Stour is navigable within both the wider study area and the Scoping Boundary. Unpowered craft (i.e. those that are paddled, rowed or sailed) are permitted to travel the whole length of the Stour Navigation, from Brundon Mill (Sudbury) to Cattawade (on the Stour Estuary). Powered craft, with certain specified exceptions, such as the River Stour Trust trip boats, are restricted to the stretch between Ballingdon Bridge (Sudbury) and Henny Street (within the wider study area). The Environment Agency is the navigation authority for this section. None of the other watercourses within the study area are navigable.

Future Baseline

15.4.33 The socio-economic baseline within the wider study area will be continually changing due to a number of factors, including inbound and outbound migration and changes to the regional, national and international economic climate. In the reasonably foreseeable future, resident populations within the Babergh, Mid Suffolk and Braintree districts, Suffolk and Essex counties, the East of England, and England are all projected to rise (ONS, 2020b). The local, regional and national age distribution is projected to skew older over time, with fewer young people and a greater proportion of the population over 60 (ONS, 2020b).

15.4.34 COVID-19 restrictions are likely to have had a significant effect on the economy and businesses. During a time when restrictions are still in place, it is difficult to predict the effect that the COVID-19 pandemic will have on the economy and businesses in the long-term. It is likely that the construction industry will continue to grow as the Government encourages spending on infrastructure to boost the economy. This could lead to a shortfall in available skilled construction workers due to the high level of demand in this sector. However, other sectors, such as those relating to tourism, may find continuing effects relating to COVID-19 restrictions, until these are lifted entirely.

15.4.35 Major developments that have received planning permission may alter the socio-economic and recreation baselines. In addition, new proposed developments will be submitted for planning. These are likely to include a number of minor housing developments to help accommodate the growing population in the region.

15.4.36 Tourist numbers and revenue are likely to fluctuate year-on-year, primarily due to external factors such as the economy, foreign exchange rates and the weather. Current numbers and forecasts will be affected by COVID-19 restrictions, which have both restricted the opening of visitor attractions and will have restricted movements of visitors to the area.

These may lead to a change in patterns of tourist numbers and tourism revenue going forward.

15.5 Embedded and Good Practice Measures

- 15.5.1 The project has avoided direct effects to sensitive features where practicable, including avoiding key tourist areas such as Bures, Sudbury and Hadleigh, through the corridor and routing studies. The project has also assumed underground cables in the Dedham Vale AONB and the Stour Valley which have a high sensitivity in terms of tourism. The project is also proposing to remove the existing 132kV overhead line within the Scoping Boundary to reduce the wirescape in Dedham Vale AONB and the Stour Valley (see Chapter 6: Landscape and Visual). A trenchless crossing is also proposed beneath the River Stour, which will avoid effects to water-based recreation.
- 15.5.2 The underground section in Section E: Dedham Vale AONB has involved detailed routing through the Boxford Fruit Farm, to reduce land take on the existing orchards (see Chapter 4: Project Description). The Indicative Alignment is currently designed to avoid direct effects to the orchard trees and is partly located along a track that would be easier to reinstate. This will reduce the potential for effects on this business.
- 15.5.3 The Outline CoCP in Appendix 4.1 contains a list of relevant good practice measures, including the following key commitments relating to socio-economics, recreation and tourism:
- GG25: Members of the community and local businesses will be kept informed regularly of the works through active community liaison. This will include notification of noisy activities, heavy traffic periods and start and end dates of key phasing. A contact number will be provided which members of the public can use to raise any concerns or complaints about the project. All construction-related complaints will be logged by the contractor(s) in a complaints register, together with a record of the responses given and actions taken.
 - TT03: All designated PRoWs will be identified, and any potential temporary closures applied for/detailed in the DCO. All designated PRoWs crossing the working area 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.
- 15.5.4 There are also a number of good practice measures in the Outline CoCP that will reduce the risk of disturbance from noise and dust, for example commitments GG10, GG11, GG12, GG13, GG19 and GG20.

15.6 Likely Significant Effects

- 15.6.1 This section sets out the likely significant effects of the project on socio-economic characteristics and recreation and tourism features. It assumes that the relevant embedded measures and good practice measures outlined within the Outline CoCP are in place before assessing the effects.

Socio-economic

Effects on the General Economy During Construction

Effects on the Tourism Economy During Construction

- 15.6.2 Tourism is a significant contributor to the local economy and generates jobs for the local workforce. During construction, there is the potential for temporary amenity effects resulting from noise, dust and traffic congestion which could have an effect on how tourists experience the area as a whole. The measures set out within the Outline CoCP would reduce these effects. In addition, the linear nature of the project means that effects would be short term in most locations and effects would be contained to the construction phase. With these measures in place, it is unlikely that the project would result in significant effects on the tourism economy, and this is scoped out of the ES.

Effects on Tourist Accommodation During Construction

- 15.6.3 The in-migration of the construction staff for the project could place a demand on accommodation within the wider study area and beyond. From previous project experience (National Grid, 2016a), National Grid anticipates that of the non-local staff employed during construction of the project:
- 50% would stay in caravan and camping accommodation;
 - 20% would stay in short-term let properties (such as through the private rented market);
 - 20% would stay in serviced accommodation (bed and breakfasts, hotels); and
 - 10% would travel to the area from home.
- 15.6.4 The workforce numbers are currently unconfirmed but are estimated to be around 300 staff at peak based on similar projects. The peak is likely to be concentrated over the first year, when the site is being set up and haul routes are being constructed. The average workforce is likely to be half of this value for the remaining construction phase (National Grid, 2016a).
- 15.6.5 Assuming an estimated peak workforce of around 300 staff, and the above anticipated accommodation demand, non-local staff are likely to number approximately 270 at peak. As presented above, 50% of the workforce (135 workers) are expected to use caravan or camping facilities. An estimated 108 workers (40%) are estimated to stay in short-term lets or serviced accommodation. However, it is highly unlikely that all 108 workers would take up single occupancy and it is more likely that workers would share accommodation. In addition, the short-term lets are likely to be spread across the district or county, for example using the Ipswich and Colchester rental markets, to increase the range of available accommodation.
- 15.6.6 Data obtained from VisitEngland (2019) show that there is a bedspace occupancy rate of 60% in the East of England, which indicates there is sufficient availability in the private sector to accommodate the project workforce without compromising the accommodation available to tourists visiting the area. Therefore, it is proposed that effects on tourist accommodation during construction (2024 to 2028) are scoped out of the ES.

Effects on the Local Economy During Construction

- 15.6.7 The project may source materials and services from the local area, which could boost the local economy during construction. Examples could include construction supplies such as skip hire, fencing and planting for landscaping. Material supply and demand will vary significantly, and it will not be possible to specify sources at the time of DCO application. Although it is not practicable to identify specific targets at this stage, the Contractor would

seek to obtain materials from the local market, where available. In addition, National Grid will work with the local planning authorities to identify opportunities to support the local economy during construction, for example using I-Construct, which helps small and medium size businesses join local supply chains. The project is unlikely to have a significant effect on provision of local materials and construction services during construction, and this is scoped out of the ES.

Effects on the General Economy During Operation

Effects on the Wider Economy

- 15.6.8 The project would create additional capacity within the power network and would help to meet Government targets to deliver net zero emissions (see Chapter 1: Introduction). This is aligned with the Government's aim of transitioning the country to a Green Economy (HM Government, 2011). The project would also improve the security of supply of power to the network, to reduce the risk of outages. Therefore, although not assessed within this chapter, the project supports the general economy (including at a local level) by providing power to homes and businesses to meet future demands and by reinforcing the network to reduce the risk of outages that would affect businesses and the economy. This forms the basis of the need of the project and is not duplicated in the assessment.

Effects on the Local Economy (Including Tourism Economy) During Operation

- 15.6.9 There is unlikely to be a significant effect on the local economy (including tourism economy) during operation, as land used temporarily during construction would be reinstated at the end of construction. Therefore, effects on the local economy (including tourism economy) are scoped out of the ES for the operation.

Effects on Local Businesses, Jobs and Employment During Construction

Direct Effects on Local Businesses During Construction

- 15.6.10 The project could cause direct effects (such as severance to access) to the operation of local businesses (excluding agricultural businesses which are covered within Chapter 11: Agriculture and Soils). The effects could be experienced within the Scoping Boundary during construction. The good practice measures within the Outline CoCP, including commitment AS03, are anticipated to reduce these effects. In addition, given the rolling nature of the linear works, the construction activities in any particular area are likely to be short term. With these measures in place, there are no likely significant effects in relation to direct effects to local businesses, and this is scoped out of the ES.

Indirect Effects on Local Businesses During Construction

- 15.6.11 There could be indirect economic effects to individual businesses, for example loss of business to a holiday let during construction. These matters will be addressed outside of the EIA, through the landowner discussions and compensation arrangements. Therefore, indirect economic effects to local businesses are scoped out of the ES.
- 15.6.12 There could also be a minor benefit to the local economy in terms of the construction workforce spending money in the form of accommodation and food (induced spend). The workforce numbers are currently unconfirmed but are estimated to be around 300 staff at peak based on similar projects. The peak is likely to be concentrated over the first year.. The average workforce is likely to be half of this value for the remaining construction phase (National Grid, 2016a). Therefore, workforce spending is not expected to provide a significant contribution to the local economy, and workforce spending is scoped out of the ES.

Effects on Local Jobs and Employment During Construction

- 15.6.13 The majority of employment activities would require trained specialists who are qualified to work on National Grid sites. Therefore, these are often sourced from an existing pool of approved contractors. However, from experience of other National Grid projects, it is likely that a minimum of 10% of the workforce would be sourced from the local labour market, including apprentices, security workers and delivery drivers. This level of local employment, based on a peak monthly employment assumption of 300 workers, could result in the monthly local job demand being up to approximately 30 jobs locally. The job density ratios set out in Section 15.4 indicate that 30 jobs could be accommodated within the local labour pool.
- 15.6.14 National Grid promote the use of local supply and small, medium enterprises (SMEs) through main contractors. National Grid will continue to work with local planning authorities and business leaders at a national, regional and local level to identify opportunities to invest in employment networks, including looking for opportunities to work with local businesses within the regional I-Construct hub.
- 15.6.15 There are unlikely to be significant adverse effects on jobs and employment. The above measures could deliver small beneficial effects through the creation of local job and employment opportunities. As these cannot be guaranteed and as they would be low in number, they are unlikely to result in significant effects on job creation and employment during construction and so are scoped out of the ES.

Effects on Local Businesses, Jobs and Employment During Operation

Direct and Indirect Effects on Local Businesses During Operation

- 15.6.16 There are no anticipated direct or indirect effects to businesses during operation, as land would be reinstated to its former use (GG07). Where there are permanent changes to land use (such as at the GSP substation), these would be a matter for the landowner discussions and compensation arrangements. Therefore, operational effects due to disruption to businesses are scoped out of the ES.

Effects on Local Jobs and Employment During Operation

- 15.6.17 During the operational phase, the GSP substation and CSE compounds would be operated remotely and would not require any operators to be on site. There would be routine inspections and maintenance associated with the project, but this would be of a similar order of magnitude to that undertaken on the existing 400kV overhead line, and no additional jobs are anticipated as a result of the operational phase. Therefore, operational effects on jobs and the economy are scoped out of the ES.

Effects to Planning and Development During Construction

- 15.6.18 The current development consent proposal, the planning applications and the site allocation will need to be considered during the design stages of the project. National Grid will undertake discussions with planners and developers to understand the extent of proposals and to avoid any conflict to their applications.
- 15.6.19 National Grid will also work with the developers to understand the timing of their works in relation to the project. This will include Brett's Aggregates in terms of the proposed changes at Layham Quarry, which the existing 132kV overhead line crosses.
- 15.6.20 With the above measures in place, there are not anticipated to be likely significant effects on planning and development during construction, and this is scoped out of the ES.

15.6.21 Chapter 18: Cumulative Effects considers the potential inter-project cumulative effects between the project and other proposed developments. Therefore, this is scoped out of the socio-economic assessment to avoid assessing the same impact twice.

Effects to Planning and Development During Operation

15.6.22 The new 400kV overhead line mainly follows the route of the existing 132kV overhead line, which will have associated land rights. This limits the sterilisation of new areas that could be developed in the future. In addition, the measures set out within the Outline CoCP (e.g. AS03 and GG07) would lead to the restoration of accesses after construction, which would reduce the risk of severance to land parcels that could be used for future development. Therefore, the project is unlikely to have a significant effect on future planning allocations and development during operation, and this is scoped out of the ES.

Effects to Community Services During Construction and Operation

15.6.23 There are no community services within the Scoping Boundary. Therefore, it is unlikely that the project will have direct effects on access to or the operation of community services during construction or operation.

15.6.24 There could be indirect effects as a result of construction traffic causing either severance to access or delays to community services. These effects are considered within Chapter 12: Traffic and Transport. Therefore, this is scoped out of the socio-economic assessment to avoid assessing the same impact twice.

15.6.25 Increased demand for community services arising from the presence of construction workers is unlikely, due to the relatively short duration of construction. In addition, the expected profile of the workforce means that workers are unlikely to permanently relocate to the area. Therefore, there is no anticipated increased demand on community services during construction or operation, and this is scoped out of the ES.

Tourism and Recreation

Effects on Tourism and Recreation During Construction

Effects on Visitor Attractions During Construction

15.6.26 There is unlikely to be a direct effect on visitor attractions in Hadleigh, Sudbury and Bures, due to the distance from the project. There could be potential effects in relation to construction traffic causing congestion, air pollution and noise, which are addressed in Chapters 12, 13 and 14 respectively. Potential intra-project cumulative effects on amenity will be considered within the cumulative effects assessment (see Chapter 18).

15.6.27 The project would have direct effects to parts of the Dedham Vale AONB and the Stour Valley during construction. This could include some paths being temporarily closed or diverted and the working area being fenced off during construction.

15.6.28 The proposed Order Limits will be significantly less than the footprint of the Scoping Boundary. The proposed Order Limits are likely to be up to 100m wide in general within the underground sections (see Chapter 4: Project Description) compared to the Scoping Boundary which is 500m wide. The Scoping Boundary covers less than 1% of both Dedham Vale AONB and the Stour Valley Project Area. The good practice measures within the Outline CoCP would reduce the effects experienced by visitors, by only closing accesses for short periods while construction activities occur (commitment TT03).

15.6.29 During construction, there are unlikely to be direct effects (such as land take) to other visitor attractions and features such as Hintlesham Golf Course, Kate's Hill Fishing Lakes,

Stoke by Nayland Hotel Golf Course and Spa, and Daws Hall Centre for Environmental Education as these are likely to lie outside of the proposed Order Limits.

Effects on Greenspaces During Construction

15.6.30 During construction, there are two local greenspaces that could be directly affected by the project (i.e. could lie within the future Order Limits):

- **Ramsey and Hintlesham Woods:** The existing 400kV overhead line passes through the middle of the woods. National Grid is proposing to divert the existing overhead line to the north of the woods and to use the existing pylons for the new 400kV overhead line through the woods. The proposed effects would be limited in area and duration. There may be some localised disruption/temporary closures or diversion of footpaths within the woods during construction. However, these are likely to be short term while the overhead line is lifted into place (few weeks in duration), and visitors would still be able to enjoy other parts of the woods during this time; and
- **Millfield Wood:** There is a PRow linking together a small group of woodland areas. The project is likely to cross the PRow that connects the woodland areas. The Indicative Alignment assumes that the proposed overhead line passes through the gap between the woodland areas. There are unlikely to be direct effects on the woodland areas, but there could be some localised disturbance on amenity due to adjacent construction activities.

15.6.31 The overall construction effects on Ramsey and Hintlesham Woods and on Millfield Wood are likely to be localised and short in duration. There will be direct effects to the areas enjoyed by visitors, but these will be reduced through good practice measures set out within the Outline CoCP. With these measures in place, there may still be a residual number of people who visit these locations less during construction. However, there are a number of other locations within the wider study area that would provide alternative recreation facilities during construction. Therefore, it is proposed that effects on all recreation areas are scoped out of the ES.

15.6.32 During construction, there are unlikely to be direct effects on access to Arger Fen or Tiger Hill LNRs or the greenspaces including Raydon Great Wood, Layham Pit Woodland and Meadow, Dollops Wood, Broom Hill Wood, Bushy Park Wood, Assington Thicks and Loshes Meadows due to the Indicative Alignment being purposely located to avoid these areas as part of the options appraisal routing. Although the Order Limits are not yet defined, it is anticipated that these would also avoid these areas.

15.6.33 There could be temporary loss of amenity value to visitor attractions and greenspaces as a result of noise and dust, where they lie adjacent to construction working areas. The good practice measures set out within the Outline CoCP would reduce the effects, and the disturbance would be for a short duration in any given location. Therefore, there are unlikely to be significant effects to these sites and they are scoped out of the ES.

Effects on PRow and the NCN During Construction

15.6.34 Effects on PRow and the NCN are considered within Chapter 12: Traffic and Transport and are not duplicated here.

Effects on Water-Based Recreation and Navigation During Construction

15.6.35 A trenchless crossing is proposed beneath the River Stour, which would avoid direct impacts to the river and boat users. During construction, there could be potential effects on river users as a result of noise, dust and visual impacts. However, good practice

measures within the Outline CoCP would reduce these effects. Therefore, construction effects on navigation are scoped out of the ES.

Effects on Tourism and Recreation During Operation

Effects on Visitor Attractions and Greenspaces During Operation

15.6.36 National Grid has sought to avoid visitor attractions and greenspaces through the options appraisal. In addition, an underground cable is proposed in areas with the highest amenity value (Dedham Vale AONB and the Stour Valley). Once reinstatement planting matures, there are unlikely to be any effects on visitor attractions and greenspaces during operation, and this is scoped out of the ES.

Effects on Water-Based Recreation and Navigation During Operation

15.6.37 There are no anticipated significant effects on water-based recreation and navigation during operation. Therefore, operational effects to water-based recreation and navigation are scoped out of the ES.

15.7 Conclusion

- 15.7.1 Many of the contributory factors affecting socio-economics, recreation and tourism during construction (for example visual, noise, dust and traffic) are already considered within other chapters within the Scoping Report. Given the type, temporary duration and level of potential construction phase effects, and recognising that any likely significant effects from various topics will already be reported within separate chapters, it is not considered that additional separate reporting is required in the ES. Therefore, a standalone socio-economics, recreation and tourism chapter is not proposed to be included within the ES.
- 15.7.2 However, where there is an interaction of the above effects during construction, such as on amenity, this will be considered within Chapter 18: Cumulative Effects, as part of the intra-project cumulative effects assessment.
- 15.7.3 A meeting was held on 4 March 2021 with representatives from Essex and Suffolk County Councils and Braintree, Babergh and Mid Suffolk District Councils. The purpose of the meeting was to agree the proposed scope of the socio-economics, recreation and tourism assessment. National Grid presented that the construction effects would be temporary and that operational effects would be limited due to underground cables (along with removal of the 132kV overhead line) being proposed in the two areas with the highest tourism and recreation value.
- 15.7.4 National Grid stated at the meeting that it proposed to scope out effects on socio-economics, recreation and tourism, recognising that the cumulative effects assessment would consider any combined significant effects, such as those on amenity. Meeting attendees requested that the Scoping Report include a document that signposts to where relevant supporting assessment would be included within the ES to support this approach. This signpost document can be found in Chapter 20: Conclusion.
- 15.7.5 All matters relating to socio-economics, recreation and tourism (other than intra-project or inter-project related effects, which will be reported in Chapter 18: Cumulative Effects) have been scoped out of the assessment as summarised in Table 15.6.

Table 15.6: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Socio-economic – effects on the tourism economy	No likely significant effects. Amenity effects will be considered within the cumulative effects assessment.	Construction	Scoped out
	No likely significant effects.	Operation	Scoped out
Socio-economic – effects on tourist accommodation	No likely significant effects.	Construction	Scoped out
Socio-economic – provision of local materials and local construction services	No likely significant effects.	Construction and operation	Scoped out
Socio-economic – direct effects on individual businesses	No likely significant effects.	Construction	Scoped out
Socio-economic – indirect effects on individual businesses	This would be a matter for landowner discussions and is not included within the scope of the EIA.	Construction	Scoped out
Socio-economic – direct and indirect effects on individual businesses	No likely significant effects.	Operation	Scoped out
Socio-economic – effects on local jobs and employment	No likely significant effects.	Construction and operation	Scoped out
Socio-economic – effects on planning and development	Cumulative effects with other proposed developments will be considered within the cumulative effects assessment.	Construction	Scoped out
	No likely significant effects.	Operation	Scoped out
Socio-economic – access to community services	No likely significant effects.	Construction and operation	Scoped out
Tourism and recreation – effects on visitor attractions and greenspaces	No likely significant effects.	Construction and operation	Scoped out
Tourism and recreation – effects on water-based recreation and navigation	No likely significant effects.	Construction and operation	Scoped out

16. HEALTH AND WELLBEING

16.1 Introduction

16.1.1 This chapter considers the effects of the project on the health and wellbeing of people. This could include residents of nearby properties, people working within the Scoping Boundary or people using PRowS or other publicly accessible areas within the Scoping Boundary. Effects during construction could include dust and emissions, which could cause respiratory conditions. During operation, electric and magnetic fields (EMF) are generated by electrical infrastructure.

16.1.2 The aspects considered in this scoping chapter comprise:

- EMFs; and
- general health and wellbeing.

Electric and Magnetic Fields

16.1.3 All equipment that generates, distributes or uses electricity produces EMFs, and these also occur naturally. The UK power frequency is 50 hertz (Hz) which is the principal frequency of the EMFs produced. Electric fields depend on the operating voltage of the equipment producing them and are measured in volts per metre (V/m). The voltage applied to equipment is a relatively constant value. Magnetic fields depend on the electrical currents flowing, which vary according to the electrical power requirements at any given time and are measured in μT (microteslas). Both fields diminish rapidly with distance from the source and are present in all areas where electricity is in use (e.g. offices and homes), arising from electric cabling and equipment in the area.

16.1.4 All overhead lines produce EMFs, and these tend to be highest directly under an overhead line and decrease to the sides at increasing distance. Underground cables produce no external electric fields, and the magnetic field falls more rapidly, falling to the levels typically found in UK homes within around 20m compared to around 150m for an overhead line. Substations and CSE compounds do not produce significant EMFs outside their boundaries.

16.1.5 At high exposure levels, EMFs can have both direct and indirect effects on human health and wellbeing. Direct effects can occur in terms of impacts on the central nervous system resulting in its normal functioning being affected. Indirect effects can occur through electric charges building up on the surface of the body producing a microshock on contact with a grounded object, or vice versa, which, depending on the field strength and other exposure factors, can range from barely perceptible to being an annoyance or even painful. Microshocks have no known long-term health effects.

General Health and Wellbeing

16.1.6 During construction, the project will result in noise from machinery and traffic movements, dust from earth moving, and emissions from exhausts and machinery. These could have an effect on health in isolation (as assessed under the relevant chapters) or in combination.

16.2 Regulatory and Planning Policy Context

16.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which states in paragraph 4.13.1:

‘...where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate.’

16.2.2 EN-1 is supported by NPS EN-5, which contains paragraph 2.10.9 relating to EMF which has also been considered within this chapter:

‘Before granting consent to an overhead line application, the IPC should satisfy itself that the proposal is in accordance with the [International Commission on Non-Ionizing Radiation Protection (1998)] guidelines, considering the evidence provided by the applicant and any other relevant evidence.’

16.2.3 Appendix 2.1: Relevant Environmental Legislation, Policy and Guidance includes legislation and national policy relevant to health and wellbeing. It also outlines key guidance documents that have been referenced when writing this chapter. Appendix 2.2: Local Planning Policy lists the local policy potentially relevant to health and wellbeing.

16.3 Approach to Scoping

16.3.1 This section describes the methods used to establish the baseline and the approach to consider and assess the significance of potential effects on health and wellbeing.

Electric and Magnetic Fields

16.3.2 The International Commission on Non-Ionizing Radiation Protection (ICNIRP) developed health protection guidelines in 1998 for both public and occupational exposure to EMF. The guidance sets out limits to ensure members of the public are protected. UK Government policy is that exposure of the public should comply with the ICNIRP (1998) guidelines and the electricity industry has agreed to follow this policy.

16.3.3 There are also three DECC Codes of Practice relating to demonstrating compliance with EMF public exposure:

- Power Lines: Demonstrating compliance with EMF public exposure guidelines. A Voluntary Code of Practice (DECC, 2012a);
- Optimum Phasing of high voltage double-circuit Power Lines. A voluntary Code of Practice (DECC, 2012b); and
- Power lines: Control of microshocks and other indirect effects of public exposure to electric fields. A voluntary Code of Practice (DECC, 2013).

16.3.4 The approach taken with regards to the EMF is based on a statement of compliance with existing policy and process documents that National Grid must comply with when designing projects. National Grid processes for assessing and reporting on potential effects EMF are based on the ICNIRP guidelines and the DECC Codes of Practice. The designs will be developed to be compliant with the requirements of the guidance.

General Health and Wellbeing

- 16.3.5 The Scoping Boundary is predominantly rural, with a relatively small number of residential properties and settlements within 200m of the project. These include Upper Layham and Rose Green and smaller hamlets and isolated properties. Chapter 15: Socio-economics, Tourism and Recreation describes businesses and publicly accessible areas within the Scoping Boundary.
- 16.3.6 In relation to general health and wellbeing, the effects are related to contributory factors already considered by other environmental topics considered in this Scoping Report, as follows, along with the intra-project cumulative effects assessment which is described in Chapter 18:
- Chapter 10: Geology and Hydrogeology – considers potential for contaminated land and how this could affect the health of people either directly or indirectly through pollution of soil and water;
 - Chapter 12: Traffic and Transport – considers the potential for disruption to rights of way which could affect people’s health, and also access to services;
 - Chapter 13: Air Quality – considers the potential for dust and vehicle emissions which could affect people’s health; and
 - Chapter 14: Noise and Vibration – considers the potential for construction and operational noise which could affect people’s health.
- 16.3.7 It is considered that the potential for effects on health and wellbeing in relation to the above topics would be limited to the construction phase. No potential for operational effects has been identified; power lines operate all around the country and there is no evidence to suggest that these cause significant adverse effects on health and wellbeing.
- 16.3.8 Given the type, temporary duration and level of potential construction phase effects, and recognising that any likely significant effects from various topics on health and wellbeing will already be reported within separate chapters, it is not considered that general health and wellbeing requires additional separate reporting in the ES. A health and wellbeing chapter is therefore not proposed within the ES. Where there is an intra-project effect of the above (i.e. where a receptor is potentially affected by more than one source of direct environmental impact resulting from the same development) during construction, this will be considered within Chapter 18: Cumulative Effects, as part of the intra-project cumulative effects assessment.

16.4 Study Area

Electric and Magnetic Fields

- 16.4.1 Previous studies and calculations (Swanson and Renew, 1994) have shown that equipment operating at the proposed voltage and rating do not produce EMFs greater than typical background levels at distances of more than 200m. Therefore, a 200m study area has been assumed around the project for the EMF assessment.

16.5 Existing Baseline

Data Sources

- 16.5.1 The baseline assessment has been informed by a desk-based study which has drawn on the following information sources:

- OS 1:25,000 mapping; and
- OS AddressBase Plus mapping data.

Baseline Environment

- 16.5.2 The study area is predominantly rural, with a relatively small number of residential properties and settlements within 200m of the project. These include Upper Layham and Rose Green and smaller hamlets and isolated properties.
- 16.5.3 There is existing electricity transmission and distribution equipment in the area including the existing 400kV and 132kV overhead lines and National Grid's Bramford Substation. The existing electricity infrastructure produces EMFs as it distributes or uses electricity.
- 16.5.4 Typical EMFs from a 400kV overhead line are in the range of 5 to 10 μ T (magnetic field) and 3 to 5kV/m (electric field) directly under the overhead line, decreasing to a background level within 150m of the overhead line. Typical EMFs for the existing 132kV overhead line would be 0.5 to 2 μ T (magnetic field) and 1 to 2kV/m (electric field).
- 16.5.5 The existing 400kV overhead line circuits between Bramford and Twinstead Tee are currently untransposed, meaning the existing 400kV overhead line is not optimally phased. In this circumstance, magnetic fields decrease to a lesser extent with increasing distance from the overhead line than would be the case if the overhead line were optimally phased. The current overhead line complies with the Governments exposure limits, but due to circuit arrangements at Twinstead Tee, the magnetic fields do not reduce as quickly with distance as an optimally phased route. The Bramford to Twinstead project would allow the circuits on the existing and proposed overhead lines to be optimally phased, removing the constraint at the Twinstead Tee.

Future Baseline

- 16.5.6 In the absence of the project, the baseline is not anticipated to change in the future over the intended lifespan of the project. Other proposed developments within the area will be considered within Chapter 18: Cumulative Effects.

16.6 Embedded and Good Practice Measures

- 16.6.1 The project has avoided sensitive features such as towns and larger residential areas through the options appraisal. In addition, it is assumed that, as part of the embedded measures, the project will be compliant with existing legal requirements and standards, including:
- Technical Specification 1 – Ratings and General requirements for plant, equipment and apparatus for the National Grid system (National Grid, 2007);
 - National Grid SHES Standard- Non-ionising radiational standard – UK/T1/8.7.4/S (National Grid, 2020); and
 - Policy Statement (Transmission) 103 – EMF Policy applied to overhead line designs (National Grid, 2013a).
- 16.6.2 These technical specifications and policies ensure that the proposed design will be compliant with the requirements of NPS EN-5.

16.7 Likely Significant Effects

16.7.1 This section sets out the likely significant effects of the project on health and wellbeing. It assumes that the relevant embedded measures are in place before assessing the effects.

Electric and Magnetic Fields

- 16.7.2 As EMFs are only generated by the distribution and use of equipment, no discernible EMF generation is anticipated during the construction stage. Only the project's operational phase (when power is being distributed) has the potential to generate EMFs. As stated in Section 16.1, substations and CSE compounds do not produce significant EMFs outside their boundaries. Underground cables produce no external electric fields, and the magnetic field falls more rapidly, falling to the levels typically found in UK homes within around 20m. Therefore, these can be scoped out of the ES.
- 16.7.3 All overhead lines produce EMFs, and these tend to be highest directly under an overhead line and decrease to the sides at increasing distance.
- 16.7.4 At high exposure levels, EMFs can have both direct and indirect effects on human health and wellbeing. Direct effects are protected against by compliance with the ICNIRP guidelines. Indirect effects, which can result in microshocks, have no known long-term health effects and the effects are mitigated by the principles in the DECC Codes of Practice referenced in Section 16.3.
- 16.7.5 National Grid's policy, as set out in its Public Position Statement (National Grid, 2018a), states that '*...as a minimum we comply with EMF regulations, guidelines or practices in force... in which we operate*'. This policy will apply to this project and all the equipment installed will comply with the guidelines, as set out in Chapter 4: Project Description. Given that EMFs resulting from electrical equipment must comply with the relevant exposure guidelines as specified by Government and with the additional precautionary policies set out within the DECC Codes of Practice referenced in Section 16.3, no potential for significant effects from EMFs has been identified from the project, and assessment of EMFs is therefore scoped out of the ES.
- 16.7.6 National Grid, however, recognises public concern regarding EMFs and therefore will provide the relevant information on EMFs in a separate document submitted as part of the application for development consent. This document will demonstrate compliance in accordance with the ICNIRP guidelines and paragraph 2.10.9 of EN-5.

16.8 Conclusion

16.8.1 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 16.1. As noted in Section 16.3, it is not considered that general health and wellbeing requires additional separate reporting in the ES. A health and wellbeing chapter is therefore not proposed. Where there is an interaction of the effects during construction, this will be considered within Chapter 18: Cumulative Effects, as part of the intra-project cumulative effects assessment.

Table 16.1: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
EMFs	EMFs are associated with power distribution. The construction stage will not generate levels of EMF to affect health.	Construction	Scoped out

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
EMFs	The project will be designed in accordance with the ICNIRP guidance, and a compliance report will be submitted with the application for development consent. As the measures are embedded within the project design, no further assessment for EMFs is required within the EIA.	Operation	Scoped out
Health and wellbeing	The relevant topic chapters will consider the effects on specific aspects of health and wellbeing, for example dust, noise and contaminated land. The cumulative effects assessment will identify any intra-project (and inter-project) cumulative effects on receptors. No separate health assessment is proposed within the ES to avoid duplicating these topics.	Construction	Considered within Chapter 18: Cumulative Effects
Health and wellbeing	No likely significant effects.	Operation	Scoped out

17. MAJOR ACCIDENTS AND DISASTERS

17.1 Introduction

17.1.1 This chapter reports on the potential risk of the project causing a significant environmental effect in the event of a major accident or disaster. The IEMA and Arup (2020) have prepared a Primer to guide the assessment of this topic in Environmental Impact Assessment ‘Major Accidents and Disasters in EIA Guide’ (here on referred to as ‘the Primer’). The Primer provides the following definitions:

- ‘A major accident is an event (for instance, train derailment or major road traffic accident) 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’. (IEMA and Arup, 2020 page 3); and
- ‘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’. (IEMA and Arup, 2020 page 3).

17.1.2 For the purposes of this chapter, the term ‘major accidents’ is taken to include both major accidents and disasters as defined above. The assessment considers the occurrence of extreme and highly unlikely incidences. As such, whilst this chapter draws on baseline information relevant to other environmental topic chapters of this Scoping Report, it considers scenarios that would not reasonably be covered by the other environmental topic assessments.

17.1.3 The Scoping Report considers two aspects: the vulnerability of the project to a major accident, and the potential for the project to cause a major accident.

17.1.4 This chapter is supported by the following appendix:

- Appendix 17.1: Major Accidents and Disasters Scoping Table.

17.2 Regulatory and Planning Policy Context

17.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1. This is supported by NPS EN-5. Neither of these documents specifically reference policy relating to major accidents and disasters.

17.2.2 The requirement to consider major accidents and disasters as part of the EIA process was established by the amended EIA Directive (2014/52/EU). This is transposed into UK law by the EIA Regulations 2017, which state that:

‘A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned... Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.’

17.3 Approach to Scoping

17.3.1 This section describes the methods used to establish the baseline for identifying potential receptors and sources of hazards, and the approach used to consider and assess the

significance of potential effects in relation to major accidents. The approach is based on the methodology set out within the Primer (IEMA and Arup, 2020).

- 17.3.2 The assessment of major accidents differs from the standard EIA methodology approach described in Chapter 5: EIA Approach and Method, as it focuses on the risk of extreme incidences and the potential for significant environmental effects as a result of those extreme incidences, i.e. those that could result in serious environmental effects to human health, welfare and/or the environment. Risk assessment and management in the UK is typically based on risk tolerability, with the focus on risk being '*as low as reasonably practicable*'. This chapter uses this term to describe where risks are already managed to a level where the risk is balanced against the trouble, time and money needed to control it (IEMA and Arup, 2020).
- 17.3.3 A significant environmental effect in relation to a major accident is defined as an event that '*could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration*' (IEMA and Arup, 2020).
- 17.3.4 The Primer (IEMA and Arup, 2020) recognises that the UK has a structured framework of risk management legislation in place. As such, a signposting approach can be an efficient way of making use of existing data and processes to avoid duplicating any risk quantification and management already being undertaken during construction and operation of the project.
- 17.3.5 Therefore, this chapter has drawn on existing regulatory requirements that need to be met when designing, building and operating new power lines. It also draws on the existing National Grid design standards and risk management tools to highlight the measures already in place to manage project risks through design, construction and operation.
- 17.3.6 The methodology adopted follows the approach set out within the Primer as follows:
- Scoping: Deciding if a major accidents and/or disasters assessment should be scoped into or out of the EIA. If scoped in, how to set out a proposed methodology as part of a scoping report.
 - Assessment: Undertaking an assessment, where required, to identify any potential significant effects that require further mitigation.
- 17.3.7 This Scoping Report covers the Scoping step outlined above. Appendix 17.1 includes supporting information underpinning the assessment made within this chapter.

17.4 Study Area

- 17.4.1 The consequences of major accidents could extend beyond the immediate environs of the project. A study area of up to 1km has therefore been established. The study area has been informed by professional judgement and based on the nature of the potential major accident or disaster identified, as well as the range of potential receptors present.

17.5 Existing Baseline

Data Sources

17.5.1 The understanding of the baseline environment and the subsequent risk assessment undertaken has been informed by a desk-based study which has drawn on the following information sources:

- OS mapping;
- information available on the Health and Safety Executive website;
- the UK's current National Risk Register;
- UK Met Office data;
- existing National Grid policy and process documents; and
- National Grid corporate and project-specific risk assessments.

17.5.2 In addition, the chapter has drawn on the embedded and good practice measures set out within Chapter 3: Main Alternatives Considered, Chapter 4: Project Description, and Appendix 4.1: Outline CoCP.

Baseline Environment

17.5.3 The baseline conditions are split into three areas:

- potential environmental receptors: receptors that could be vulnerable to a major accident or disaster as a result of the project;
- nearby major accident installations: potential linkages with other projects that could increase the risk of a major accident within the study area; and
- natural hazards and disasters: a review of existing baseline data relating to natural hazards/disasters, such as flooding or drought, that inform the likelihood of a natural disaster occurring within the study area.

Potential Environmental Receptors

17.5.4 The potential receptors that could be affected by a major accident have been identified within the specific environmental topic chapters and, as part of maintaining a proportionate assessment, are not duplicated here. Table 17.1 signposts to information regarding the receptors that could be vulnerable to a major accident in relation to the project. No additional receptors that would be relevant to the major accidents chapter have been identified outside of those set out within the preceding chapters.

Table 17.1: Signpost to Chapters with Relevant Receptors

Chapter	Potential Receptors Relevant to Major Accidents and Disasters
Chapter 7: Biodiversity	Protected species (terrestrial and aquatic) Protected sites and habitats
Chapter 8: Historic Environment	Designated sites and historic buildings Known and unknown archaeology
Chapter 9: Water Environment	Surface water

Chapter	Potential Receptors Relevant to Major Accidents and Disasters
Chapter 10: Geology and Hydrogeology	Groundwater and aquifers including private water supplies) Land stability
Chapter 11: Agriculture and Soils	Soil Livestock and crops
Chapter 12: Traffic and Transport	Local road network
Chapter 15: Socio-Economics, Recreation and Tourism	Properties and businesses
Chapter 16: Health and Wellbeing	Local residents

Nearby Major Accident Installations

- 17.5.5 There are no sites that fall under the Control of Major Accident Hazard Regulations 2015 (COMAH) within 1km of the project. The nearest COMAH site is situated approximately 6.5km east of the Scoping Boundary.
- 17.5.6 The project would cross a number of buried services, including a high-pressure gas main near Dollops Wood in the AONB and a local high-pressure gas main at the Stour Valley Eastern CSE Compound.

Natural Hazards and Disasters

- 17.5.7 Cabinet Office guidance (2011) indicates that the main natural hazards that can disrupt infrastructure in the UK are hydrological (e.g. drought, floods), geological (e.g. earthquakes, landslides) and climatic and atmospheric (e.g. extremes of heat and cold, windstorm). In addition, the Primer sets out examples of natural hazards in the UK, and this has been used to guide baseline data collection to determine the likelihood of the identified risk.

Flooding

- 17.5.8 Environment Agency flood zone definitions are set out in the National Planning Policy Guidance (MHCLG, 2014), as follows:
- 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 year probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%)
 - 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%).
- 17.5.9 The project crosses Flood Zone 2 and 3 in a relatively small number of locations. The locations are associated with main rivers and their tributaries and are relatively small in size, with the largest being the River Stour (600m wide floodplain). Further details on flood risk in relation to the project can be found in Chapter 9: Water Environment.
- 17.5.10 Expected increases in rainfall and storm events are likely to lead to an increased risk of flooding and potential extension of areas at risk of flooding in the future.

Climate

- 17.5.11 The UK is not subject to extremes of hot or cold weather. The highest daily maximum temperature on record in the UK is 38.7°C, recorded in July 2019 in Cambridge. The lowest daily minimum temperature on record in the UK is -27.2°C recorded in December 1995 in Altnaharra (UK Met Office data).
- 17.5.12 Data have been sourced from the Met Office website, which includes climate data for Eastern England (Met Office, 2016). Based on available data (1981–2010) from the UK Met Office climate station in Wattisham (Suffolk) (approximately 10km from the Scoping Boundary), average temperature data are as follows:
- max. temperature range: 6.6°C (January) to 21.9°C (July);
 - min. temperature range: 0.8°C (February) to 12.2°C (July/August); and
 - days of air frost per year: 47.4.
- 17.5.13 The area through which the project passes has a relatively low rainfall in a UK context. Based on available data (1981–2010) from the UK Met Office climate station at Wattisham, rainfall data are as follows:
- total rainfall: 613.7mm;
 - min. monthly rainfall: 40.7mm (Feb);
 - max. monthly rainfall: 64.8mm (Oct); and
 - days of rainfall >1mm: 115.8.
- 17.5.14 The occurrence of snow is linked closely with temperature, with falls rarely occurring if the temperature is higher than 4°C, and temperatures below this are generally required for snow to lie for any length of time. UK Met Office information (2016) indicates that, on average, snow falls around 20 days per year in the southeast of eastern England, but as much as 30 days over the highest ground.
- 17.5.15 Eastern England is one of the more sheltered parts of the UK, since the windiest areas are to the north and west, closer to the track of Atlantic storms (Met Office, 2016). The strongest winds are associated with the passage of deep areas of low pressure close to or across the UK. The frequency and strength of these depressions is greatest in the winter half of the year, and this is when mean speeds and gusts (short duration peak values) are strongest.
- 17.5.16 Based on available data (1981–2010) from the UK Met Office climate station at Wattisham, mean wind speed is 10.9 knots at 10m. Gales (a mean windspeed of 34 knots or more over any 10 consecutive minutes) only occur occasionally, with less than two days of gales per year in East Anglia and Lincolnshire. Extreme storms are very rare in the UK but can have significant implications when they do occur. Examples include Storm Ciara, which caused damage and disruption across Suffolk and Essex in October 2020. However, such events have not resulted in a major accident event in relation to electrical infrastructure to date.
- 17.5.17 In a UK context, the East of England is relatively susceptible to the effects of droughts, which result in dry ground conditions (Met Office, 2016). Water company supply areas in the UK are assessed in terms of 'water stress'. Suffolk and Essex, within which the project is located, are both classified as areas of serious water stress (Environment Agency, 2021b). However, due to the UK's temperate climate, the effects of drought are generally short term.

17.5.18 The National Risk Register states that the UK is likely to experience a trend towards warmer winters and hotter summers (HM Government, 2020). This would also lead to changing rainfall patterns, leading to heavier rainfall. Other extreme weather events such as storms and heavy snowfalls could also be expected as a result of climate change. The National Risk Register expects extreme weather events to become more frequent.

Land Instability

17.5.19 The project is located in an area with generally gentle to flat topography. Land instability for the purposes of this assessment was considered in terms of extensive ground movement due to natural hazards, principally an earthquake. Earthquakes severe enough to cause damage are rare in the UK, and the route passes through areas considered to be of very low seismicity. The BGS data indicate that the project passes through areas with a Peak Ground Acceleration of 0.02 to 0.04g. This is the second lowest of the nine BGS seismicity categories for the UK (BGS, 2021a; 2021c).

Wildfire

17.5.20 The UK has a temperate climate that is not usually associated with wildfire; however, wildfires do occur annually. Wildfires generally start from human error, such as discarded cigarettes or barbecues, when ground conditions are dry after extended periods of hot, dry weather, and vegetation may have increased susceptibility to fire.

17.6 Embedded and Good Practice Measures

- 17.6.1 Chapter 3: Main Alternatives Considered sets out how the project has, where practicable, avoided sensitive features such as urban areas and sensitive environmental sites through the options appraisal. The GSP substation and the CSE compounds are located outside of areas of flood risk.
- 17.6.2 The project will be designed, constructed and operated in accordance with applicable health and safety legislation. All aspects of the project will comply with the provisions of the Health and Safety at Work etc. Act 1974 and all relevant subordinate legislation. The project will also prepare and maintain a health and safety policy and a detailed site-specific health and safety plan. Method statements, accompanied by safety risk assessments, would be produced to cover the construction activities.
- 17.6.3 The project will comply with design safety standards including 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 policy and process guidance which contains details on design standards which must be met when designing, constructing and operating assets such as the components that make up the project. National Grid's Safety Rules and Guidance (National Grid, 2018b) also sets out generic risk mitigation measures that apply to all work undertaken by National Grid.
- 17.6.4 The project falls under the Construction (Design and Management) Regulations 2015 (CDM Regulations). These place specific duties on clients, designers and contractors so that health and safety is considered throughout the life of a project, from its inception to its subsequent final demolition and removal. Under the CDM Regulations, designers are required to avoid foreseeable risks so far as reasonably practicable, by eliminating hazards from the construction, maintenance, and proposed use and demolition of a structure, reducing risks from any remaining hazard, and giving collective safety measures priority over individual measures.

- 17.6.5 The major accidents chapter has not considered the effects associated with damage to either the overhead line and/or the underground cables that results in widespread power failure, as it is not considered that such effects would constitute a major accident.
- 17.6.6 If damage were to occur to either the underground cable or the overhead line, the National Grid Protection and Monitoring system would detect the fault within milliseconds and the circuit would be instantly tripped to prevent any risk of electrocution or fire. National Grid would be aware of the fault almost instantly and would send a team to the site to undertake emergency repairs. National Grid also undertakes regular helicopter surveys of its network, using thermal imaging to detect faults early or risks to the network, which allows maintenance work to be planned and scheduled.
- 17.6.7 It is extremely unlikely that damage would occur to multiple cables, or to more than one overhead line circuit at the same time. If this were to occur, it could lead to the project being out of operation for a period of time while repairs are made. The majority of connection issues can be rectified within days, due to National Grid responses and comprehensive plans in place to react to regional and national outages of electricity. In addition, the aim of the project is to reinforce the network in the region. This means that if the project were to be consented and built, there would be additional capacity within the network to allow for both planned maintenance events and emergency situations that cause damage to the network. Therefore, there would be less chance of widespread power failure as a result of the project, and therefore this would not result in a major accident or disaster.
- 17.6.8 The above embedded and good practice measures demonstrate that there are many processes already in place that reduce the risk to a level that is as low as reasonably practicable. However, for transparency these are reviewed in more detail in Appendix 17.1: Major Accidents and Disasters Scoping Table.

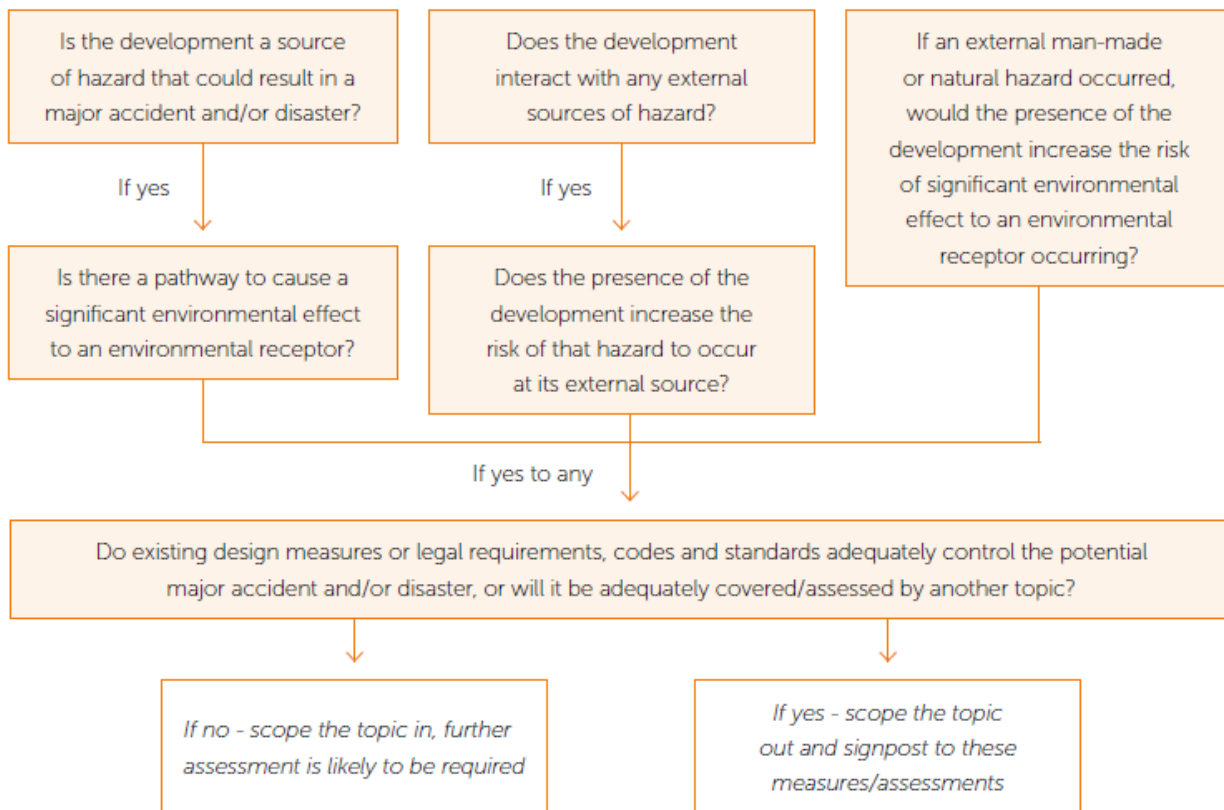
17.7 Likely Significant Effects

- 17.7.1 This section sets out the likely significant effects of the project in relation to the potential for major accidents. It follows the methodology set out within the Primer (IEMA and Arup, 2020). It assumes that the relevant embedded measures and good practice measures are in place before assessing the effects, in accordance with guidance from the IEMA for delivering a proportionate assessment (IEMA, 2016). However, it highlights the relevant documents that support this, to aid communication of the matters and in order to provide transparency in the conclusions drawn.
- 17.7.2 This Scoping assessment has focused on identifying the potential sources of a hazard that could result in a major accident, whether there are potential pathways to receptors that could cause a significant environmental effect and, finally, whether existing design measures, legal requirements, codes and standards adequately control the potential major accident. This process is set out within Figure 1 of the Primer (IEMA and Arup, 2020) and is replicated in Illustration 17.1 for information.
- 17.7.3 The first step has been to identify a list of possible hazards that could occur within the study area. This considered potential natural hazards such as extreme weather conditions. It also considered potential man-made events such as conflict and sabotage. The list considered the example hazards listed within the Primer (IEMA and Arup, 2020, page 5). The list was initially screened to remove the hazards that were not considered relevant to the UK and the study area, such as conflict and volcanic eruption.

17.7.4 Each hazard was assessed in turn to identify whether the project was a potential source of hazard that could result in a major accident or disaster, or whether the project could interact with any external source of hazard. This is documented in Appendix 17.1 along with any existing design measures or standards that apply.

17.7.5 Appendix 17.1 shows that the existing design measures, legal requirements, codes and standards adequately control the potential major accident and/or disaster, and that the topic can be scoped out of further assessment.

Illustration 17.1: Scoping Decision Process Flow



17.8 Conclusion

17.8.1 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 17.2. The scoping assessment has shown that existing processes and standards are already in place to reduce the vulnerability of the project to major accidents and/or disasters. It also demonstrates that the project is unlikely to generate any likely significant effects on the environment if a major accident or disaster were to occur. On this basis, major accidents and disasters is scoped out of the ES.

Table 17.2: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Vulnerability of the project to a major accident or disaster	Risk reduced to as low as reasonably practicable due to existing legislative requirements, design standards and the measures already contained within the project risk register.	Construction and operation	Scoped out

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Potential for the project to cause a major accident of disaster	Risk reduced to as low as reasonably practicable due to existing legislative requirements and design standards and the measures already contained within the project risk register.	Construction and operation	Scoped out

18. CUMULATIVE EFFECTS

18.1 Introduction

- 18.1.1 This chapter sets out the proposed approach to assessing cumulative effects associated with 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.
- 18.1.2 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 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 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.
- 18.1.3 This chapter is supported by the following appendix and figure:
- Appendix 18.1: Cumulative Effects Long List Table; and
 - Figure 18.1: Cumulative Effects Long List of Proposed Developments.

18.2 Regulatory and Planning Policy Context

- 18.2.1 Chapter 2: Regulatory and Planning Policy Context sets out the overarching policy relevant to the project including NPS EN-1, which is supported by NPS EN-5. EN-1 contains the following paragraphs relating to Cumulative Effects which have been considered when developing this chapter:
- Paragraph 4.1.3 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’.*
 - Paragraph 4.2.5 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)’.*

18.3 Approach to Scoping

18.3.1 This section describes the methods that will be used to establish the baseline, and the approach to consider and assess the significance of potential inter-project and intra-project cumulative effects arising from the project. The methodology draws on Advice Note Seventeen: Cumulative Effects Assessment (Planning Inspectorate, 2019).

Temporal Scope

18.3.2 Subject to grant of a DCO, construction works would be expected to start in 2024 and be completed by 2028. It is expected that operation of the project would commence in 2028, after a period of testing the infrastructure. As the construction and operational phases of the project occur at different times, they are not expected to act cumulatively with each other. The assessment will consider whether the construction or operational phases of the project are likely to interact with other proposed developments.

Zone of Influence

18.3.3 The Zone of Influence (ZOI) is the defined geographic area within which the project’s environmental receptors are located (Figure 18.1). The ZOI used for the Scoping Report and developing the provisional long list of other developments to be considered in the cumulative effects assessment (Appendix 18.1) is based on a distance extending from the Indicative Alignment shown on Figure 18.1. As the project design evolves, the ZOI will be based on the relevant distances (according to the individual environmental topic) around the proposed Order Limits.

18.3.4 The proposed ZOIs have been developed using professional judgement and knowledge of effects experienced on similar schemes. The ZOIs used for environmental topics are listed in Table 18.1.

Table 18.1: Zone of Influence for Environmental Topics

Environmental Topic	ZOI of Topic (Distance from Project)
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.

18.3.5 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 because at 5km distance, a 50m tall pylon will appear to be approximately 0.61cm high in the landscape. At this distance, it is likely to be barely perceptible and unlikely to give rise to significant effects (see Chapter 6: Landscape and Visual). A 10km ZOI allows for the cumulative effects to be considered with another proposed development that potentially includes pylons or other tall structures.

18.3.6 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 ARN, which will be defined within the traffic and transport assessment.

- 18.3.7 The remaining topics have a ZOI of 1km or less based on the potential for likely significant effects from the project and its interactions with other proposed developments. 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.

18.4 Existing Baseline

Data Sources

18.4.1 The identification of potential cumulative developments has been informed by a desk study which has drawn on the following information sources:

- a review of planning applications from the relevant planning authority websites (including the Planning Inspectorate’s Programme of Projects, local planning authority planning portals, and local development plans); and
- a review of the receptors and likely effects identified within each of the topic chapters in this Scoping Report.

Intra-project – Identification of Receptors

18.4.2 The baseline conditions for each of the topics, including likely receptors, have been detailed in the respective chapters in this Scoping Report, as set out in Table 18.2, and are not repeated here. Chapter 17: Major Accidents and Disasters is not included within the cumulative effects assessment, as the embedded measures identified within this chapter are such that there are unlikely to be significant effects in combination with other developments.

Table 18.2: Topics and Their Location Within the Scoping Report

Environmental Topic	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	Chapter 15
Health and Wellbeing	Chapter 16

Inter-project – Identification of Proposed Developments

- 18.4.3 To inform the scope of the inter-project cumulative effects assessment, a preliminary review has been undertaken to compile a provisional long list of other developments to be considered. This list has been informed through a review of planning applications from the relevant planning authority websites (including the Planning Inspectorate's Programme of Projects, local planning authority planning portals, and local development plans).
- 18.4.4 The long list of other developments will change as new applications are submitted for development consent or planning permission or where applications are withdrawn. Therefore, the provisional long list presented in Appendix 18.1 reflects the current situation (March 2021) and will be reviewed as the project progresses.
- 18.4.5 A 10km study area was chosen, based on the largest ZOI for environmental topics included within the assessment. The 10km study area excluded significant urban areas, including the Ipswich Borough Council boundary (2.2km from the project), and south of the A12 within the Colchester Borough Council boundary (9.5km from the project). 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. 10km was also chosen as a suitable ZOI for traffic based on experience from previous projects over which traffic movements could be significant.
- 18.4.6 A 50km study area was used for NSIPs, in order to establish context within the region. However, these were not considered as part of the long list, where they lay outside of the defined study area, as they were unlikely to result in cumulative effects with the project given the defined ZOI.
- 18.4.7 A search period of 10 years preceding the planned commencement of construction was chosen to take into consideration submitted or approved planning applications that may have a temporal overlap with the project.

18.5 Embedded and Good Practice Measures

- 18.5.1 Relevant embedded and good practice measures are listed within each of the preceding topic chapters and are not repeated here.

18.6 Proposed Assessment Methodology

- 18.6.1 This section sets out the proposed methodology for the cumulative effects assessment.

Intra-project Cumulative Effects

- 18.6.2 The intra-project cumulative effects assessment will consider the environmental effects reported in the individual topic chapters of the ES. These will be summarised in the cumulative effects chapter of the ES where there is considered to be potential for a significant cumulative effect.
- 18.6.3 There is no standard approach to the assessment of intra-project effects. A checklist matrix will be used to scope-in receptors subject to multiple effects. For example, protected lanes could have effects identified within the landscape, ecological, cultural heritage, and traffic and transport assessments. The matrix approach is useful as a tool as it can visually represent relationships between project impacts and environmental components.

- 18.6.4 Representative groups and/or individual receptors, such as people, a watercourse, a group of listed buildings or protected species, will be identified for each topic. These will represent the receptors that are most sensitive to impact interactions as described in the relevant chapters. This will be undertaken in discussion with the relevant specialists to capture the potential synergistic effects between topics and to identify those that could be significant.
- 18.6.5 The assessment will consider the receptors which are likely to experience minor, moderate or major significance of effects in the individual chapters. Receptors with negligible effects will not be included within the assessment. If the same receptor is identified in more than one chapter, this will indicate a spatial overlap. These effects will then be checked for a temporal overlap. If both a spatial and temporal overlap exists, then the receptor will be assessed for intra-project cumulative effects.
- 18.6.6 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

- 18.6.7 The methodology of the inter-project cumulative effects assessment is structured using the staged assessment approach detailed in Advice Note Seventeen (Planning Inspectorate, 2019). In summary, this involves identifying a long list of proposed developments that could interact with the project (Stage 1A and 1B). These are screened as to whether they should progress to a shortlist (Stage 2). The shortlist is then subjected to assessment to identify whether there are likely significant effects with the project (Stages 3 and 4). These are explained in more detail below.
- 18.6.8 Stages 1A and 1B have been completed as part of the Scoping Report. Stages 2, 3 and 4 will be undertaken as part of the EIA.

Stage 1A: Identify Zone of Influence (ZOI)

- 18.6.9 The proposed ZOIs are outlined in Table 18.1.

Stage 1B: Identify Long List of Other Developments

- 18.6.10 A provisional long list of developments has been identified in Appendix 18.1. The following development types were included in the long list:
- NSIPs listed on the Planning Inspectorate's Programme of Projects;
 - major developments; and
 - sites allocated in relevant Local Development Plans.
- 18.6.11 Major developments are defined under Development Management Procedure (England) Order 2010 (as amended) as development involving any one or more of the following:
- (a) the winning and working of minerals or the use of land for mineral-working deposits;
 - (b) waste development;
 - (c) the provision of dwelling houses where —
 - (i) the number of dwelling houses to be provided is 10 or more; or
 - (ii) 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 sub-paragraph (c)(i);

(d) 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

(e) development carried out on a site having an area of 1 hectare or more.

18.6.12 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.

18.6.13 The cumulative effects assessment will also consider other National Grid projects where these meet the spatial and temporal parameters of the cumulative effects assessment and there are sufficient details available in order to assess the potential cumulative effects. This will include projects 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 would be added into the long list of developments for further consideration. It is currently anticipated that the following projects will be considered, which are drawn from the Network Options Assessment (National Grid, 2021):

- a new 400kV double circuit in north East Anglia (AENC);
- a new 400kV double circuit in south East Anglia (ATNC); and
- reconductoring of existing circuits.

18.6.14 National Grid is also engaging with Anglian Water regarding a proposed strategic water pipeline that may interact with the project. This will be considered as part of the cumulative effects assessment at the next stage.

18.6.15 Advice Note Seventeen (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 it 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 listed in Table 18.3 and the relevant tier is referenced in Appendix 18.1. 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.

Table 18.3: Criteria Used to Determine the Tier of Development for the Inter-Project Cumulative Effects Assessment

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>

Decreasing
level of
available data
↓

Tier	Development Status
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3 Projects on the Planning Inspectorate's Programme of Projects or in local planning authorities' portal where a Scoping Report has not been submitted.

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.

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.

18.6.16 The ZOIs were used to identify the topic areas that could have cumulative effects with the other development identified. This has been used to screen the provisional long list to identify whether projects should proceed to Stage 2. This is presented in Appendix 18.1.

18.6.17 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 prior to the application being submitted to enable the assessment to be concluded.

18.6.18 Rejected and withdrawn planning applications have been excluded from the shortlist 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 cumulative effects assessment where applicable.

18.6.19 Allocations within Local Development Plans and other plans and programmes will be excluded from the shortlist 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.

Stage 2: Identify Shortlist of Other Developments

18.6.20 The next step will be to establish the shortlist of other developments to determine whether the other developments have the potential to give rise to significant effects in combination with the project.

18.6.21 Professional judgement will be used to identify whether potential cumulative inter-project effects are likely to be significant; only potential significant effects will be taken forward to the next stage of assessment. The following threshold criteria will be used for the assessment:

- **Temporal scope:** Other development within the ZOI with overlapping construction phases (2024-2028) and operational phases (2028-2068) will be scoped into the assessment.
- **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 will be considered further. Developments not identified as Schedule 1 or 2 developments will be scoped out of the assessment, except where it was considered that potential significant environmental effects may arise in combination with the project.

- **Sensitivity of the receiving environment:** Where there are potential source-pathway-receptor linkages between the project and other developments, cumulative effects will be considered further. Other developments with no clear source-pathway-receptor linkage will be scoped out of the assessment.

18.6.22 Professional judgement will be used during the application of threshold criteria to determine whether other developments should be scoped into or out of the assessment. This will include developments that are below the threshold criteria but with characteristics that are likely to give rise to a significant effect.

Stage 3: Information Gathering

18.6.23 Stage 3 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.

18.6.24 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 Seventeen (Planning Inspectorate, 2019).

Stage 4: Assessment

18.6.25 The assessment will be undertaken by a competent EIA practitioner in collaboration with environmental topic specialists to describe and evaluate the likely significant intra-project and inter-project cumulative effects arising from the project and shortlist of other developments. 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 Seventeen (Planning Inspectorate, 2019), and tabulated within the ES.

18.6.26 Significance of effects will be taken from the environmental topic 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.

18.7 Likely Significant Effects

Intra-project Cumulative Effects

18.7.1 Environmental topic chapters of the ES will consider the intra-project cumulative effects of the project. Professional judgement will be used to determine the potential for cumulative effects, with effects identified as significant or not. Any likely significant intra-project cumulative effects, along with any identified mitigation and residual effects, will be presented within the ES.

Inter-project Cumulative Effects

18.7.2 The shortlist of other developments will be assessed for potential inter-project cumulative effects arising in combination with the project during construction and operation. Professional judgement will be used to determine whether the effects are significant or not. The likely significant effects, along with any identified mitigation and residual effects, will be presented within the ES.

Limitations of Assessment

- 18.7.3 The assessment relies on third-party information available on local planning authority planning portals (which can differ between local authorities). It has been supplemented with information sourced from engagement with the relevant local planning authorities.
- 18.7.4 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.
- 18.7.5 Only planning applications submitted since 2014 (10 years prior to the planned commencement of construction works for the project) have been considered. It was considered likely that developments related to applications submitted prior to this planning search period would have been completed prior to the project construction works and are therefore unlikely to give rise to cumulative effects during construction, and operational effects would already form part of the baseline environment.

18.8 Conclusion

- 18.8.1 Cumulative effects are scoped into the EIA and the results will be presented within the ES. The intra-project cumulative effects assessment will consider the potential for effects from different topics combining into a cumulative effect. The inter-project cumulative effects assessment will consider the potential for combined effects from the project with other proposed developments within the ZOI, including those on planning registers and also National Grid projects.
- 18.8.2 The approach to the cumulative effects assessment was discussed with representatives from Suffolk County, Essex County, Babergh District, Mid Suffolk District and Braintree District Councils at a meeting held on 1 March 2021. The initial long list and a technical note setting out the proposed scope of the assessment was issued to the local councils for comment on 22 March 2021.
- 18.8.3 The matters that are proposed to be scoped into and out of the assessment are summarised in Table 18.4.

Table 18.4: Proposed Scope of the Assessment

Sub-topic	Potential Significant Effects	Timing	Scoped In/Out
Intra-project cumulative effects	There is the potential for significant effects arising between environmental topics.	Construction and operation	Scoped in
Inter-project cumulative effects	There is the potential for significant effects arising between the project and other proposed developments.	Construction and operation	Scoped in

19. ENVIRONMENTAL MANAGEMENT AND MITIGATION

19.1 Introduction

19.1.1 This chapter sets out how the environmental measures and mitigation identified within the EIA would be implemented. It outlines the proposed securing mechanisms for commitments made within the application for development consent and also sets out potential management measures that would apply post consent.

19.2 Proposed Securing Mechanisms

19.2.1 The options appraisal and design evolution process has included a number of embedded measures that have been included within the project. These embedded measures are described in Chapter 3: Main Alternatives Considered and Chapter 4: Project Description. The embedded measures form an intrinsic part of the project, and would be secured through the designs proposed at application. These include, for example, adjustment of Indicative Alignment to avoid sensitive features, undergrounding within Dedham Vale AONB and the Stour Valley, removal of the 132kV overhead line and a trenchless crossing under the River Stour.

19.2.2 Good practice measures are set out within the Outline CoCP which can be found in Appendix 4.1. National Grid intends to submit an updated version of the CoCP with the application for development consent. National Grid is anticipating 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.

19.2.3 In addition, as a minimum, the project will prepare an Outline CEMP, an Outline CTMP and an Outline LEMP which will be submitted with the application for development consent. These will provide more details about how aspects of the environment would be managed post consent during the construction phase. 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. Further details on these and how they would be developed will be set out within the ES.

19.2.4 Additional mitigation may be identified through the EIA process to avoid or reduce the potential for significant effects to a residual non-significant level. This mitigation would be set out in a schedule of EIA commitments, which would be included within the ES, and the implementation of which would be secured through a requirement in the DCO.

19.3 Environmental Management Post Consent

19.3.1 Subject to gaining grant of development consent, National Grid will include environmental management measures in the contract documents when procuring a construction contractor. The contractor would be required to comply with the measures set out within the ES and final management plans when they implement the project.

20. CONCLUSION

20.1 Introduction

20.1.1 This chapter summarises the aspects that are proposed to be scoped into and out of the EIA, and the proposed content of the ES. It also sets out the proposed next steps as the project moves forward.

20.2 Topics Proposed to be Scoped In and Out

20.2.1 Table 20.1 sets out the matters that National Grid proposes to scope in to and out of the assessment based on its understanding of the baseline, and whether the project is likely to result in significant effects on the receptors. This also provides a signpost to where effects will be reported, including those scoped as not significant which would therefore lie outside of the ES, and links to other key supporting documents. Further details and the justification for this scope is set out within the topic chapters.

Table 20.1: Proposed Scope of the Assessment and Signpost to Other Documents

Scope of the Assessment and Signpost to Other Documents
Landscape and Visual
Scoped in:
<ul style="list-style-type: none">• Effects on the designated landscapes Dedham Vale AONB and SLA during construction and operation;• Effects on landscape character in relation to the district-scale landscape character areas during construction and operation; and• Effects on views in relation to people living and moving around the area, and people visiting and/or taking part in recreational activities within the area during construction and operation (focus within 3km).
Scoped out:
<ul style="list-style-type: none">• Effects on landscape character areas at national or county scale,• Landscape elements, including tree cover, will not be assessed in their own right but will be considered as part of the baseline in terms of contribution to landscape character and value; and• Effects on views at night, views outside the ZTV and on private views, and road or rail receptor views during construction and operation.
Signpost to other documents:
<ul style="list-style-type: none">• The LEMP will set out the measures to protect existing vegetation on the project and details regarding the reinstatement and additional planting including biodiversity net gain.• The Arboricultural Impact Assessment will provide details about the trees affected and proposed good practice measures to be used during construction to protect trees (including their root zones).
Biodiversity
Scoped in:
<ul style="list-style-type: none">• Effects on statutory designated and non-statutory sites during construction;• Effects on ancient woodland and veteran trees during construction;• Effects priority habitats (including GWDTEs) during construction and operation; and• Effects on protected species: bats, hazel dormouse, riparian mammals, birds (breeding, wintering or raptors), vascular and lower plants (arable plant assemblage only), fish and other aquatics during construction.

Scope of the Assessment and Signpost to Other Documents

Scoped out:

- Effects on great crested newts, badgers, terrestrial invertebrates, reptiles and other notable species during operation and construction;
- Effects on protected species: bats, hazel dormouse, riparian mammals, birds (breeding, wintering or raptors), vascular and lower plants (arable plant assemblage only), fish and other aquatics during operation;
- Effects on statutory designated and non-statutory sites during operation; and
- Effects on ancient woodland and veteran trees during operation.

Signpost to other documents:

- A Biodiversity Legislation Compliance Report will form a supporting appendix to the ES and will outline the measures required to comply with legislation. This will set out the project-specific measures in relation to protected species and invasive non-native species.
- The LEMP will set out the measures to protect habitats on the project and details regarding the reinstatement and enhancement of habitats including biodiversity net gain.
- A No Significant Effects Report will set out the assessment in relation to the HRA.

Historic Environment

Scoped in:

- Damage to or destruction of known or unknown non-designated archaeological remains and historic landscape elements within the proposed Order Limits;
- Impacts to the setting of designated archaeological remains, historic buildings and historic landscapes during construction and operation; and
- Indirect damage to historic buildings through vibration or changes to groundwater levels during construction.

Scoped out:

- Damage to or destruction of designated archaeological remains and historic buildings during construction and operation; and
- Damage to known or unknown non-designated archaeological remains and historic landscape elements during operation.

Signpost to other documents

- The Outline WSI outlining potential archaeological mitigation required post application.

Water Environment

Scoped in:

- Flood risk from rivers and surface water during construction and operation;
- Changes to the land drainage regime/surface water flood risk during construction; and
- Effects on hydromorphology (watercourse crossings) during construction.

Scoped out:

- Flood risk from sewers, the sea and reservoirs and groundwater during construction and operation;
 - Effects on surface water quality during construction and operation;
 - Effects on hydromorphology (watercourse crossings) during operation; and
-

Scope of the Assessment and Signpost to Other Documents

- Detriment to existing water interests (surface water abstractions and discharges) during construction and operation.

Signpost to other documents

- The FRA will document the potential effects on fluvial, surface water and groundwater flood risk.
 - The WFD Screening Assessment will document how the project will achieve compliance with the objectives of the WFD.
 - The CEMP will include details around the standard designs for temporary watercourse crossings and other measures to reduce the effects to water quality in surface water features.
-

Geology and Hydrogeology

Scoped in:

- Effects on groundwater levels and quality from dewatering and discharge during construction (trenchless crossing locations only);
- Effects on groundwater flow from ground disturbance resulting from trenchless crossing works during construction and operation; and
- Effects due to ground disturbance of contaminated land on sensitive receptors.

Scoped out:

- Effects on groundwater due to pumped discharges during construction;
- Effects on groundwater due to dewatering and discharge during operation;
- Effects on groundwater levels and quality during construction (all locations other than trenchless crossings);
- Effects on infiltration and recharge due to changes in impermeable surfaces or re-routing between catchments during construction and operation; and
- Restriction of access to mineral reserves during construction and operation.

Signpost to other documents

- The SWMP and CEMP will describe the measures to protect groundwater sources and to manage potential contaminated land during construction.
-

Agriculture and Soils

Scoped in:

- Effects on BMV land during operation.

Scoped out:

- Effects on BMV land during construction;
- Effects on soil quality and associated ecosystem services during construction and operation; and
- Economic effects on landowners and agricultural landholdings during construction and operation.

Signpost to other documents

- Land agreements will outline the arrangements regarding specific landowners and effects on existing agri-environmental schemes.
 - The LEMP will set out reinstatement requirements and the CEMP will describe the measures to protect soil during construction.
-

Traffic and Transport

Scoped in:

Scope of the Assessment and Signpost to Other Documents

- Effects of traffic on network performance and safety on the local highway network, local bus services, and at junctions with the SRN during construction; and
- Effects on WCH journey length on the public highway, and on severance during construction.

Scoped out:

- Effects of traffic on the SRN during construction;
- Effects on PRoWs in the study area during construction; and
- Effects on all traffic and transport receptors during operation.

Signpost to other documents

- The Transport Assessment will assess the impacts of the project on transport (road, rail, water) and will include any measures required in relation to PRoWs and the NCN.
 - The CTMP will include measures to reduce impacts on the local road network and the PRoW network.
-

Air Quality

Scoped in:

- Effects of construction traffic on local air quality receptors.

Scoped out:

- Effects from construction dust;
- Effects from construction generators; and
- Effects on all aspects of air quality during operation.

Signpost to other documents

- The CEMP will include the Dust Risk Assessment and describe the measures to manage dust during construction.
-

Noise and Vibration

Scoped in:

- Effects from construction vehicles and machinery on noise and vibration during construction; and
- Effects of construction traffic noise on human receptors during construction.

Scoped out:

- Effects from traffic vibration during construction; and
- Effects from noise and vibration during operation.

Signpost to other documents

- The CEMP will include the BPM to manage noise during construction.
 - The Operational Noise Compliance Report will document the outputs of the operational noise assessment for the GSP substation that has been done to demonstrate compliance with required standards.
-

Socio-Economics, Recreation and Tourism

Scoped in:

- No topics.

Scoped out:

- Effects on socio-economics, recreation and tourism during construction and operation.

Signpost to other documents

Scope of the Assessment and Signpost to Other Documents

- The cumulative effects assessment will consider intra-project cumulative effects on amenity such as traffic, noise and dust.
- The CEMP will include the good practice measures to manage effects during construction.
- The CTMP will include measures to reduce impacts on the local road, PRowS and NCN network.

Health and Wellbeing

Scoped in:

- No topics.

Scoped out:

- Effects on health and wellbeing (including from EMF) during construction and operation.

Signpost to other documents

- The cumulative effects assessment will consider intra-project cumulative effects health effects such as noise and dust.
- The CEMP will include the good practice measures to manage effects during construction.
- The EMF Compliance Report will set out the results of the compliance assessment.

Major Accidents and Disasters

Scoped in:

- No topics.

Scoped out:

- Vulnerability of the project to a major accident or disaster during construction and operation; and
- Potential for the project to cause a major accident or disaster during construction and operation.

Signpost to other documents

- No links to other documents.

Cumulative Effects

Scoped in:

- Intra-project and inter-project cumulative effects between proposed developments on the shortlist.

Scoped out:

- Potential effects with proposed developments not taken forward on the shortlist.

Signpost to other documents

- The CEMP will include the good practice measures to manage effects during construction.

20.2.2 This Scoping Report will be submitted to the Planning Inspectorate as part of the requirements under the EIA Regulations 2017. The Planning Inspectorate will scrutinise this report, take account of comments provided by consultees, and provide a Scoping Opinion. The Scoping Opinion will confirm which topics are to be scoped into or out of the EIA process, and the final ES will be based on the Scoping Opinion adopted by the Secretary of State.

20.3 Proposed Contents of the ES

20.3.1 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. It would include the chapters listed in Table 20.2.
- 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.

20.3.2 The structure of the ES will reflect the topics scoped into the Scoping Opinion provided by the Planning Inspectorate. The proposed ES contents would be as set out in Table 20.2 based on the conclusions set out in this Scoping Report.

Table 20.2: Proposed Contents of the ES

Chapter	Title
1	Introduction
2	Regulatory and Planning Policy Context
3	Main Alternatives Considered
4	Project Description
5	Consultation
6	EIA Approach and Method
7	Landscape and Visual
8	Biodiversity
9	Historic Environment
10	Water Environment
11	Geology and Hydrogeology
12	Agriculture and Soils
13	Traffic and Transport
14	Air Quality
15	Noise and Vibration
16	Cumulative Effects
17	Environmental Management and Mitigation
18	Conclusion

20.3.3 The ES will be supported by a number of documents either as appendices or standalone application documents, including:

- No Significant Effects Report;
- Flood Risk Assessment;
- Statement of Statutory Nuisances;
- Protected species surveys supporting the Letters of No Impediment;
- Updated CoCP;
- Outline CEMP;
- Outline CTMP;
- Outline LEMP (including Arboricultural Impact Assessment); and
- Evidence supporting the scoping out of effects relating to noise and EMF.

20.4 Next Steps

20.4.1 Following submission of this Scoping Report, the project design, planning and EIA will be progressed, including:

- obtaining the Scoping Opinion and reviewing scoping consultation feedback to refine the scope of surveys and assessments, and to inform the ES;
- continued desk studies, data collation and field surveys to obtain further baseline information to support the assessment;
- continued stakeholder engagement with both statutory/prescribed consultees and also with landowners and tenants;
- ongoing design evolution and identification of potential additional mitigation measures, as well as identification of potential environmental enhancements such as biodiversity net gain;
- further development of the Outline CoCP and preparation of the outline management plans;
- submission of the Draft HRA Screening Report to Natural England for comment before finalising into a No Significant Effects Report for submission with the application for development consent;
- preparation of the Preliminary Environmental Information Report, which will be submitted as part of the engagement material presented at the Statutory Consultation; and
- preparation of the ES, which will be submitted as part of the application for development consent.

Acronyms

Acronym	Full Reference
AADT	Annual average daily traffic
AIL	Abnormal indivisible load
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
APFP	Infrastructure Planning (Applications: Prescribed Forms and Procedure)
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
ARN	Affected Road Network
ASR	Annual Status Report
BGS	British Geological Survey
BMV	Best and Most Versatile
BNL	Basic Noise Level
BPM	Best practicable means
BS	British Standard
CCTV	Closed Circuit Television
CDM Regulations	Construction (Design and Management) Regulations 2015
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CoCP	Code of Construction Practice
COMAH	Control of Major Accident Hazard Regulations 2015
COR	Connection Options Report
CRTN	Calculation of Road Traffic Noise
CSE	Cable Sealing End
CTMP	Construction Traffic Management Plan
CWS	County Wildlife Sites
dB	Decibel
DCO	Development Consent Order
DECC	Department of Energy and Climate Change (now BEIS)

Acronym	Full Reference
Defra	Department for the Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EHER	Essex Historic Environment Record
EIA	Environmental Impact Assessment
EMF	Electric and magnetic 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
HDV	Heavy Duty Vehicle
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HLT	Historic landscape type
HRA	Habitats Regulations Assessment
IAQM	Institute of Air Quality Management
ICNIRP	International Commission on Non-Ionising Radiation Protection
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive and non-native species
kV	Kilovolt (1,000 Volts)

Acronym	Full Reference
LBAP	Local Biodiversity Action Plan
LCA	Landscape Character Assessment
LEMP	Landscape and Ecological Management Plan
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LOAEL	Lowest observed adverse effect level
LSOA	Lower-layer Super Output Area
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
MHCLG	Ministry of Housing, Communities and Local Government
MW	Megawatt (1 million Watts)
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
NO2	Nitrogen dioxide
NOx	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
IMD	Index of Multiple Deprivation
OS	Ordnance Survey
ONS	Office for National Statistics

Acronym	Full Reference
PM10	Particulate matter with an aerodynamic diameter equal to or less than 10µm.
PM2.5	Particulate matter with an aerodynamic diameter equal to or less than 2.5µm.
PPV	Peak particle velocity
PRF	Potential roost feature
PRoW	Public Right of Way
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 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
SWMP	Site Waste Management Plan
TAG	Transport Analysis Guidance
V/m	Volts per metre
WCH	Walkers, cyclists and horse riders
WFD	Water Framework Directive
WSI	Written Scheme of Investigation
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility
µT	Microtesla
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 National 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 (61 cm) 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.
Basic Noise Level	A reference noise level at 10m from the nearside carriageway, calculated as a function of traffic flow, percentage of Heavy Goods Vehicles, 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 (ALC) system.

Term	Description
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.
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.

Term	Description
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.
Electric and Magnetic Field	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).
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

Term	Description
	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).
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 water bodies.
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 has been identified through the options appraisal process to date.
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 has the ability to 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.

Term	Description
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.
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.

Term	Description
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.
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

Term	Description
	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 NERC 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 NERC 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.
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.
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.

Term	Description
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.
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.
Topsoil	The uppermost layer of soil, usually with the highest concentration of nutrients, organic matter and microorganisms.

Term	Description
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 have the potential to 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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