



Bramford to Twinstead Tee Connection Project

Connection Options Report

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ABBREVIATIONS

APPENDICES

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- B – Calculation of Capital and Lifetime Costs

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1 INTRODUCTION

Purpose of report

- 1.1 In July 2011, National Grid announced its preferred corridor for developing a scheme for a 400kV overhead line connection between Bramford substation in Suffolk (west of Ipswich) and Twinstead Tee in Essex (south of Sudbury). This corridor (Corridor 2) incorporates the route of a 132kV overhead line comprising part of the electricity distribution system under the control of the Distribution Network Operator UK Power Networks (UKPN). This 132kV overhead line runs from Burstall Bridge, 2.5km to the south of Bramford substation, to Twinstead Tee. Two options (Corridors 2A and 2B) for the eastern end of Corridor 2 in the Hintlesham area were identified.
- 1.2 The July 2011 announcement included commitments to undertake further studies to evaluate whether the undergrounding of sections of the proposed 400kV overhead lines may be appropriate, to mitigate the potential impacts of the scheme on sensitive locations, and to determine the treatment of the Hintlesham sections of the route (Corridors 2A and 2B).
- 1.3 Following the preferred corridor announcement, National Grid has been undertaking further technical and environmental studies in respect of both of these commitments. It has also established three Thematic Groups and four Community Forums. These have provided advice and have commented on the information which National Grid has gathered to use in its further studies.
- 1.4 In order to assess whether undergrounding may be considered appropriate, taking account of particular local landscape and visual sensitivities, it was first necessary to develop "indicative alignments" for overhead line solutions and to assess the potential effects of these alignments to determine the least environmentally constrained "interim alignment". The case for undergrounding was then assessed taking into account the landscape and visual impacts which would be associated with this interim alignment, together with the other environmental, technical and cost implications of underground cable solutions, as required by National Policy Statements EN-1¹ and EN-5².

¹ Department for Energy and Climate Change : Overarching National Policy Statement for Energy : July 2011

² Department for Energy and Climate Change : National Policy Statement for Electricity Networks Infrastructure : July 2011

1.5 This report demonstrates how statutory duties, policy considerations, environmental, socio-economic, technical and cost issues have been considered and makes recommendations as to the extent and location of undergrounding which National Grid should take forward for the Bramford to Twinstead Tee Connection. Where the appraisal concludes that an overhead line solution is appropriate, this report identifies the least environmentally constrained option. The findings of the report will be made available for interested parties to comment upon. A specific consultation will be held to obtain views on alignment options in the Hintlesham area. Comments received on this report and responses to the specific consultation will help to inform the development of a detailed connection design. Further consultation will be undertaken regarding detailed alignments and preliminary environmental information. Following this, the detailed connection design will be further developed and subject to an environmental impact assessment. National Grid will then formally publicise and consult in accordance with the Planning Act 2008³ requirements. An application for an Order granting Development Consent will be finalised, having regard to consultation feedback, and submitted to the Planning Inspectorate⁴.

Structure of report

1.6 The report is structured as follows :

- Chapter 2 - sets out how National Grid approaches the design and routeing of new electricity transmission lines and explains why consideration is being given to undergrounding sections of the connection. Reference is made to Stage 1 Consultation responses;
- Chapter 3 – explains how the study areas were defined and in particular how the preferred corridor was sub-divided based on landscape character assessment;
- Chapter 4 – outlines the principles adopted in defining overhead line and underground cable options and the reasons why other options were excluded from the appraisal;
- Chapter 5 – describes the basis of the options appraisal, identifying those factors which have been taken into account in the appraisal process and

³ Planning Act 2008 : 2008 Ch29

⁴ From April 2012 the duties of the Infrastructure Planning Commission, including the processing of applications for Development Consent Orders under the Planning Act 2008, were transferred to the Planning Inspectorate.

discussing other factors which were considered not to affect option selection;

- Chapters 6 to 11 – present the findings of the options appraisal for individual study areas;
- Chapter 12 – draws on the findings of Chapters 6 to 11 to identify an integrated approach to the proposed connection, considering how overhead and underground sections may be linked and potential locations for sealing end compounds;
- Chapter 13 – explains how a decision on the approach to undergrounding will be integrated with other design decisions and how the results of consultation will be taken into account before finalising an application for an Order granting Development Consent.

2 BACKGROUND TO THE PROPOSAL

National Grid and its duties

- 2.1 National Grid is the operator of the high-voltage transmission system for the whole of Great Britain and the owner of the high voltage transmission network in England and Wales.
- 2.2 National Grid's transmission system in England and Wales consists of approximately 7,200km of overhead lines and a further 700km of underground cabling, operating at 400kV and 275kV. The overhead lines and cables connect around 340 substations to form a highly interconnected network.
- 2.3 Under Section 9(2) of the Electricity Act 1989, National Grid has a duty:
- to develop and maintain an efficient, co-ordinated and economical system of electricity transmission; and
 - to facilitate competition in the supply and generation of electricity.
- 2.4 Section 38 and Schedule 9 of the Electricity Act require 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"*.

National Grid policy and approaches

- 2.5 In its Stakeholder, Community and Amenity policy⁵, National Grid sets out how the company will meet the duty placed upon it by the aforementioned legislation. This includes :
- only seeking to build new lines and substations where the existing transmission infrastructure cannot be upgraded to meet transmission security standards;

⁵ National Grid plc : National Grid's commitments when undertaking works in the UK - our Stakeholder, Community and Amenity Policy : February 2010

- 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.
- 2.6 The Stakeholder, Community and Amenity Policy also commits to applying best practice methods, assessing the environmental impacts of proposals and identifying appropriate mitigation measures, and to promoting effective stakeholder and community engagement.
- 2.7 In September 2011, National Grid published its Approach to the Design and Routeing of New Electricity Transmission Lines⁶. This states that *"in cases where a predominantly overhead route has been selected, we will continue to apply the Holford Rules and we will identify any sections where it would be more appropriate to place infrastructure underground. We may propose other forms of mitigation, which could involve tree planting or alternative pylon designs or removal of other electricity transmission or distribution infrastructure"*.
- 2.8 The Approach to the Design and Routeing of New Electricity Transmission Lines also describes the process which National Grid adopts for its project development. This involves increasing refinement of the design as more information is gathered about the proposal, its setting and constraints. In order to test different options, a multi-criteria assessment is used which takes account of a range of factors – environmental, socio-economic, technical and cost. The application of this approach is considered later in this chapter.

Outline of proposed Bramford to Twinstead connection proposal

- 2.9 In July 2011, National Grid announced its preferred corridor (Corridor 2) for developing a scheme for an overhead line connection between Bramford and Twinstead Tee. Corridor 2 proposes the adoption of the route of a 132kV overhead line comprising part of the electricity distribution system under the control of the Distribution Network Operator UKPN. This overhead line runs from Burstall Bridge, 2.5km to the south of Bramford substation, to Twinstead Tee, a distance of 25.5 km. Between Bramford and Burstall Bridge, the existing 132kV connection is established by means of underground cable circuits. This underground connection would be retained along with the section of 132kV overhead line running south from Burstall Bridge. A 400kV overhead line (the 4YL route) runs between Bramford and Twinstead Tee, a distance of 26.7 km,

⁶ National Grid plc : Approach to the Design and Routeing of New Electricity Transmission Lines : September 2011

where the circuits then diverge to connect to Pelham (to the west) and Braintree and Rayleigh (to the south).

- 2.10 Corridor 2 was defined to encompass land to either side of the existing 400kV overhead line between Bramford and Twinstead Tee. At the western end, the corridor broadened in recognition of the fact that there is scope for connections to be made to the Bramford-Braintree-Rayleigh overhead line to the south of Twinstead Tee.
- 2.11 Two options for the eastern end of Corridor 2 were identified. Corridor 2A runs due south from Bramford substation passing the outskirts of Burstall before picking up the route of the existing 132kV overhead line at Burstall Bridge and turning west to run to the south of Hintlesham. Corridor 2B runs south west from Bramford substation, passing to the north of Hintlesham village before joining the route of the existing 132kV overhead line about 2km west of Hintlesham. The 132kV overhead line between Burstall Bridge and Twinstead Tee would be removed irrespective of whether Corridor 2A or 2B is adopted.
- 2.12 At that stage, the overall route length was identified as 28.5 km following Corridor 2A and 27 km following Corridor 2B.
- 2.13 The Selection of Preferred Corridor report⁷ included a commitment that *"further studies should be undertaken to evaluate whether the undergrounding of sections of the proposed 400kV overhead lines may be appropriate to mitigate the potential impacts of the scheme on sensitive locations, including within the AONB and Stour Valley, and be subject to further consultation at Stage 2."*
- 2.14 A further commitment stated that *"further studies should be undertaken to determine the treatment of the Hintlesham sections of the route (Corridor 2A or 2B), to be subject to additional consultation at Stage 2."*
- 2.15 The first stage in undertaking these studies was to obtain baseline information. This was sourced from :
- National Grid data gathering and field studies;
 - Stage 1 Consultation activities and associated feedback;
 - Stage 2 Consultation activities and associated feedback.

The environmental baseline information may be accessed via the project website <http://www.bramford-twinstead.co.uk/library-stage-2.aspx>.

⁷ National Grid plc : Bramford to Twinstead Tee Connection Project – Selection of Preferred Corridor : June 2011

National Grid data gathering

- 2.16 In order to inform its options appraisal (outlined in Chapter 5), National Grid's consultants have undertaken additional desk studies and field surveys relating to landscape, visual amenity, ecology, heritage, water and socio-economic factors. These surveys have been informed by inputs from the Thematic Groups, Community Forums and other consultees. In addition, a range of engineering studies have been undertaken, also involving desk studies and field surveys, to identify feasible technical options.

Stage 1 Consultation activities

- 2.17 In its options appraisal, National Grid has taken account of work undertaken in reaching its decision on a preferred route corridor and relevant responses to the Stage 1 Consultation relating to the issues of undergrounding and to corridors in the Hintlesham area.

Background to the consideration of undergrounding

- 2.18 The Strategic Optioneering Report 2009⁸ concluded that the option of constructing a new 400kV overhead transmission line between Bramford and Twinstead Tee would achieve a balance between National Grid's technical, economic and environmental obligations and should be the preferred option. The Review of Strategic Options Report (June 2011)⁹ tested whether, on the basis of the latest available information, the selection of a connection option based upon the provision of a new overhead transmission line between Bramford and Twinstead Tee was robust. Section 10 of that report considered the costs, environmental and socio-economic effects of overhead line, undergrounding and gas insulated line (GIL) technology options for a connection between Bramford and Twinstead Tee. Section 13 (paragraphs 13.7 and 13.8) sets out the conclusions as follows:

"The cost estimates for the two underground technology options considered for a Bramford to Twinstead Tee connection are greater than the estimates for an overhead line connection. GIL would be £587m more expensive and AC underground cables £583m more expensive. Both would offer benefits in terms of landscape and views over an equivalent length of overhead line, during

⁸ National Grid plc : Bramford to Twinstead 400kV Overhead Line Project – Strategic Optioneering Report : October 2009

⁹ National Grid plc : Bramford to Twinstead Tee Connection Project – Review of Strategic Options Report : June 2011

construction, underground/GIL works would be more invasive than the works required for an overhead line and would have a greater scale of effect on sites important for their ecology or archaeology.

The conclusion of this Report is that the option of constructing a new 400kV overhead transmission line between Bramford and Twinstead Tee would achieve a balance between National Grid's technical, economic and environmental obligations and should remain the preferred strategic option. This is taking account of National Grid's statutory obligations, its licence requirements and all other relevant considerations. However, National Grid recognises due to amenity issues in some areas that sections of the proposed connection may need to be placed underground and that these and other mitigation measures will be investigated in the next stage of the project."

- 2.19 During the Stage 1 Consultation, undertaken prior to reaching a decision on the preferred route corridor, a large number of views were expressed in favour of undergrounding all or part of the route.
- 2.20 Suffolk County Council resolved¹⁰ that it "*considers that corridor 2B would cause the least environmental damage, but that any parts of a new line running through the sensitive Dedham Vale Area of Outstanding Natural Beauty, the crossing of the Stour Valley south of Sudbury and the immediate setting of these areas should be undergrounded; and that, to compensate at least in part for adverse environmental impact elsewhere and to maximise the environmental benefit, lengths of the existing 400kV line within these areas and their settings should also be undergrounded*".
- 2.21 Essex County Council¹¹ and Babergh District Council¹² expressed the view that the only acceptable transmission line proposal connecting to Twinstead Tee across the Stour Valley in Essex would be by undergrounding. Babergh District Council also urged that the options for underground routeing should be fully explored. Natural England¹³ wanted to see a full appraisal of undergrounding of the transmission line in appropriate locations. Parish councils generally requested that the overhead line should be placed underground especially in the most sensitive areas such as the AONB. Members of the public also supported the use of underground cable rather than overhead lines.

¹⁰ Suffolk County Council : Minutes of Cabinet : 2 February 2010

¹¹ Essex County Council Environment, Sustainability and Highways : Executive decision : 28 February 2010

¹² Babergh District Council : Strategy Committee : 11 February 2010

¹³ Natural England : consultation response : 25 February 2010

- 2.22 While some respondents to the Stage 1 Consultation expressed the view that the whole route should be placed underground, others considered that partial undergrounding should be considered, especially through sensitive areas such as the Dedham Vale AONB. A wide range of potential locations were identified by respondents as areas in which partial undergrounding should take place: Burstall to Hintlesham; through Hintlesham and Chattisham; east of Hadleigh; the Brett Valley/Upper and Lower Layham; around Polstead; at the top of the Dedham Vale near Boxford; Dedham Vale AONB; between Gravel Pit Lane and Leavenheath; crossing of the Stour Valley; near residential areas; in areas designated locally as Special Landscape Areas; in sensitive landscapes or environments; and near substations where wires can proliferate.
- 2.23 As part of its investigations, National Grid convened a workshop in August 2010 to discuss each of the Bramford to Twinstead Tee corridor options which were subject to consultation at that time. The workshop considered where there are particularly sensitive or constrained sections in each corridor; and where National Grid should focus attention in evaluating and considering the costs and benefits of potential use of underground cables compared to overhead lines. It also considered whether other mitigation measures might be worthy of further evaluation.
- 2.24 The workshop was attended by National Grid staff and officers from the relevant local authorities, Natural England, the Environment Agency and English Heritage. It was recognised that other bodies and members of the public had expressed specific views about undergrounding but that the attendees held wider remits which would enable them to provide a more objective assessment at that stage. Wider public consultation on potential mitigation, including locations for undergrounding, was identified as being undertaken more appropriately as part of the detailed connection design stage (during the Stage 2 Consultation which is currently in progress).
- 2.25 For Corridor 2 the workshop highlighted three areas for consideration:
- the crossing of the Brett valley south of Hadleigh;
 - the area within the AONB south of Boxford;
 - the crossing of the Stour Valley between Workhouse Green and Twinstead Tee.
- 2.26 Undergrounding was considered by the workshop to offer a clear benefit in the high value landscape of the Stour Valley.

2.27 It was recognised that further detailed studies (for example of landscape features, ecology and archaeology) would need to be undertaken to inform a judgement as to whether the amenity and environmental benefits of undergrounding would outweigh the costs and environmental risks (for example to biodiversity and archaeology). This report presents the findings of those studies.

Background to the consideration of Corridors 2A and 2B

2.28 In its representation to the Stage 1 Consultation, Suffolk County Council considered that all of the proposed route corridors would cause severe damage to the environment of South Suffolk. However the County Council resolved that, if the scheme was to proceed, it "*considers that corridor 2B would cause the least environmental damage*". The other local authorities did not express a preference for either corridor.

2.29 In stating its preference for Corridor 2, English Heritage¹⁴ was mindful of the existing adverse impacts from the two lines in this corridor and it accepted that these impacts would be intensified. It noted that additional adverse impacts would be received where new corridors are required around Hintlesham Wood and also drew attention to the potential for visual impacts on the Grade I listed Hintlesham Hall.

2.30 Natural England considered that Corridor 2 would have the least impact but stated that more clarity was required on Corridors 2A and 2B around Hintlesham, particularly in connection with Hintlesham Woods Site of Special Scientific Interest (SSSI), before being able to make an informed decision on the sub-route options. Its representation to the Stage 1 Consultation stated: "*Several ancient woodland SSSIs are present in the study area and are intersected by route corridors 2B and 4 in particular. Option 2B intersects Hintlesham Woods SSSI. We consider that an additional line in this area may have an adverse impact on the SSSI. We therefore recommend that further detailed consideration is given to the route corridor Options 2A and 2B and that both options are included in the Environmental Impact Assessment if Option 2 is selected. There may be impacts on County Wildlife Sites and protected species. These will need to be considered at Environmental Impact Assessment stage.*"

2.31 No formal representation was received from the Environment Agency.

¹⁴ English Heritage : consultation response : 15 March 2010

- 2.32 Chattisham and Hintlesham Parish Council¹⁵ did not favour Corridor 2, but rather favoured Corridor 4 or underground solutions. The Parish Council considered that Corridor 2 would bring “*additional blight to a village with high landscape value that is already impacted by overhead pylons.*” It considered that particular regard should be had to impacts on the Grade I listed Hintlesham Hall “*a prominent feature on the local landscape also being a prominent business and large employer in the locality*”. It expressed the view that “*any pylons erected near Hintlesham Hall would no doubt have great effect on the viability on the business and therefore the local economy and local employment*”. It also urged National Grid to ensure that the setting of Hintlesham Hall and its surrounding parkland is not impacted by pylons, either by undergrounding or selecting an alternative corridor (Corridor 4). It noted the importance of Hintlesham Great Wood as a Site of Special Scientific Interest and RSPB Reserve and the potential effects upon it of Corridor 1 (equivalent to Corridor 2B). A number of other concerns were raised, including potential effects on health and property values.
- 2.33 Burstall Parish Council¹⁶ preferred the use of Corridor 4 and did not express particular views about the merits or otherwise of Corridors 2A and 2B. It had concerns about the impact of the existing overhead lines on the landscape in its parish.
- 2.34 Few other bodies expressed views on the two options. Notable were the RSPB¹⁷ and Suffolk Wildlife Trust¹⁸. The former highlighted that Corridor 1 (which envisaged a new 400kV overhead line in Corridor 2B, but without removing the 132kV overhead line) was “*considered to be their least preferred corridor as it would add further to the dissection of a SSSI and ancient woodlands between Ramsey and Hintlesham Great Wood*”. The latter considered Corridor 2 to be the least damaging of the route corridors and also noted that Corridor 2A would avoid impacts upon Hintlesham Woods SSSI.
- 2.35 During the Stage 1 Consultation, respondents were not directly asked their preference with regard to the sub-options of Corridor 2. However some did express preferences. More respondents had a specific preference for Corridor 2B than for Corridor 2A. Most of the 131 who preferred Corridor 2B did so on the grounds that it would impact fewer people and some noted that it would avoid Hintlesham and Chattisham. Over 100 respondents supported Corridor

¹⁵ Chattisham and Hintlesham Parish Council : consultation response : 21 February 2010

¹⁶ Burstall Parish Council : consultation response : 30 January 2010

¹⁷ Royal Society for the Protection of Birds : consultation response : 25 August 2009

¹⁸ Suffolk Wildlife Trust : consultation response : 17 February 2010

2B on the grounds that it would involve the removal of an existing stretch of overhead line from the area between Hintlesham and Chattisham, which they deemed beneficial to the local community. A small number of respondents specifically opposed Corridor 2A, sometimes in combination with a preference for Corridor 2B. No respondent solely expressed opposition to Corridor 2B.

- 2.36 The Selection of Preferred Corridor report noted that if Corridor 2 were to be adopted, the greatest increase in impact would be experienced by the population at the eastern end of the route (Burstall, Hintlesham, Chattisham) where the existing 400kV and 132kV overhead lines currently diverge. In the case of Corridor 2A, a greater population at this end of the route may experience visual impacts as the visual envelope of a 400kV overhead line would be greater than that of the existing 132kV overhead line. It went on to note that, if Corridor 2B were selected, this would involve some environmental and amenity benefits associated with the removal of the existing 132kV overhead line (and no replacement infrastructure) over a distance of about 4km near Hintlesham.

Stage 2 Consultation activities

- 2.37 The Stage 2 Consultation process commenced at the same time as the studies to consider whether it would be appropriate to underground sections of the proposed connection and also options in the Hintlesham area. While the Stage 2 Consultation will extend up to the announcement of a preferred connection alignment, feedback from the early stage of the consultation has informed the options appraisal. Recent representations raised by Community Forums, Thematic Groups and other bodies and individuals are identified in Chapters 6-11 where relevant.
- 2.38 The main objectives of the Stage 2 Consultation activities are to :
- actively engage and consult publicly on the connection design and other related project issues in accordance with National Grid's commitments, legal obligations and with IPC Guidance; and
 - enable consultation feedback to inform National Grid's decisions on alignment and technology (i.e. overhead or underground) choices.
- 2.39 To ensure that issues of interest and concern to communities are reflected and considered in the development of its detailed connection design, National Grid set up four **Community Forums** (Hintlesham/Chattisham, Hadleigh,

- Polstead/Dedham Vale and Twinstead) made up of representatives from local parish councils, community groups and local residents.
- 2.40 Community Forum members have been asked for their views on the main areas of consultation and to consider discussions held with the Thematic Groups (see below) and other sources of specialist technical advice on aspects of the environment. Community Forum members provided specific input based on local knowledge and values. This input and issues raised have been recorded and considered by the project team in developing the interim alignment.
- 2.41 A separate programme of **Thematic Groups** was developed to engage and consult with organisations with specialist expertise in environmental aspects that are relevant to the project. The three groups were established to consider Landscape and Views, Ecology and Cultural Heritage issues. These Thematic Groups were established to allow effective engagement with the wide range of organisations with responsibilities for these particular aspects of the environment. The issues discussed in these Thematic Groups have been reported to the Community Forums for discussion and review.
- 2.42 Membership of Thematic Groups is primarily from nominees of local planning authorities and their partnership organisations such as Dedham Vale AONB and Stour Valley Project and also from agencies with statutory responsibilities such as Natural England, Environment Agency and English Heritage. Local interest groups, including Suffolk Wildlife Trust, RSPB, CPRE, Dedham Vale Society and the Suffolk Preservation Society are also represented. Observers from Community Forums or action groups often attend Thematic Group meetings.
- 2.43 The primary purpose of each Thematic Group is to advise on the scope and methods of assessment of each aspect of environmental value; to review survey findings presented; and to discuss and advise on the evaluation of survey findings and appropriate actions. Actions that may be considered appropriate in light of survey findings may be avoiding areas of the route corridor entirely; siting pylons or other equipment in specific locations to avoid or minimise effects on valued features; employing working methods or timings to avoid or minimise effects; and mitigation works such as planting trees or undertaking habitat creation.
- 2.44 At the first meeting of the Thematic Groups and Community Forums, National Grid identified issues important in informing the detailed connection design, which it wished to be considered early in the consultation process. These were:

- the commitment to consider the merit of undergrounding along each section of the route;
 - the selection of a preferred corridor route, either option 2A or 2B around Hintlesham; and
 - the selection of a preferred substation site west of Twinstead.
- 2.45 National Grid sought initially for the Groups to identify issues which would be particularly relevant to informing those decisions and removing some aspects of uncertainty from the overall connection design as early as possible.
- 2.46 Early meetings of the Community Forums and Thematic Groups were also provided with an update on National Grid's approach to undergrounding and presentations explaining the method of construction, maintenance and repair of overhead and underground connections. It was intended that this would facilitate constructive dialogue. This was borne out by subsequent contributions, which raised a number of general and location-specific issues which have been addressed by the project team and incorporated in this options appraisal where relevant. To date seven rounds of Community Forums and six rounds of Thematic Groups have been held. Design-related issues raised by Community Forums and Thematic Groups are referenced in Chapters 6 to 11.
- 2.47 The meeting notes providing a record of all issues raised from the Thematic Group Meetings and Community Forums can be found on the Project website (<http://www.bramford-twinstead.co.uk/meetings-community-forums.aspx>). Furthermore, plans capturing the outputs from the Community Forum workshops held in November 2011, at which members were asked to identify what they consider to be of particular importance or of value in their local area, are shown on the project website alongside the environmental baseline information to support the Connection Options Report. This information can be found at: <http://www.bramford-twinstead.co.uk/library-stage-2.aspx>.
- 2.48 It is also considered important that members of the public, particularly in the area where the detailed connection design is being considered, can provide input and give feedback to National Grid. While Community Forum members were encouraged to represent as many views as possible, it is important that members of the public can separately raise issues and engage in the consultation programme. Public information 'drop in sessions' were therefore held in suitable locations along the route corridor to present the main aspects of environmental baseline information collected by National Grid and to enable the

public to meet the project team to discuss progress and issues raised during the Community Forums and to raise directly any other issues which they felt had not been addressed to date.

2.49 Five events were held as shown below :

- Friday 27th January 2012 (2:00-8:00pm) - Stoke By Nayland Village Hall;
- Saturday 28th January 2012 (2:00-8:00pm) - Hadleigh Town Hall;
- Tuesday 31st January 2012 (2:00-8:00pm) - Twinstead Village Hall;
- Wednesday 1st February 2012 (2:00-8:00pm) - Castle Hedingham Village Hall;
- Thursday 2nd February 2012 (2:00-8:00pm) - Hintlesham Community Centre

2.50 Design related issues raised by the public and persons with an interest in land are referenced in Chapters 6 to 11, where appropriate. At the public events held in January/February 2012, to which persons with an interest in land were invited, attendees were asked to review the environmental baseline information and mark up on plans what they consider to be of particular importance or of value in their local area. Plans capturing the outputs from this exercise are shown on the Project website alongside the environmental baseline information to support the Connection Options Report. This information can be found at: <http://www.bramford-twinstead.co.uk/library-stage-2.aspx>.

2.51 Information from the Community Forums, Thematic Groups, the general public and PILs was recorded and communicated to the project team. This assisted in focussing the technical and environmental studies which have been undertaken.

Summary of the approach to the appraisal

2.52 The overall approach to the appraisal has been guided by National Policy Statements EN-1 (Overarching Energy) and EN-5 (Electricity Networks), relevant planning policies at national and local level and by National Grid's Approach to the Design and Routeing of New Electricity Transmission Lines which was published in September 2011.

2.53 The appraisal has been co-ordinated by the project team with inputs from the Electricity Alliance (technical issues), TEP (environmental issues) and ERM (socio-economic issues).

Policy background

National Policy Statements

- 2.54 The context for any options appraisal relating to energy infrastructure is provided by the Overarching National Policy Statement for Energy (EN-1). This states that in considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the IPC¹⁹ should take into account:
- its potential benefits including its contribution to meeting the need for energy infrastructure, job creation and any long term or wider benefits; and
 - 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.
- 2.55 It goes on to note that, in this context, the IPC should take into account environmental, social and economic benefits and adverse impacts, at national, regional and local levels. The NPS provides guidance on assessment on a topic basis relevant to all energy projects which is supplemented by guidance specific to the project type. In the case of the Bramford to Twinstead Tee Connection, the relevant guidance is to be found in the National Policy Statement for Electricity Networks Infrastructure (EN-5). EN-1 recognises 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 (in particular section 2.8) before any overhead line proposal is consented."* (EN-1 paragraph 3.7.10).
- 2.56 Paragraph 2.8.2 of the Electricity Networks National Policy Statement (EN-5) states that *"Government does not believe that development of overhead lines is generally incompatible in principle with developers' statutory duty under section 9 of the Electricity Act to have regard to amenity and to mitigate impacts. In practice new above ground electricity lines, whether supported by lattice steel towers/pylons or wooden poles, can give rise to adverse landscape and visual impacts, dependent upon their scale, siting, degree of screening and the nature of the landscape and local environment through which they are routed. For the*

¹⁹ The functions of the IPC were transferred to the Planning Inspectorate in April 2012

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."

2.57 EN-5 goes on to say that although Government expects that overhead lines will often be appropriate and their effects can often be mitigated, where there are serious concerns about the potential adverse landscape and visual effects of a proposed overhead line, *"the IPC will have to balance these against other relevant factors, including the need for the proposed infrastructure, the availability and cost of alternative sites and routes and methods of installation (including undergrounding)"*.

2.58 EN-5 states that consent should only be refused for overhead line proposals 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"*. In this context it should consider:

- the landscape in which the proposed line will be set, (in particular, the impact on residential areas, and those of natural beauty or historic importance such as National Parks, AONBs and the Broads);
- the additional cost of any undergrounding; and
- the environmental and archaeological consequences of undergrounding.

2.59 The options appraisal that has been undertaken includes consideration of these particular factors in reaching a recommendation on those sections where undergrounding may be considered appropriate.

National Planning Policy Framework

2.60 The National Planning Policy Framework²⁰ (NPPF) may be considered as an "important and relevant"²¹ matter to be considered in decision making for NSIPs. Paragraph 6 of the NPPF states that *"the purpose of the planning system is to contribute to the achievement of sustainable development"*. It goes on to note that planning has a key role to play in *"supporting the delivery of renewable and low carbon energy and associated infrastructure"*. The Bramford to Twinstead Tee Connection is intended to provide additional transmission capacity to permit the connection of wind and nuclear powered

²⁰ Department for Communities and Local Government : National Planning Policy Framework : March 2012

²¹ National Planning Policy Framework paragraph 3

generation and thereby assist the UK to meet its renewable energy targets. While the NPPF does not include policies specifically related to electricity transmission infrastructure, it does include policies for conserving and enhancing the natural and historic environment which have been taken into account in planning and assessing indicative alignments.

- 2.61 Paragraph 115 states that *“great weight should be given to conserving landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty. The conservation of wildlife and cultural heritage are important considerations in all these areas....”*
- 2.62 Paragraph 116 states that *“planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated that they are in the public interest.”* It goes on to state that applications for such development should be accompanied by assessments of the need for the development; the scope for meeting the need outside the designated area; and the effects of the development on landscape and recreational opportunities and the extent to which these could be mitigated. The need for additional energy infrastructure in general, and electricity transmission infrastructure in particular, is accepted in the Overarching NPS for Energy EN-1 and the NPS for Electricity Networks EN-5. The scope for meeting the need outside the designated area was considered in the Review of Strategic Options report and in the Selection of Preferred Corridor report. The latter concluded that a route corridor passing through the AONB, and which would involve the replacement of one of the two overhead lines which traverse the area with a larger scale overhead line, would involve a lower scale of change than an overhead line passing through an area outside the AONB, but where no overhead line are present, and should therefore be preferred. An assessment of effects on landscape and recreational opportunities (as well as wildlife and cultural heritage) in the Dedham Vale AONB is presented in Chapter 9.
- 2.63 Paragraph 118 calls on local planning authorities to aim to conserve and enhance biodiversity in determining planning applications by protecting nationally and internationally designated sites from development which would have an adverse effects upon them and, in all locations, by refusing development which could result in significant harm to biodiversity and which cannot be avoided or adequately mitigated or compensated. Specific mention is made of the need to protect irreplaceable habitats, including ancient woodland

and veteran trees. The potential effects on biodiversity, including woodland, hedgerows and trees are considered in Chapters 6-11.

- 2.64 Paragraph 128 states that in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. This is considered in Chapters 6-11. Paragraph 132 states that *“when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset’s conservation. The more important the asset, the greater the weight should be. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting.”* Subsequent paragraphs provide for weighing the harm to heritage assets against the public benefits which would be achieved through the proposed development.

Development Plans

- 2.65 Regional planning policies are contained in the East of England Plan²². The Coalition Government has announced its intention to revoke Regional Spatial Strategies, as provided for in the Localism Act²³.
- 2.66 Policy ENV2 in the East of England Plan states that the highest level of protection should be afforded to the East of England’s nationally designated landscapes, including Dedham Vale AONB. Within the AONBs priority over other considerations should be given to conserving the natural beauty, wildlife and cultural heritage of each area. Similarly Policy ENV3 seeks to ensure that sites internationally and nationally designated for biodiversity are given the strongest level of protection, with proper consideration given to the potential effects of development on the conservation of habitats and species outside designated sites, and on species protected by law.
- 2.67 Other elements of regional planning policy include:
- ensuring new development minimises damage to biodiversity and earth heritage resources by avoiding harm to local wildlife sites;
 - safeguarding, conserving, and restoring regionally important geological and/or geomorphological sites;

²² Government Office for the East of England : East of England Plan The revision to the Regional Spatial Strategy for the East of England : May 2008

²³ Localism Act 2011 Ch20

- a strong presumption against development that would result in the loss or deterioration of ancient semi-natural woodland and other woodlands of acknowledged national or regional importance;
- the highest level of protection to historic and archaeological areas, sites and monuments of international, national and regional importance, including safeguarding the landscape context and setting of buildings and settlements relating to historic assets.

2.68 The Suffolk Structure Plan and the Essex and Southend-on-Sea Structure Plan ceased to form part of the Development Plan for the route corridor in September 2007, with the exception of a small number of policies saved by a direction from the Secretary of State. None of the saved policies are of relevance to the current proposal.

2.69 Suffolk County Council has subsequently adopted Core Strategies for Minerals and for Waste. The Minerals Core Strategy²⁴ identifies a Minerals Safeguarding Area to the south west of Hadleigh based on Layham Quarry. In accordance with Policy 5, such areas will be safeguarded from development subject to certain provisions. The Minerals Site Specific Allocations DPD²⁵ identifies an area of potential extension to Layham Quarry (Site 4) however this lies to the south of the route corridor and would not be affected by any of the potential alignments. In the Waste Core Strategy DPD²⁶, Layham Quarry is identified as a potential strategic non-hazardous landfill site (W7).

2.70 The Babergh Local Plan Alteration No 2²⁷ was adopted in June 2006. The plan includes a number of policies which aim to protect the environment of the district, from developments which would have a material adverse impact on:

- nationally and internationally designated nature conservation sites;
- existing or proposed County Wildlife Sites, Regionally Important Geological/Geomorphological Sites or Local Nature Reserves;
- protected species;
- existing semi-natural features, including rivers, streams, ponds, marshes, woodlands, hedgerows, trees, features of geological interest, wildlife corridors and green wedges;
- listed buildings and their settings;

²⁴ Suffolk County Council : Minerals Core Strategy DPD : September 2008

²⁵ Suffolk County Council : Minerals Site Specific Allocations DPD : September 2009

²⁶ Suffolk County Council : Waste Core Strategy DPD : March 2011

²⁷ Babergh District Council : Babergh Local Plan Alteration No 2 : June 2006

- conservation areas;
 - character, appearance or setting of historic parks and gardens;
 - landscape quality and the character of the countryside.
- 2.71 Policy CR02 states that *"the landscape of the Dedham Vale and the Suffolk Coast and Heaths Areas of Outstanding Natural Beauty will be safeguarded through the strict control of development. Unless there is an overriding national need for development having a significant impact in the particular location and no alternative site is available, such developments will not be allowed. Due regard will be given to the provisions contained within the Dedham Vale and Stour Valley, and the Suffolk Coast and Heaths Management Strategies."*
- 2.72 Related to this policy, paragraph 6.19 states *"the provision of public utility services may necessitate the construction of buildings and other installations, often of a large scale such as grid lines and water towers. If it is necessary to site these in Areas of Outstanding Natural Beauty, care should be taken to minimise their impact."* However Policy CR03 states that *"in considering proposals by statutory undertakers and utility providers for buildings and installations in Areas of Outstanding Natural Beauty, particular attention will be paid to siting, design and landscaping. Major utilities and overhead power lines will be discouraged in Areas of Outstanding Natural Beauty"*.
- 2.73 The Local Plan designates several areas as Special Landscape Areas. Although Policy CR05 does not rule out overhead lines in Special Landscape Areas, it states that *"major utilities and power lines will be permitted only where it can be demonstrated that they do not have a significant detrimental effect on the landscape characteristics of the Special Landscape Area"*.
- 2.74 Babergh District Council has commenced production of its Local Development Framework but does not yet have a Core Strategy in place.
- 2.75 The eastern end of the corridors, in the vicinity of Bramford substation and Flowton, lies within Mid Suffolk District.
- 2.76 Mid Suffolk District Council adopted its Core Strategy²⁸ in 2008. This sets the framework for more detailed development control policies. Policy CS5 refers to maintaining and enhancing the environment. Until such time as new Development Plan Documents are approved, some of the policies in the Mid Suffolk Local Plan²⁹ remain relevant. These include those protecting:

²⁸ Mid Suffolk District Council : Core Strategy Development Plan Document : September 2008

²⁹ Mid Suffolk District Council : Mid Suffolk Local Plan : 1998

- listed buildings and their settings;
- gardens and parkland of historic interest;
- the character and appearance of conservation areas;
- ancient monuments and their settings;
- woodland, particularly ancient woodland;
- designated wildlife areas, including County Wildlife Sites and Local Nature Reserves;
- landscape quality and the character of the countryside.

2.77 Policy CL3 states that *"new major installations for utilities and power lines exceeding 33kV should be carefully sited to ensure minimal intrusion in the landscape. The feasibility of undergrounding electricity lines will be regarded as a material consideration"*. The supporting text notes that *"wherever possible the District Planning Authority expects major utility installations, particularly power lines, to be located away from Special Landscape Areas because of their visual intrusion. Any proposals put forward by the utility companies e.g. gas, water and electricity suppliers, will need to demonstrate that more environmentally acceptable sites, routes or systems are not available. The feasibility of undergrounding power lines should be assessed taking a balanced view of the archaeological and ecological impact of undergrounding"*.

2.78 A small part of the corridor, to the west of the River Stour, lies within Braintree District. The Braintree Core Strategy³⁰ aims to *"make sure the landscape character of the countryside, biodiversity, wildlife habitats (including those of European importance outside the District), agricultural land, historic towns, villages and buildings are protected and enhanced for future generations."*

2.79 Policy CS8 states that *"all development proposals will take account of the potential impacts of climate change and ensure the protection and enhancement of the natural environment, habitats and biodiversity and geo-diversity of the District"*. This encompasses protection of :

- the best and most versatile agricultural land;
- the natural environment of the District, and in particular designated sites of national importance and locally designated sites identified on the Proposal Map;
- development from the risk of flooding.

³⁰ Braintree District Council : Local Development Framework Core Strategy : September 2011

- 2.80 It states that development must have regard to the character of the landscape and its sensitivity to change and where development is permitted it will need to enhance the locally distinctive character of the landscape in accordance with the Landscape Character Assessment.
- 2.81 Policy CS9 includes measures to promote and secure the protection and enhancement of the historic environment in order to respect and respond to the local context, especially in the District's historic villages, where development affects the setting of historic or important buildings, conservation areas and areas of highest archaeological and landscape sensitivity.
- 2.82 The Proposals Map identifies a number of protected lanes and local and designated wildlife sites in the area between Twinstead, Great Henny and Lamarsh which would need to be taken into account in terms of policies in the Core Strategy.
- 2.83 The Core Strategy replaces some of the policies in the Local Plan³¹, including Policy RLP78 (The Countryside) and RLP79 (Special Landscape Areas). Other policies, such as RLP80, which require assessments to be made of the effects of development on particular environmental assets, are retained until other elements of the Local Development Framework are in place.
- 2.84 Policy RLP 86 is of particular relevance to the route corridor. This states that *"development will not be permitted which would harm the open character, nature conservation importance or recreational importance of the floodplains of the Rivers Stour....."*
- 2.85 Policy RLP 161 states that *"proposals for development required for the operational needs of utilities serving the public will be supported and approved where applicable, subject to their acceptability on environmental and amenity grounds in terms of the other policies in this Plan. In considering proposals the Council will take into account existing levels of infrastructure, technical and operational requirements and opportunities for the sharing of sites, facilities and installations"*.

Approach to the Design and Routeing of New Electricity Transmission Lines

- 2.86 In September 2011, National Grid published "The Approach to the Design and Routeing of New Electricity Transmission Lines" which describes the process which National Grid adopts for its project development. This involves increasing

³¹ Braintree District Council : Braintree District Local Plan Review: July 2005

refinement of the design as more information is gathered about the proposal, its setting and constraints. In order to test different options, appraisal techniques are used, which take account of the environmental, socio-economic, technical and cost issues listed below:

Environment

- Landscape
- Visual Amenity
- Cultural Heritage
- Ecology
- Air quality
- Noise and vibration
- Soils and Geology
- Water
- Resources and waste
- Greenhouse gases and energy efficiency
- Climate Change adaptation

Socio-economic

- People and Communities
- Aviation and defence
- Traffic and transport
- Local economic impact

Technical/Safety

- Technical
- Safety

Cost

- Capital cost
- Lifetime cost

2.87 The Approach document states that *“whether the preferred route corridor is predominantly overhead, underground or sub-sea, detailed survey and assessment work is carried out to find the alignment of the transmission line*

which best satisfies all of our obligations and the needs of stakeholders. In doing this we seek to avoid as far as possible any impacts on people, settlements, and environmentally-sensitive areas. We continue to refine the route alignment to minimise any visual and other environmental impacts, in consultation with stakeholders and communities”.

- 2.88 In cases where a predominantly overhead route has been selected, as is the case for the Bramford to Twinstead Tee connection, National Grid will continue to apply the Holford Rules³² and to identify any sections where it would be more appropriate to place the infrastructure underground. The same approach is to be adopted for siting the associated land-based/above-ground infrastructure such as substations or sealing end compounds.
- 2.89 The Approach document notes that candidates for undergrounding might include: locations with physical difficulties in constructing an overhead line (such as in urban areas), wide river or estuary crossings, the presence of highly valued landscapes (which include National Parks and AONBs but could also include particularly sensitive landscapes and iconic views or areas where other potential impacts could only be mitigated by undergrounding). However it stresses that this is not an exhaustive list and all projects are considered on a case by case basis.

Stages in the overall approach for the current appraisal

- 2.90 The approach adopted for the options appraisal has included a number of stages:
- establishing the study areas – dividing the route corridor into sections based on landscape character;
 - identification of potential indicative overhead line and underground cable alignments in each study area;
 - selection of least constrained interim overhead line alignment in each study area, using a multi-criteria assessment;
 - assessment of the case for undergrounding in each study area based on : landscape and visual considerations; undergrounding costs and the environmental consequences of undergrounding;

³² National Grid plc : The National Grid Company plc and new high voltage transmission lines - guidelines for line routeing (the Holford Rules) and undergrounding : March 2003

- drawing conclusions on the most appropriate solution (overhead or underground) in each study area;
- considering how these solutions may be assembled to form a feasible connection between Bramford and Twinstead Tee.

2.91 The need to identify the least constrained overhead option prior to considering the merits of undergrounding arises because it is necessary to compare an underground solution with the overhead option which would have least environmental impact i.e. the “best” overhead solution.

Scheme Development and Consultation Process

2.92 Following a period of consultation on the findings of this report, including specific local consultation regarding indicative alignments in the Hintlesham area, the interim alignment will be confirmed. This decision will be integrated with the results of other studies, including the selection of a preferred substation site west of Twinstead, to inform a detailed connection design. The detailed connection design will be subject to further consultation and assessment. It will then form the basis of a proposed application for an Order granting Development Consent which will be subject to formal publicity and consultation under s42, s47 and s48 of the Planning Act 2008. Feedback from that formal consultation will be taken into account in finalising any proposed DCO application before submission to the Planning Inspectorate.

2.93 The next stages in taking forward the proposal will therefore involve :

- detailed connection design - definition of detailed route alignment(s) for overhead lines and underground cables, including the location of towers (pylons), sealing end compounds, and substation and consideration of other mitigation techniques;
- continuing Stage 2 Consultation - to obtain the views of statutory and non-statutory bodies, other agencies and the public on preliminary environmental information and in developing the detailed connection design and appropriate mitigation measures;
- analysis of responses – reviewing responses to the Stage 2 Consultation to determine what should be included in the proposed DCO application;
- assessment – seeking a scoping opinion from the Planning Inspectorate before undertaking an environmental impact assessment of the detailed connection design and finalising the proposal;

- Stage 3 Consultation – in accordance with the Statement of Community Consultation and s42, s47 and s48 of the Planning Act 2008, to consult on the proposed detailed connection design and to consider responses to this consultation, and consequential amendments to the proposal, in accordance with s49 of the Act;
- submission - submission to the Planning Inspectorate of an application for an Order granting Development Consent.

3 DEFINITION OF STUDY AREAS

Relationship to selection of Preferred Corridor

- 3.1 The study areas were defined to cover the whole of the Preferred Corridor (Corridor 2). The study area for landscape and visual assessment was extended to include the Zone of Visual Influence (ZVI), which is up to 10km from the corridor, although initial survey data to inform this report generally extends to 3km in order to consider the likely extent of the greatest scale of effects. The Landscape and Views Thematic Group was asked to put forward any viewpoints beyond 3km which they considered important enough to be assessed at this stage.
- 3.2 The division of the corridor into these study areas has assisted in making the gathering, assessment and presentation of environmental information more manageable. Organising the options appraisal by each study area allows careful consideration in turn of where undergrounding might be considered appropriate within each part of the preferred corridor.
- 3.3 The study areas are shown on Figure 1.

Factors influencing definition of study areas

Landscape character areas

- 3.4 It is recognised that the main effects of an overhead line will be on landscape and views and so the county-level landscape character assessments, conducted by Suffolk and Essex County Councils, were used as the starting point for defining the study areas. The landscape character areas divide the landscape into a series of river corridors (flowing north to south) and interfluves (areas of higher ground), on which the study areas have been broadly based.

Inputs from Thematic Groups

- 3.5 The draft study areas were originally presented to the Thematic Groups in Autumn 2011. The Landscape and Views Thematic Group was broadly in agreement with the sub-divisions being considered subject to the following amendments:
 - The eastern extent of the Stour Valley (Study Area G) should be at Dorking Tye, using the lane as the boundary;

- The western extent of Study Area A should extend to the western side of the valley at Burstall.

These amendments were incorporated and the study areas were agreed by the Thematic Groups as amended.

- 3.6 The Biodiversity Thematic Group was particularly concerned with issues regarding woodland habitats at Hintlesham and was keen to ensure that the study area was defined so as to permit a wide range of options to be considered, in particular options which would allow the woodland to be avoided. This has been addressed in the appraisal.
- 3.7 The Cultural Heritage Thematic Group was concerned that the study areas should be defined in such a way as to enable the impact on the views and setting of cultural heritage assets to be evaluated. This has also been addressed in the appraisal.

Description of study areas

- 3.8 The study areas were initially defined as :
- 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;
 - G - Stour Valley.
- 3.9 Study Areas A and B were subsequently combined as the landscape characteristics are similar and combining the two would allow consideration of the issues relating to Corridors 2A and 2B and reduce the potential for confusion. This was agreed by the Landscape and Views Thematic Group and subsequently by the two other Thematic Groups. The landscape and other characteristics of each of the study areas are described in Chapters 6-11.
- 3.10 Study Area AB - Bramford substation/Hintlesham - extends from Bramford substation in the east to Hadleigh Railway Walk in the west. The study area includes Corridor 2A, which follows the route of the existing 132kV overhead line and Corridor 2B, which follows the route of the existing 400kV overhead line. The landscape within the study area is mainly ancient farmland with

woodlands, forming an area of higher ground (interfluve). The exception to this is Belstead Brook, a minor tributary of the River Orwell which flows through the eastern part of the study area. The nearest villages to the corridor within this study area are Burstall, Hintlesham and Chattisham.

- 3.11 Study Area C – Brett Valley - extends from Hadleigh Railway Walk in the west to Overbury Hall Road on the western side of the Brett Valley. The landscape within this study area is valley farmland and meadowland and the River Brett flows north to south through the study area and across the corridor. The town of Hadleigh lies to the north of the corridor and the villages of Upper and Lower Layham to the south.
- 3.12 Study Area D – Polstead - extends from Overbury Hall Road on the western side of the Brett Valley to the boundary of the AONB, west of Polstead Heath. The landscape within the study area is mainly ancient farmland with woodlands, forming an area of higher ground (interfluve). The village of Polstead Heath lies within the western part of this study area to the immediate north of the corridor. In the eastern part of the study area and occupying part of the corridor is Layham Quarry.
- 3.13 Study Area E – Dedham Vale AONB - comprises the northern extent of the Dedham Vale AONB and extends from the boundary of the AONB, west of Polstead Heath to the AONB boundary on Brick Kiln Hill lane. A small area of farmland within the corridor and this study area sits outside the AONB designation. The landscape within this study area is valley farmland and meadowland and the River Box flows north to south through the study area and across the corridor. The corridor crosses a substantial area of orchard, Boxford Fruit Farm at the western end of the study area. The hamlet of Whitestreet Green is found 0.5km to the north of the corridor and the village of Boxford and hamlets of Stone Street and Calais Street lie north of this. The village of Polstead sits 0.5km to the south of the corridor with the village of Stoke-by-Nayland beyond this.
- 3.14 Study Area F – Leavenheath/Assington - extends from the AONB boundary on Brick Kiln Hill lane to Upper Road (near Dorking Tye). The landscape within the study area is mainly ancient farmland with woodlands, forming an area of higher ground (interfluve). Within this study area the village of Assington lies to the north of the corridor and Leavenheath to the south.
- 3.15 Study Area G – Stour Valley - extends from Upper Road (near Dorking Tye) to the end of the corridor near Twinstead Tee. The landscape within this study

area is valley farmland and meadowland and the River Stour flows north to south through the study area and across the corridor. The villages and hamlets of Workhouse Green, Henny Street and Little Henny lie closest to the corridor to the north. The hamlet of Twinstead lies to the west. Closest to the corridor to the south are the hamlets of Alphamstone and Lamarsh. Further to the south (approximately 2km from the corridor) is the village of Bures and further to the north (approximately 2km from the corridor) is the town of Sudbury.

4 DEFINITION OF OPTIONS

Principles adopted in defining overhead line alignment options

- 4.1 The main principles adopted in defining indicative alignments for overhead lines are described below. It is not possible to apply these principles equally in every situation – professional judgement has been applied where principles are found to conflict. This has applied particularly in seeking to optimise alignments (see paragraph 4.8).
- 4.2 The starting point was to consider potential overhead line alignments which lay within the limits of the preferred route corridor (Corridor 2) as set out in the Selection of Preferred Corridor report. This approach was adopted on the grounds that the corridor boundaries had been identified with the intention of maximising the benefit of using Corridor 2 - to install a new overhead line close to the route of the existing 400kV overhead line and the 132kV overhead line which will be removed. The corridor boundaries have also been the basis for informing local communities of the proposal to be taken forward. However it was recognised that situations may arise where environmental constraints suggest that a more acceptable alignment for an option for a possible overhead line route might extend outside the defined corridor limits – for example where moving the alignment outside the limits would avoid oversailing a property. Alignments extending significantly beyond the defined limits were not considered to be acceptable.
- 4.3 Health and safety considerations dictate that there should be a minimum separation distance between a proposed overhead line and the existing 400kV overhead line. For the purposes of the options appraisal it is assumed that the distance between the centre lines of existing and proposed overhead lines should generally be at least 85m. This takes into account the dimensions of the pylons, the likely height of cranes needed to construct the new line and electrical safety clearances. Constructing lines closer together could be possible but would require specific justification and risk assessment and possible circuit outages.
- 4.4 In visual terms it would be preferable for the existing and proposed overhead lines to run closely in parallel and for pylon positions to be synchronised. Installing the new 400kV overhead line close to the existing 400kV overhead line was a clearly stated reason for the preference for Corridor 2 in the

- responses to the consultation on the route corridors. Pylon positions will be identified when environmental surveys and consultation with landowners have been completed. However close parallel running has been adopted where possible in defining indicative alignments.
- 4.5 In accordance with the Holford Rules, alignments close to residential areas or individual properties have been avoided as far as possible on the grounds of general amenity. Particular attention has been paid to situations which could involve lines oversailing properties or properties having overhead lines on either side and in close proximity.
- 4.6 In accordance with the Holford Rules, the most direct line would generally be preferred to avoid the need to construct larger, more visually intrusive, angle pylons. For the same reason, sharp changes in direction have been avoided wherever possible.
- 4.7 In accordance with the Holford Rules, areas of high amenity value or scientific interest have been avoided and indicative alignments chosen which minimise effects on the setting of heritage assets.
- 4.8 In planning indicative alignments, the first step was to consider close parallel alignment with an offset of 85m to the north and south of the existing 400kV overhead line. The initial alignments were then tested against the Holford Rules to determine whether localised adjustments would be beneficial. This process enabled optimised alignments to the north and south of the existing 400kV overhead line to be identified. In the Hintlesham area a wider range of options was initially considered for the area around Hintlesham Woods SSSI (see Appendix A), but this was subsequently refined to provide a north and south option in Corridor 2B.
- 4.9 While a connection solution involving overhead lines entirely to the north or to the 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, higher costs and a potentially complex programme of outages which would be difficult to accommodate given other constraints on the management of the electricity transmission system in East Anglia. This would not apply if changes from one side to the other were made either side of a proposed underground section.
- 4.10 For the construction of an overhead line, temporary access roads and working areas would need to be installed at each pylon location. Each temporary access

road may provide access to one or more pylon locations. To minimise lorry movements and material handling, pylon steelwork would be delivered directly to site. Delivery of conductors (wires) would be initially to a centralised storage facility before being transported to its pulling position. Normal construction traffic routes will be agreed with the highway authorities. Some minor works to adopted highways may be required to improve the alignment, clearances and standard of roadbed in order to facilitate access for construction traffic.

- 4.11 Overhead line alignments are described in Chapters 6-11. It should be noted that these alignments are indicative and have not yet been designed in detail. Pylon positions and the precise alignment of the overhead lines cannot be established until the results of the consultation have been reviewed, further surveys and technical studies undertaken and discussions held with landowners, occupiers and other parties.
- 4.12 The Selection of Preferred Corridor Report explains that 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 Stage One Consultation.
- 4.13 For the purposes of the appraisal therefore it has been assumed that an overhead line would be based on lattice steel pylons of similar design to the existing 400kV overhead line, strung with triple Araucaria conductors. Using a notably different pylon design to the existing 400kV overhead line that will remain and to the pylon design used for the 132kV overhead line that will be removed would draw attention to the new overhead line because it would be markedly different from each of these presently existing features. Use of a different pylon design would make the scale of change greater which would be contrary to the main reason for selecting the preferred route corridor.
- 4.14 During on-going consultation on the detailed connection design, National Grid will review pylon designs that may become available for the Bramford to Twinstead Tee Connection and consider if these are appropriate to use. It will consider any representations made regarding pylon design and will also consider use of variants of the standard design including low height towers where this may offer benefit.

Principles adopted in defining underground cable options

- 4.15 The higher costs of underground cables, as compared to overhead lines, suggests that the most direct route, which is shortest, should be adopted where possible.
- 4.16 It was acknowledged that the route corridor defined in the Route Corridor Study had been defined for an overhead line. Underground cables affect environmental constraints differently. For example hedges are oversailed by an overhead line and the most sensitive habitats or areas of high archaeological potential may be avoided when siting pylons. Unlike the situation with overhead lines and their associated landscape and visual effects, there was no strong driver that cable alignment options should remain within the limits of the preferred route corridor.
- 4.17 An appropriate cable alignment was selected which avoided as far as possible environmental constraints, including developed areas, woodland, SSSI and County Wildlife Sites, Scheduled Monuments, and areas of archaeological potential. This was to minimise disturbance to such features and limit environmental effects.
- 4.18 A number of technical constraints were also considered in planning cable alignments. For instance, the ability of the cable to deviate sharply is restricted by its maximum bending radius. Potential locations for cable joint bays (required approximately every 800m-1000m) were also considered although these were assumed to be contained in the overall cable swathe. For the purposes of the appraisal it has been assumed that the cable installation will require three cables per phase of 2500sq mm XLPE cable and that cables would generally be installed in open trenches. Together with its cable suppliers and cable manufacturers, National Grid is undertaking a study to review system ratings, new cable technology, cable cross sectional area and thermal backfill to understand what innovative solutions can be provided in order to deliver and develop a secure, sustainable and affordable energy network. If this study can be concluded in line with the Bramford to Twinstead Tee Connection programme, then any recommendations would be considered in the design of any underground sections of the route.
- 4.19 The area of land required for the construction of the cables could be up to 65m wide and this was taken into account in routeing close to environmental constraints. Wherever possible, efforts would be made to reduce this width to about 40-50m.

- 4.20 It has been assumed that, exceptionally, horizontal directional drilling would be used for crossing the main rivers of the Brett, Box and Stour, the Sudbury branch railway line, Hadleigh Railway Walk and Dollops Wood. Road crossings would be ducted. Horizontal directional drilling (HDD) is a steerable trenchless method of installing underground cables in a shallow arc in a prescribed bore path by using a surface launched drilling rig, with minimal impact on the surrounding area (allowing vegetation to be retained). For underground cable installations, a number of pipes are installed using the HDD method and the cables are then pulled through the pipes during the cable installation phase. Once the cables have been installed the pipes are filled with bentonite to maintain the cable rating.
- 4.21 Ducts are installed in road crossings where, with the aid of traffic management, a carriageway is closed to traffic and a trench is excavated to install the ducts resulting in vegetation removal. Once the trench has been reinstated it is opened to traffic and then works repeated for the other carriageway. When the ducts have been installed, the underground cables are pulled through during the installation phase.
- 4.22 The construction of the underground cable route would require specific temporary site access locations to be established at the ends and along the route to service the construction programme. They would be chosen on the basis of proximity to a highway of an appropriate standard. To limit the impact on local transport infrastructure, the underground cable route would be provided with a temporary haul road, which would run along the entire route and between the two cable circuits and serve as a traffic route for the construction traffic. Installation of an underground cable requires the delivery of heavy duty cables on large cable drums. Access to the construction sites therefore needs to be suitable for abnormal indivisible loads. There would be a requirement to import construction and export waste materials using HGVs whose size can be accommodated by local vehicular routes. Normal construction traffic routes will be agreed with the highway authorities. Some minor works to adopted highways may be required to improve the alignment, clearances and standard of roadbed in order to facilitate access for construction traffic.
- 4.23 Sealing end compounds are required at the interface between overhead lines and underground cables. A sealing end compound comprises an overhead line terminal tower (pylon) set within a relatively flat area (nominally 85m X 50m) surrounded by security fencing. The compound will contain cable terminations, electrical equipment, support structures and a small control building. These

would be to a maximum 16m in height. The overhead line terminal tower acts as a support for the conductor system and down leads, these down leads feed each circuit into the sealing end compound. A connection is provided to the electrical equipment via landing structures designed to take the tension force. A metalled road would provide access from the public highway.

- 4.24 The sealing end compound would contain equipment that would be monitored remotely. Routine visits would be required to visually inspect condition of non-mechanical equipment, structures and buildings. Mechanical (manual operated) earth switches would require inspection and servicing as part of these visits.
- 4.25 Sealing end compounds need to be positioned on the line of the new overhead route and be close to the local road network. A permanent tarmac road 3m in width (with passing places) would be constructed from the local road network into the compounds to allow for installation and for maintenance purposes.
- 4.26 Wherever possible, sites should take advantage of topography or natural screening which allows the compounds to blend into the surrounding countryside. Where appropriate, screen planting can be undertaken alongside sealing end compounds, provided that trees avoid the underground cables and potential interference with the compound fence and safe electrical clearances to overhead lines. Compounds should be large enough to allow for the electrical clearances which are required to maintain system safety and to accommodate the size of compound, which is dictated by the number of cables per phase and the electrical clearances.
- 4.27 For the purposes of the appraisal, indicative locations for sealing end compounds were identified close to each end of each study area. Precise locations would depend on whether the underground cable route is connecting to a northern or southern overhead alignment.
- 4.28 Underground cable alignments and indicative locations for sealing end compounds are described in Chapters 6-11. As with the overhead line alignments, further studies and discussions with landowners and other parties will be required to finalise the details of any cable alignments which are selected to be taken forward.

Other options considered but excluded from appraisal

- 4.29 In developing optimised alignments, it was determined that a number of overhead line and underground cable options should not be taken forward. These are identified in Chapters 6-11.

- 4.30 During the Stage 1 Consultation, respondents queried why consideration had not been given to placing the whole route underground or to using other underground technology such as gas insulated lines or tunnels.
- 4.31 As noted in the Selection of Preferred Corridor report, the costs of undergrounding are significantly higher than those associated with constructing an overhead line. A major element of this cost differential is accounted for by the cable itself. The underground conductor has to be bigger than its overhead counterpart to reduce its electrical resistance and hence the heat produced. The requirement to properly insulate whilst at the same time maintaining the cable's rating (its ability to transmit the required current) means that special insulation is needed. This results in a large conductor, using expensive materials and manufacturing techniques. There are also substantial costs associated with burying the cables in the ground. At either end of the underground section, terminal towers (pylons) and sealing end compounds are required.
- 4.32 When cable circuit faults develop, it can be a long and expensive task to locate a fault, excavate the cable and undertake the necessary repairs. Apart from the cost of the repair itself, there is an additional operational cost relating to the period of time for which a circuit is out of service.
- 4.33 In late 2010, the IPC suggested to Government that an independent authoritative report on costs of underground and subsea transmission would be useful. This report, prepared by Parsons Brinckerhoff and endorsed by the Institution of Engineering and Technology (IET), was published in February 2012³³. The costs of different technology options contained in the report are broadly in line with those that National Grid has used to date and has published when carrying out appraisal of options on current projects.
- 4.34 Some representations to the Stage 1 Consultation advocated that the whole of the route between Bramford and Twinstead Tee should be installed underground. Previous estimates (included in the Selection of Preferred Corridor Report) of capital costs for the AC underground cables alone and assuming the shortest route possible had been in the range £572m-£616m.
- 4.35 More detail on underground alternatives including GIL and tunnels is included in the Review of Strategic Options Report 2011. Gas-insulated transmission lines (GIL) are a developing alternative to conventional underground cables for high voltage transmission. The IET report suggests that capital costs may be higher compared to conventional underground cables. GIL would also not be able to

³³ Parsons Brinckerhoff : Electricity Transmission Costing Study : January 2012

achieve the ratings necessary on this project unless installed in tunnels. However an important consideration is that, although GIL has been deployed worldwide for electricity transmission over short distances, no GIL circuit longer than 1km is presently in operation. Its application for distances such as that which would be required between Bramford and Twinstead is unproven and could not be established within the timescale of the connection programme.

- 4.36 To install cables in tunnels would involve significant civil engineering works associated with driving twin tunnels of at least 4m diameter for a distance of about 26km. Twin tunnels would be required to dissipate the heat generated by the cables. Approximately ten access shafts would be required, each of which would be surmounted by a headhouse to provide access and ventilation. The anticipated scheme development period of about seven years means that National Grid would be unable to meet its contractual obligations or comply with its statutory duties to develop and maintain an efficient, co-ordinated and economical system of electricity transmission. There would also be significant environmental impacts associated with the excavation and removal of large quantities of spoil material.
- 4.37 For the reasons outlined above, wholly underground solutions have been rejected. The Selection of Preferred Corridor Report concluded that the basis of the scheme should be an overhead line connection between Bramford and Twinstead Tee, but that the undergrounding of sections of the proposed overhead line, to mitigate the potential impacts of the scheme on sensitive locations, should be evaluated. The current report addresses this evaluation.
- 4.38 Some representations have suggested that all or part of the existing 400kV overhead line should be dismantled and replaced with an underground cable. This has not been considered because such works would not contribute to meeting the identified need to increase capacity between Bramford and Twinstead Tee. Nor would it represent an efficient and economic approach to developing the electricity transmission system. It would therefore be at variance with National Grid's statutory duties.

5 OPTIONS APPRAISAL TOPICS

Topics to be considered in the appraisal

- 5.1 As noted in Chapter 2, the Approach to the Design and Routeing of New Electricity Transmission Lines explains that options appraisal techniques are used to test different options and reference is made to a list of issues which could be addressed in such an assessment.
- 5.2 National Grid consulted with the local planning authorities to assist in determining which topics should be included in the appraisal. Where the consideration of certain topics is not likely to assist in determining which of the options under consideration should be taken forward, these topics may be “scoped out”.
- 5.3 The options appraisal is not an Environmental Statement (ES) reporting on an Environmental Impact Assessment (EIA). Such an assessment of the detailed scheme design will be undertaken at a later stage in the process and an Environmental Statement will be submitted to accompany the application for an Order granting Development Consent for the Bramford to Twinstead Tee connection. The scope of the Environmental Impact Assessment will be agreed with the Planning Inspectorate by way of a scoping opinion. It is possible that this scope will include topics which are not material differentiators in the current options appraisal.
- 5.4 For the purpose of this study, the following topics were considered:

Environment

- Landscape
- Visual Amenity
- Cultural Heritage
- Ecology
- Water
- Resources and waste

Socio-economic

- Traffic and transport
- Local economic impact

Technical/Safety

- Technical
- Safety

Cost

- Capital cost
- Lifetime cost

As explained later, following initial assessment, it was concluded that some of these topics would not be material differentiators.

- 5.5 Effects on **landscape and visual amenity** are recognised as important factors in determining the merits of different options. This was confirmed by responses during the Stage 1 consultation and recognised by the establishment of a Thematic Group covering these topics. The effects of underground cable options on landscape and visual amenity is generally considerably less than the effect of overhead line options and there will also be variation between overhead line options depending on landscape character and quality and the relationship with the existing 400kV overhead line and with sensitive receptors.
- 5.6 The importance of assessing effects on **cultural heritage** is recognised by the establishment of a Thematic Group covering this topic. Underground cable options have the potential for greater effects on unknown archaeology than overhead line options because of the much greater extent of ground disturbance. However, the setting of a range of heritage assets may be more affected by overhead line options.
- 5.7 The importance of assessing effects on **ecology** is recognised by the establishment of a Thematic Group covering this topic. Underground cable options have the potential for greater effects on ecology than overhead line options because of the extent of habitat disturbance.
- 5.8 Once operational, neither underground cable nor overhead line options are expected to have significant effects on **water resources**. While during construction there is the potential for different effects on surface water and groundwater, depending on the nature and extent of construction activity, initial

- studies suggested that such differences were insufficient for them to be material differentiators in options selection.
- 5.9 Each option will have different implications in terms of the use of **resources and waste generation**. While the quantities can only be broadly estimated at this stage, any differences could inform the decision regarding which option to take forward. However the quantities of resources used and waste generated are, like cost, directly related to the length of the route and whether it is to be overhead or underground. The topic would not therefore, in itself, help to further differentiate the options.
- 5.10 Once operational, the effects on **traffic and transport** will be negligible for all options. During the construction phase, issues such as the movement of plant, equipment and materials will vary dependent on the nature and extent of the option. The transport network in the vicinity of options will also have different characteristics which may be more or less able to cope with the traffic flows associated with construction activities. Initial studies showed that it should be possible to provide access to all the indicative alignments and that this topic would not be a material differentiator in options selection.
- 5.11 The Stage 1 consultation emphasised the importance of assessing the effects of the scheme on the **local economy**, including tourism. The potential for local economic effects will vary depending on the proximity of options to local businesses and tourism facilities and the degree of potential temporary disturbance during construction or longer term effects on business premises and operations or visitor attractions.
- 5.12 The **technical** topic area covers a range of issues mainly relating to the buildability of the option, for example its technical complexity, construction delivery risk, programme implications and outage requirements. While each may vary from option to option, as will ease of maintenance, these issues will not be a material differentiator in options selection.
- 5.13 The **safety** topic area covers a range of issues mainly relating to the construction phase. While the design of the scheme will seek to minimise hazards, in accordance with the relevant Regulations, the potential for hazards to affect workers and third parties will vary depending on the nature and extent of the option. However these issues will not be a material differentiator in options selection.
- 5.14 National Grid has determined, over many years of experience, that the use of **capital cost**, which comprises cost of equipment and installation costs, is a

reliable basis on which to make investment decisions. Experience shows that there is not a sufficient difference in operation, maintenance, decommissioning and disposal costs between technology options to alter materially a decision based on capital costs alone. However, in response to representations made during the Stage 1 Consultation, to other consultations on major projects, and to the publication of the Parsons Brinckerhoff/IET report, National Grid has undertaken a review of **lifetime costs** and will now take these into account in investment decisions.

Outline methodology

- 5.15 The environmental and socio-economic elements of the appraisal are based on desk studies and site visits by specialist consultants TEP and ERM respectively and have also been informed by information provided by the Community Forums and Thematic Groups. As noted in paragraph 2.47, the environmental baseline information may be accessed via the project website.
- 5.16 The assessment of **landscape** character commenced with a review of existing landscape designations and county and district level landscape character assessments. Desk based studies have been supplemented by field assessment of landscape character. This method, and the information gathered, was presented to the Landscape and Views Thematic Group at meetings from October 2011 to January 2012 for comment.
- 5.17 The landscape appraisal in Chapters 6 to 11 starts by considering the baseline conditions of the landscape within each study area with reference to the relative value that is attached to the landscape. Highly valued landscapes are typically identified by national level designations, such as National Parks and Areas of Outstanding Natural Beauty. Landscapes of lower value have also been identified through designations in the local planning process (Special Landscape Areas). Recent government guidance advocates an approach to landscape protection and enhancement which avoids designation at the local planning authority level, but rather favours an approach where local landscape character assessments identify value and where pertinent this is referred to. The baseline conditions also make reference to landscape condition or quality; that is a factual description is provided of the physical state of the landscape and how intact it is from visual and functional perspectives. The baseline conditions also consider landscape capacity or sensitivity, which refers to the degree to which a landscape can accommodate change without suffering detrimental effects on its character. This can vary depending on the existing land use,

pattern and scale of the landscape, visual enclosure or openness and the landscape's value. The capacity of a landscape to accommodate change is dependent on the characteristics of the receiving landscape and the type and nature of the proposed development. For example, a large scale landscape with blocks of woodland may be more able to accommodate a large building without detrimentally affecting its character, compared to a smaller scale or more intimate landscape, such as a narrow river valley. A judgement on the capacity of the landscape to accommodate an additional 400kV overhead line within each study area is provided with the landscape baseline in Chapters 6 to 11.

- 5.18 The capacity of a landscape to accommodate an underground cable route is generally high as the majority of landscape characteristics affected can be reinstated following construction. Many underground installations, such as pipeline crossings have been successfully installed, including within sensitive landscapes. It has therefore been assumed for the purposes of this study that the capacity of the landscape to accommodate an underground cable route within each of the study areas is high.
- 5.19 Within the assessment of landscape effects, reference is made to magnitude of effect or scale of change. Magnitude considers the scale of change that would arise through the proposed development compared to the baseline landscape (i.e whether it is high, moderate or low), its nature (negative or positive) and its duration (short, medium, long term or temporary). These considerations result in a judgement of either high, moderate, low or negligible scale of change.
- 5.20 In the assessment of landscape effects a judgement is made on the likely effect of the option on the landscape and the nature of the effect (positive, negative or neutral). This is not an absolute scale but is a judgement based on the magnitude of the anticipated effect (or scale of change), the value and condition of the landscape and the sensitivity or capacity of the landscape to accommodate the particular development. The scale which has been adopted for this report is given in paragraph 5.90. The assessment of effects on landscape in Chapters 6 to 11 considers these effects prior to mitigation. Mitigation measures are then described and the effects are reassessed in the summary taking mitigation into account.
- 5.21 Feedback from statutory consultees and others has highlighted the need to consider effects on the setting of Dedham Vale AONB as a result of connection options because of the potential for negative landscape effects on the designation. There is no defined 'setting' of the AONB to which reference can

- be made. The landscape assessment considers the indirect effects on the Dedham Vale AONB where there are likely to be views of a connection option from part of the AONB.
- 5.22 The **visual amenity** appraisal in Chapters 6 to 11 starts by considering the baseline views. That is the extent and nature of existing views within each study area. Visual assessment has been carried out on the ground from publicly accessible locations. The method used, and information gathered on views, was presented at the Landscape and Views Thematic Group at meetings from October 2011 to January 2012 for comment.
- 5.23 The baseline and assessment of visual effects also makes reference to the sensitivity of visual receptors and the general importance of views. The sensitivity of visual receptors depends upon the location of the viewpoint, the activity of the receptor and expectations of the view. For example a walker using a public footpath for the purposes of recreation and the enjoyment of the countryside is likely to be of higher sensitivity than a worker in their workplace where the key focus is on work rather than views out from the workplace. The land use planning system considers that public views are of greater importance than private views from private property. In this assessment, users of public rights of way, and particularly long distance footpath routes, and public open spaces are considered to be of high sensitivity. Private residents are also considered to be of high sensitivity. Workers, motorists, rail passengers and people playing outdoor sports are generally considered to be of lower sensitivity.
- 5.24 A judgement is made as to the importance of views, in general, in each study area. The importance of views is considered in the context of the value placed on the scene, alternatives available and relative scenic quality of the view. Reference to a view in a guidebook or in a tourist map indicates a view of greater importance which can be experienced by many people.
- 5.25 Within the assessment of visual effects reference is made to magnitude of effect or scale of change. Magnitude considers the scale of change to the view that would arise through the proposed development compared to the baseline view (i.e whether it is high, moderate or low), its nature (negative or positive) and its duration (short, medium, long term or temporary). Magnitude of effect takes into account factors such as distance, angle of view, proportion of view affected, filtering effects, backgrounding effects and the degree of change compared with the baseline. These considerations result in a magnitude of effect judgement of either high, moderate, low or negligible scale of change.

- 5.26 In the assessment of visual effects a judgement is made on the likely effect of the option on visual amenity and the nature of the effect (positive, negative or neutral). This is not an absolute scale but is a judgement based on the magnitude of the anticipated effect (or scale of change), the sensitivity of visual receptors and the importance of views. The scale which has been adopted for this report is given in paragraph 5.90. The assessment of effects on visual amenity in Chapters 6 to 11 considers these effects prior to mitigation. Mitigation measures are then described and the effects are reassessed in the summary taking mitigation into account.
- 5.27 In discussion at a joint Thematic Group meeting, a point was made that some landscape elements such as trees and hedges are relatively short-lived features and may be lost to disease, old age or through intervention such as felling and hedge grubbing up. A question was raised as to the value that could be placed on these as having filtering, screening or backgrounding functions because they could be seen as 'temporary' features as compared to the long life of transmission infrastructure. This point is acknowledged although it needs to be balanced by the observation that a number of representations have referred to the general constancy of the South Suffolk landscape over time. It is also the case that hedges of value are protected under Hedgerow Regulations; woodlands are often protected by legislation; and trees and tree groups of amenity value can be protected by Tree Preservation Orders. Accordingly, where reference is made to vegetation in views, these are considered to be relatively long-standing features in the landscape which will continue to perform a similar function for the majority of the lifetime of the proposed connection.
- 5.28 Effects on trees and woodland have been considered in the landscape and visual amenity appraisal and reference to those trees and woodlands protected by Tree Preservation Orders is made in the ecology appraisal.
- 5.29 There is potential for mitigating the effects on landscape and visual amenity of either an underground cable or overhead line connection by way of planting. However, this would be subject to the agreement of landowners and would need to be carefully managed and monitored to ensure successful establishment. Given the lack of certainty that such measures will be feasible in every instance, the assessment of effects on views has been judged without these mitigation measures in place.
- 5.30 In the design of overhead line connections it can be assumed that pylon positions will seek to minimise overall the landscape and visual effects. This

- has been taken into account in the assessment of effects, as part of 'in-built mitigation', rather than as an additional mitigation measure.
- 5.31 In the assessment of landscape and visual effects of an underground cable connection it has been assumed that the reinstatement of agricultural land would take place, as part of 'in-built mitigation', rather than as an additional mitigation measure.
- 5.32 The **cultural heritage** appraisal has obtained information from all of the relevant Historic Environment Records, the National Monuments Record, English Heritage and local authority records. In addition selected historic mapping was consulted and a review of modern vertical aerial photography and LIDAR survey data was undertaken. Site survey work was undertaken from publicly accessible vantage points. The archaeology and history criteria for determining 'important' hedgerows (Schedule 1, Part II of the Hedgerow Regulations 1997) were also used to provisionally quantify the likely occurrence of 'important' hedgerows within the Route Corridor. This method, and the information gathered, was presented to the Cultural Heritage Thematic Group for comment at meetings from October 2011 to January 2012.
- 5.33 The known heritage assets have been broadly classified as those which are 'designated' and those which are not. Designated heritage assets in this case are listed buildings, conservation areas and scheduled monuments, as no registered battlefields, registered parks and gardens, world heritage sites, or protected wrecks or military remains are recorded within or adjacent to the Route Corridor.
- 5.34 The National Planning Policy Statement for Energy (EN-1) acknowledges that "*the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be*". All listed buildings are of national importance, but in line with guidance and policy, the assessment of effects treats Grade I and II* listed buildings as having greater significance than Grade II listed buildings.
- 5.35 Non-designated heritage assets are, in this case, primarily archaeological and historic landscape remains or features included in the local or national monuments record. The non-designated heritage assets within the Route Corridor are currently determined to be of local or regional importance. In the case of buried archaeological remains, any rating of importance is very provisional, given the difficulties in characterising such assets, common to any assessment of this type. Also, the assessment of effects has taken into account

the probability of encountering previously unrecorded buried archaeology. Non-designated heritage assets of demonstrably equivalent significance to a designated heritage asset will be subject to the same considerations.

5.36 In order to determine the likely and relative effects of the connection options on cultural heritage assets, and in line with the above, the relative significance of the various heritage assets has been categorised as follows:

- Very high sensitivity: Grade I and II* listed buildings, conservation areas and scheduled monuments;
- High sensitivity: Grade II listed buildings, potentially some of the known non-designated heritage assets; and
- Moderate/ low sensitivity: Non-designated heritage assets and landscape features.

5.37 It is Government policy that decision makers (EN-1) should “*seek to preserve those elements of the setting of a designated heritage asset that make a positive contribution to, or better reveal the significance of, the asset*”. In the case of listed buildings this is a statutory requirement under Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990.

5.38 The effects of the connections options on cultural heritage receptors will therefore be either direct or indirect. Direct effects are any physical change to any archaeological or cultural heritage site. Indirect effects relate to any change or effect of the proposed development on the setting of, or important views to or from, a designated heritage asset.

5.39 In either case, the magnitude of effect can be high (resulting in a major negative change to most or all key elements of cultural heritage interest, or total loss of character or substantial alteration to setting), moderate (resulting in negative change to many key elements of cultural heritage interest, or less than substantial alteration to setting) or low (minor negative changes to key elements of cultural heritage interest, or slight alteration to setting).

5.40 In establishing the indirect effect of the connection options on the setting of a designated heritage asset, the existing 400kV and 132kV overhead lines are included as part of the baseline, as is the extent of existing screening. It has been assumed that pylons would be positioned to avoid important views to or from a designated heritage asset, or any moderate or high sensitivity buried archaeology.

- 5.41 Of the connection options proposed, the overhead alignments would have a greater negative effect on the setting of designated heritage assets while the underground cable option would have greater negative effects on buried archaeology. The extent of negative effect on non-designated buried archaeology will be commensurate with the area of disturbance (i.e. the larger the area disturbed the greater the likelihood for encountering important buried archaeological remains).
- 5.42 Buried archaeological remains are a non-renewable resource and sustaining their significance is best achieved through preservation in situ. Avoidance is the preferred option for mitigating effects on buried archaeology. Where this is not possible, mitigation can be achieved through a programme of archaeological recording. Similarly, avoidance is the preferred option for mitigating indirect effects on designated heritage assets. Where this is not possible, reducing the indirect effects may be achieved by landscape planting. However, as described above, due to the lack of certainty that such measures will be feasible the indirect effects have been judged without any mitigation measures in place.
- 5.43 The overall scale of effect of each of the connection options has been assessed by comparing the relative significance of the heritage assets against the magnitude of effect. The vast majority of the effects on heritage assets are negative and are described as major, moderate or minor (as described in paragraph 5.90). The assessment of effects on cultural heritage in Chapters 6 to 11 considers these effects prior to mitigation. Mitigation measures are then described and the effects are reassessed in the summary taking mitigation into account.
- 5.44 The **ecological** appraisal of the connection options has been carried out using desktop records including wildlife site designations, TPO data, species records and habitat inventory data in combination with Phase 1 habitat survey data gathered in the field and supplemented with mapping data and satellite imagery. This method, and the information gathered, was presented to the Biodiversity Thematic Group at meetings from October 2011 to January 2012 for comment. Ecological information provided by consultees at the Biodiversity Thematic Group meetings, Community Forums, public events and discussions with landowners has been added to the baseline data used to inform this assessment.
- 5.45 The ecology appraisal in Chapters 6 to 11 starts by considering the baseline conditions within each study area with reference to the relative value attributed to ecological receptors. A receptor can refer to a habitat type, a species, a

wildlife site or can be a combination of these. The value of certain receptors can be determined by associated legislation or policy. For example Sites of Special Scientific Interest (SSSI) are designated nationally and are valued at the national level, whereas Local Wildlife Sites or County Wildlife Sites (CWS or LWS) are designated by the County Council and are valued at the county level. However, this is not always the case, for example while badgers are protected under national legislation, they are relatively abundant in many areas and a badger sett would not be valued at the national level. Similarly while great crested newts are a European protected species, a population within the Route Corridor is not automatically of European importance. Its value takes account of factors such as status, rarity, uniqueness, quality and abundance, considering these factors in relation to local, district, county, regional, national and international conditions. Relevant published evaluation criteria form an important basis for determining value for sites, species and habitats. Value can be intrinsic but can also be linked to the function of a receptor. For example, a species-poor hedgerow may have a high value due to its role in connecting two important dormouse woodlands or providing a commuting route between a rare bat roost and bat foraging grounds. The ecological appraisal takes a broad and precautionary approach to considering the value of receptors.

- 5.46 Within the assessment of ecology effects, reference is made to magnitude of effect. This considers the scale of the change that would arise through the proposed development compared to the baseline (i.e. whether low, moderate or high), its nature (negative or positive) and its duration (temporary, short, medium or long term). This information on magnitude is combined with the value of receptor to determine the overall impact on the receptor. Impacts upon receptors of higher value are given greater weight than impacts upon receptors with a lower value. These considerations result in an overall judgement of either minor, moderate or major scale of effect on ecology for each connection option within each study area as described in paragraph 5.90. The assessment of effects on ecology in Chapters 6 to 11 considers these effects prior to mitigation. Mitigation measures are then described and the effects are reassessed in the summary taking mitigation into account.
- 5.47 In some instances, mitigation in the form of planting or habitat creation outside the permanent easement of the connection is described in the mitigation section. Securing this mitigation would be subject to landowner agreement. Given the lack of certainty that such measures would be feasible in every

- instance, the summary assessment of effects on ecology has not included these measures.
- 5.48 A hydrological desk study has been undertaken to assess the existing hydrology, and to identify any potential effects on **water resources** caused by the development, both during and post construction. An assessment has been made of the potential direct and indirect effects of the proposed development on hydrology including the impacts on surface waters (main rivers, streams, drains, ponds) and groundwater bodies in the general area of the site and surrounding area. The local and regional importance of the water resources has also been described. Data has been collected and collated from the Environment Agency Flood Zone Maps, Reservoir Flood Maps and Source Protection Zone Mapping.
- 5.49 The **resources and waste** implications of each option have been measured in units of carbon dioxide equivalent (tCO₂e). This is a useful surrogate for measurement of the general environmental impact of material consumption because it reflects energy used in the manufacturing process and waste production, the energy used and greenhouse gases produced on disposal. An assessment has been made of the main material consuming assets and sources of waste production for different technologies and values for carbon dioxide equivalent estimated per kilometre.
- 5.50 The **socio-economic** assessment has aimed to identify the presence of socio-economic constraints within the corridors and indicate whether potential effects can be mitigated. The methodology is consistent with established good practice regarding socio-economic impact assessment principles and is also consistent with the only available guidance on the assessment of outdoor recreation as one aspect of tourism, as set out in the Scottish Natural Heritage's A Handbook on Environmental Impact Assessment (February 2006). The main data sources used to describe the socio-economic baseline have included: the Dedham Vale AONB Visitor Survey and Visitors Perception Survey (2009); official labour market statistics; Visit England statistics; and a Postcode address datafile on tourist related business (2012). In addition a range of publications relating to the economic impact of tourism have been considered. Field surveys were also undertaken to identify local businesses within, and close to, the route corridor.

- 5.51 Consideration of **traffic and transport** issues was undertaken by engineers from the Electricity Alliance³⁴. Access requirements were established for each option and the ability of the local highway network to accommodate these requirements was assessed, based on desk studies and site visits and with advice from an abnormal loads contractor.
- 5.52 **Technical and safety** matters were addressed by engineers from the Electricity Alliance and their assessment is based on experience with other projects of a similar nature. The project team has considered a number of options from both an engineering and environmental perspective and has refined indicative alignments. The options appraisal assumed that lattice steel pylons of similar design to the existing 400kV overhead line would be used for overhead line options, accepting that later detailed studies may determine that low height pylons could be used to mitigate landscape and visual effects. Assumptions for underground options were based on standard approaches to the construction of cable infrastructure utilising three cables per phase to meet the required rating for the connection.
- 5.53 Appendix B provides information regarding **costs** associated with each technology, based upon the required capacity of the new circuits. In turn these capacities equate to those produced by Parsons Brinckerhoff in the report endorsed by the Institution of Engineering and Technology. The Bramford to Twinstead Tee connection requires AC circuit options which equate to the "Hi" circuit capacity described in the report viz. 6930MVA AC (two AC circuits of 3465MVA).
- 5.54 The lifetime cost methodology is also explained in Appendix B. The lifetime costs assessed for the new transmission circuits are based on Net Present Value costs for each new circuit transmission technology over a 40 year period taking into account a 3.5% discount rate.

Topics which would not assist in comparing the merits of options

- 5.55 Following the studies outlined above, it was concluded that a number of the topics would not assist in differentiating between options for the reasons set out below. The findings of the studies are recorded in technical working papers which are available on request.

³⁴ The Electricity Alliance is a partnership between National Grid and 15 construction companies, formed to deliver a major investment programme to update and develop the high-voltage transmission network in order to maintain safe, secure and reliable electricity supplies across England and Wales.

Environment - Water

- 5.56 Overhead line options would all have temporary effects on the water environment during construction and neutral or minor negative effects in the long term, depending on where pylons are located in relation to main watercourses.
- 5.57 An underground option would require more mitigation during construction than would an overhead option, but with mitigation would be deemed to have minor negative but temporary effects. Once in situ, an underground cable route would have a neutral impact on existing hydrology in the long term.
- 5.58 Sealing end compounds would have a minor negative effect on the surrounding hydrology, provided suitable mitigation measures addressing surface water runoff are implemented.
- 5.59 It would not be possible to differentiate between overhead alignments or between overhead and underground options on the basis of the impact on the water environment given the similar degree of effects which would be anticipated.

Environment - Resources and waste

- 5.60 The quantities of resources used and waste generated are directly related to the length of the route and whether it is to be overhead or underground. That being the case the relative performance of the options will be the same as that identified in the assessment of cost and will not help to further differentiate the different options.
- 5.61 The use of resources to construct the overhead line asset is influenced mainly by the supply and transportation of conductors and pylon steelwork. The use of aggregate for temporary access roads and working areas is the third most significant resource usage. This is also an important contributor to the waste element as it is generally removed on completion of the works.
- 5.62 The cable construction would be more complex than the overhead line equivalent, in that the copper conductor requires a high quality insulation surround and mechanical protection. For the underground cable system to match the capacity ratings of the overhead line there is a requirement, based on current technology, to provide three cables per phase. The cable construction would require land to be excavated and reinstated throughout the entire underground route. The main contributor to the waste element would be

excavated material which cannot be reused, because of the volume of the excavation which would be occupied by the cable system and thermal backfill.

- 5.63 Construction of the underground cable option would require substantially more resources than any of the overhead line options and would also generate the greatest amount of waste.

Socio-economic – Traffic and transport

- 5.64 As noted in Chapter 4, construction of an overhead line would need temporary access roads and working areas to be installed to each pylon location and pylon steelwork would be delivered directly to site.
- 5.65 The construction of the underground cable route would also require temporary site access locations to be established at the ends and along the route to service the construction programme. A temporary haul road would then be established which would run along the entire route and between the two cable circuits and serve as a traffic route for the construction traffic. This could also service the construction of sealing end compounds, although permanent access arrangements will also be required for these sites.
- 5.66 Normal construction traffic routes will be agreed with the highway authorities and may involve some minor works to adopted highways to improve the alignment, clearances and road construction. For all options, any improvement works required to the local highway network will be planned to be reversible if required. In particular where verges have been widened and temporary access points constructed these would be reinstated to their previous condition. Short to medium term effects would be related to the growth of hedgerows and other vegetation which may have been disturbed as a result of the works
- 5.67 In principle, construction access can be achieved to all study areas in a corridor which has previously hosted construction of a 400kV and 132kV overhead line. The proximity of the northern and southern overhead alignments means that access arrangements for both are likely to be similar and therefore access cannot be used as a distinguishing factor. As access can also be achieved along the underground alignments, it does not allow a distinction to be made between underground and overhead options in any study area.

Technical/Safety – Technical

- 5.68 This topic involved consideration of :
- technical complexity;

- ease of maintenance;
 - end of life replacement;
 - outage system access impact;
 - construction delivery risk/programme implications; and
 - additional system benefits.
- 5.69 In defining indicative alignments, issues of buildability were taken into account and none of the options is technically complex in engineering terms. The sole technical challenge which has been identified is achieving line entries to Bramford substation with a northern overhead alignment in Corridor 2B in Study Area AB. This is because of the current configuration of line entries and the proposals by East Anglia Offshore Wind Ltd to construct converter stations on land to the north of the substation. Should this alignment be selected to be taken forward, the detailed design would depend on the form of any converter stations that are consented.
- 5.70 No significant issues have been identified relating to future maintenance of any of the overhead or underground alignments.
- 5.71 At the end of its life, constraints on National Grid system access would require significant temporary works schemes (large temporary sections of overhead line route) to enable rebuilding an overhead line on its existing route. Alternatively a new overhead line route would need to be found to enable a like for like replacement overhead line. This would apply equally to all overhead alignments.
- 5.72 For an underground option, constraints on National Grid system access would require some temporary works schemes and sequencing of the cable replacement to minimise disruption beyond the proposed easement. For the majority of the replacement programme, temporary National Grid system arrangements would be put in place at the sealing end compounds and substations which would impose a reduced rating arrangement for the affected circuit to remain available. This would allow sequential replacement work to commence on each of the cable bundles. As part of these works there would be a requirement for circuit outages which would be most significant when removing and installing the replacement terminations.
- 5.73 As arrangements can be made for end of life replacement in all cases, this cannot be used as a distinguishing factor.

- 5.74 For the majority of the connection, typical arrangements for system access would enable the construction of an overhead line on either a northern or southern alignment. The alignments can be constructed off-line and would only require system access for commissioning purposes. The exception would be in Study Area AB where, for a northern alignment in Corridor 2B, arrangements for system access would be complex to enable the construction of the line entries into Bramford substation.
- 5.75 The underground cable route would, with the exception of tie-ins at either end of the connection, be constructed off-line, with no particular requirements for system access.
- 5.76 No significant issues have been identified in relation to construction delivery risk or programme implications for any of the options. While it would not be possible to construct sections of some alignments (overhead or underground) until the 132kV overhead line has been decommissioned and dismantled, this can be managed within the overall construction programme.
- 5.77 In terms of additional system benefits, it should be noted that an overhead line has the potential to be uprated with a higher capacity conductor system if required in the future. The cable system would only be designed to provide for the defined system ratings requirements. There would be limited capacity for increasing ratings if these system requirements were changed. In the context of meeting current predicted capacity requirements, such benefits would not influence the choice of option.

Technical/Safety – Safety

- 5.78 This topic involved consideration of :
- Electrical hazards;
 - Working at height;
 - Workplace hazards;
 - Third party hazards; and
 - Hazardous site conditions.
- 5.79 At this stage no safety issues have been identified which would distinguish between the various options.
- 5.80 The designs of both overhead and underground solutions would be based on the industry standards. Prior to the start of the construction programme all necessary surveys would be carried out to identify any constraints and

associated mitigations, including arrangements to manage the potential hazards to third parties during the construction period.

Other topics

5.81 In addition to the above, the following topics and sub-topics, which are referenced in National Grid's "Approach to the Design and Routeing of New Electricity Transmission Lines" were not included in the appraisal, for the reasons stated:

Environment

- Air quality
- Noise and vibration
- Soils and Geology
- Climate Change adaptation
- Greenhouse gases and energy efficiency

Socio-economic

- People and Communities
- Aviation and defence

5.82 Neither underground cable nor overhead line options would have any effects on **air quality** during the operational phase. During construction, both cable laying and the construction of an overhead line have the potential to generate dust and emissions from plant and traffic movements. However these effects would be temporary and dust and other emissions are capable of mitigation using well established techniques. There is therefore unlikely to be a significant difference between the effects of different options on air quality.

5.83 Underground cables would not give rise to **noise and vibration** during the operational phase. The National Policy Statement for Electricity Networks EN-1 notes that noise from overhead lines is unlikely to lead the IPC to refuse an application as a variety of mitigation measures are possible, such as the positioning of lines and the design and maintenance of conductors. Construction activities associated with both cable laying and the erection of an overhead line have the potential to generate noise and vibration. However these effects would be temporary and are capable of mitigation using well established techniques. There is therefore unlikely to be a significant difference between the effects of different options on noise and vibration.

5.84 There are no sites designated for their geological/geomorphological interest in the study area and the local **geology and soils** pose no particular constraint to

- either cable laying or the construction of an overhead line. Any agricultural land temporarily affected during construction would be restored to an equivalent quality in all cases. While there would be some permanent land loss associated with overhead line options, this would be insignificant in terms of the local land resource and cannot be used to distinguish between options.
- 5.85 The topic of **climate change adaptation** considers the vulnerability of projects to, for example, changes in temperature and flood levels in the lifetime of the project. Neither underground cable nor overhead line options are particularly susceptible to such factors which can, if necessary, be taken into account in the project design. Therefore the topic cannot be used to distinguish between options.
- 5.86 Insufficient information is available at this stage to enable the emission of **greenhouse gases and energy efficiency** of the construction phase to be calculated.
- 5.87 While the Stage 1 consultation emphasised the importance of assessing the effects of the scheme on **people and communities**, the more obvious effects on people and communities, such as effects on views from communities, are captured under other topic headings.
- 5.88 Through the aviation studies and consultations to-date, no **aviation or defence** interests have been identified or brought to the attention of the project team which would be adversely affected by development in the preferred route corridor.
- 5.89 In addition, consideration of **electro-magnetic fields** is excluded from the options appraisal because National Grid designs all of its systems to be compliant with ICNIRP guidelines³⁵ on exposure to electric and magnetic fields. The detailed connection design will take these guidelines fully into account, whichever option is selected. An assessment of the potential impact of electric and magnetic fields will be included in the environmental impact assessment of the preferred connection design.

Determining the scale of effects

- 5.90 In reporting the effects associated with an option, a scale has been used which differentiates between positive and negative effects and, in each case, the

³⁵ International Commission on Non-Ionising Radiation Protection : Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields : 1998

degree of effect. For negative effects, the following scale has generally been used as a guide:

- Major negative effects could arise as a result of a major scale of change to receptors, or effects on receptors of national and/or international importance, for which reliable and effective mitigation cannot be guaranteed;
- Moderate negative effects could arise as a result of a moderate scale of change to receptors, or effects on receptors of regional importance. Potential negative effects remain for some sensitive receptors despite mitigation;
- Minor negative effects could arise as a result of a minor scale of change to receptors or effects on receptors of local importance. Potential negative effects remain for some sensitive receptors despite mitigation.

5.91 As noted elsewhere in this chapter of the report, the appraisal has focussed on those issues which should assist in differentiating between options. The Approach to the Design and Routing of New Electricity Transmission Lines notes that National Grid will seek to balance the various issues and not to impose a hierarchy between the environmental, socio-economic, technical and cost requirements. The multi-criteria assessment does not provide the answer as to which is a preferred option based on weightings which are applied arithmetically. Rather, planning judgements are made based on the information collected through the options appraisal process.

5.92 The Stage 1 Consultation made clear the importance placed on landscape and visual considerations and it would therefore be appropriate to place greater weight on these considerations. As noted in paragraph 2.58 of the present report, the National Policy Statement for Electricity Networks EN-1 identifies the main factors to be considered in determining whether an underground line should be favoured – landscape (particularly sensitive locations), costs and the environmental and archaeological consequences of undergrounding.

6 OPTIONS APPRAISAL STUDY AREA AB - HINTLESHAM

Study area boundaries

- 6.1 Study Area AB covers a section of the corridor with the eastern boundary at Bramford substation and the western boundary defined by the former Hadleigh branch railway. Corridor 2 splits in this area into Corridor 2A and Corridor 2B.
- 6.2 Corridor 2A runs to the east of Burstall to Burstall Bridge and then follows the 132kV overhead line between the settlements of Hintlesham and Chattisham. Corridor 2B follows the line of the existing 400kV overhead line, widening at Hintlesham Wood to enable options to be considered which avoid the woodland. Corridors 2A and 2B merge 2.5km to the east of the former Hadleigh branch railway.
- 6.3 The options for Study Area AB are shown on Figures 2 to 6.

Definition of options

OHL 2A Alignment

- 6.4 The indicative alignment for an overhead option in Corridor 2A would run due south from Bramford substation to the east of Burstall as far as Burstall Bridge. From Burstall Bridge, this option would follow the route of the existing 132kV overhead line as far as the existing 400kV overhead line, south of Primrose Farm. At this point, a northern alignment would be achieved by connecting the new 400kV overhead line from Corridor 2A to the existing 400kV overhead line. A new 400kV overhead line would be constructed to the north of this which would be connected to the existing 400kV overhead line approaching from the east after it crosses Hintlesham Woods. In order to avoid oversailing property this would require the connection of a northern alignment to the existing 400kV overhead line immediately south of Hintlesham Woods, introducing a new section of overhead line to the rear of properties at Hadleigh Bee Farm and Primrose Farm. This would result in the removal of a short section of the existing 400kV overhead line to the east of Primrose Farm. The approximate length of this option in Study Area AB would be 10.1km. A southern alignment would involve the new line continuing west from Primrose Farm at an 85m offset to the south of the existing 400kV overhead line. The approximate length of this option would be 9.1km.

OHL 2B Northern Alignment

- 6.5 In order to achieve a technically feasible line entry into Bramford substation, a northern alignment for an overhead option in Corridor 2B would utilise the alignment of the existing 400kV overhead line for a short section out of Bramford substation. In order to achieve this the existing 400kV overhead line entry into the substation would need to be modified. From a point north of Hill Farm, the northern alignment would then broadly parallel the existing 400kV overhead line at an offset distance greater than 85m in order to avoid residential property. This offset would be increased to avoid Square Pastures Covert, running outside the previously defined route corridor. This option would cross the A1071 avoiding residential property and would run around the northern and western edge of Ramsey Wood. To avoid any effects on woodland the overhead alignment would be routed just outside the route corridor at the point where the alignment turns south to follow the western edge of the wood. The alignment would then continue south to cross Pond Hall Road between Bushey Cooper's Farm and Pheasant House. Once to the south of Pond Hall Road this northern alignment would continue in an 85m parallel offset to the north of the existing 400kV overhead line. The approximate length of this option would be 8.6km, as well as a 0.9km realignment of the existing 400kV overhead line.

OHL 2B Southern Alignment

- 6.6 The southern alignment for an overhead option in Corridor 2B would run south west from Bramford substation between Canes Farm and Walnut Farm and then take an 85m offset to the south of the existing 400kV overhead line from Mill Farm to College Farm. From here the new overhead line would take the route of the existing 400kV overhead line through Hintlesham Woods and the existing 400kV overhead line circuits would be routed around the northern and western edge of Ramsey Wood. To avoid any effects on woodland the overhead alignment would be routed just outside the route corridor at the point where the alignment turns south to follow the western edge of the wood.
- 6.7 Both the existing and new 400kV overhead lines would converge to the east of Primrose Farm where the southern option would then run parallel to the existing overhead line at an 85m offset to the south. The approximate length of this option would be 7.9km, as well as a 2.6km realignment of the existing 400kV overhead line..

Underground cable alignment

- 6.8 The underground cable option would run west from Bramford substation passing to the south of Burstallhill. It would then run outside the previously defined overhead line route corridor and take a more direct route to the south west, avoiding woodland and properties. It would pass to the east of Kate's Hill Farm and would continue southward to avoid buildings, woodland and a County Wildlife Site, to cross beneath Hadleigh Railway Walk where it is on a slight embankment. The approximate length of this option would be 7.8km.
- 6.9 The underground cable option would not require a sealing end compound at the eastern end of Study Area AB, as connections could be accommodated within Bramford substation.
- 6.10 If an underground cable route were to be taken forward in Study Area AB and not in the adjacent Study Area C, then at the western extent of Study Area AB it is anticipated that a connection to a northern overhead alignment would require the underground cable to be routed to the north of Station Road Works and the former Town House Fruit Farm, with a sealing end compound located between Benton End Farm and the former Town House Fruit Farm to the east of Hadleigh Railway Walk.
- 6.11 A connection to a southern overhead alignment in Study Area C could be made at a sealing end compound to the west of Hadleigh Railway Walk.

Other options considered but discounted

- 6.12 A number of overhead line options were considered in the vicinity of Hintlesham Woods SSSI in Corridor 2B. These are set out in the Preliminary Options Appraisal of Potential Overhead Alignments on Corridor 2B at Hintlesham Woods SSSI (See Appendix A).
- 6.13 An 85m parallel offset on a northern overhead alignment would oversail the garden of Kate's Hill Cottage. An alternative would be to deviate to the north of Pond Hall Farm, however this would require a number of angle pylons and involve effects over a wider area.
- 6.14 An 85m parallel offset on a southern overhead alignment would pass close to Kate's Hill Farm; however the alternative would be for the southern alignment to follow the existing 132kV alignment, which would result in a 400kV overhead line to both the north and south of Kate's Hill Farm. This was considered less

acceptable than having overhead lines restricted to only one side of the property.

- 6.15 Consideration was given to an underground cable route which took a more direct route toward Hadleigh Railway Walk, passing to the west of Pond Hall Farm and Kate's Hill Farm. This option was discounted in order to avoid woodland belts, fruit trees and agricultural buildings at Town House Fruit Farm and also a County Wildlife Site.

Other Proposals

- 6.16 There are current proposals for High Voltage Direct Current (HVDC) underground cables to be brought to a site adjacent to Bramford substation as part of the East Anglia Offshore Wind Ltd project. This would require up to two converter stations to be built in a single compound on land to the immediate north of Bramford substation, to enable HVDC to be converted to Alternating Current (AC) before being fed into the existing substation. Such a compound could have a footprint of the order of 145m by 180m and the buildings could be about 11m high³⁶. The developer has not yet sought consent for this development but initial consultations have recently been undertaken.

Environment – Landscape

Baseline conditions

- 6.17 Study Area AB comprises the Belstead Brook valley which is designated a Special Landscape Area (SLA) in the Babergh District Local Plan and is therefore of local value. This designation covers the eastern half of Study Area AB. The western extent of Study Area AB falls under the designation of the Brett Valley Special Landscape Area and is also of local value. The landscape in Study Area AB west of Hintlesham Woods and east of Clay Lane is not designated.
- 6.18 There are no regional or national landscape designations within this study area and the setting of the Dedham Vale AONB, which at its closest lies some 2km to the southwest of the study area, is not affected by the existing overhead lines within this study area.
- 6.19 The Suffolk Landscape Character Assessment characterises this area as Rolling Valley Farmlands, Ancient Plateau Claylands and Ancient Estate Claylands, which are described below.

³⁶ Environmental Resources Management for Scottish Power/Vattenfall : East Anglia ONE offshore windfarm : Preliminary Environmental Information Report : February 2012

- 6.20 The Rolling Valley Farmlands character type is found at the east of the study area along Belstead Brook and at the west of the study area along a tributary of the River Brett. It is described in the Suffolk Landscape Character Assessment as having gently sloping valley sides within a wider rolling landscape. This landscape is comprehensively settled and contains locally distinctive villages often with late medieval cores. Woodland forms a distinctive feature in the land beyond the valley and is often present on the upper slopes and framing views out from the valley.
- 6.21 The Ancient Plateau Claylands landscape character type is found outside of the river valleys to the north of the study area around Corridor 2B. It is described as being a gently rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular fields and ancient and plantation woodlands form a significant feature.
- 6.22 The Ancient Estate Claylands landscape character type is found outside of the river valleys to the south of the study area around Corridor 2A. It is described as being a gently rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular fields and ancient and plantation woodlands form a significant feature. Estate landscape features are evident.
- 6.23 Hintlesham Hall Hotel and Golf Course occupies the area between Corridor 2A and 2B. The former parkland setting is not a Registered Park and Garden, but the Hall is Grade I listed and is referred to in the cultural heritage section. Hintlesham parkland has been characterised within Suffolk County Council's landscape character assessment as part of the Ancient Plateau Claylands rather than the Ancient Estate Claylands to the immediate south. Representations by some members of the public have alluded to connections between the parkland and Capability Brown but no evidence has been found to support this. The existing 400kV overhead line already passes approximately 0.5km to the north of the hall and is buffered from it by intervening tree belts. The 132kV overhead line is approximately 1km to the south and separated from the hall and its grounds by intervening built form in Hintlesham village and wooded belts.
- 6.24 The existing 400kV and 132kV overhead lines are present in this landscape although they diverge west of Chattisham, with the 400kV overhead line running to the north of Hintlesham and the 132kV overhead line passing between Hintlesham and Chattisham to a terminal platform tower (pylon) at Burstall Bridge. The 132kV connection runs underground between the platform tower at Burstall Bridge and Bramford substation. From the platform tower the

132kV overhead line continues for a short distance in a south easterly direction terminating just north of Pigeon's Lane. This part of the 132kV overhead line between the platform tower and Pigeon's Lane would remain following the removal of the overhead line between Twinstead Tee and the platform tower at Burstall Bridge. The 132kV underground cables between the platform tower and Bramford substation would also remain in situ.

- 6.25 Study Area AB is broadly comprised of unremarkable arable land on plateaux of higher ground between the River Gipping (to the east of Bramford substation), Belstead Brook and the River Brett. Arable fields have a mixture of open and hedgerow boundaries, interspersed by angular blocks of broadleaved woodland, some of which are associated with former parkland landscapes. Settlement ranges from distinct villages to residential ribbon style development along roadsides. The study area is crossed at its eastern end by Belstead Brook, a small watercourse, which is a tributary of the River Orwell. Belstead Brook lies in a small and secluded valley to the west of the village of Burstall and contains pockets of pastoral land and woodland belts. The presence of Bramford substation, the busy A1071 and the existing overhead lines influence the landscape character of this study area. The boundary to locally designated Special Landscape Areas (SLA) in Study Area AB is not distinguishable in the landscape on the ground. In particular, it is not clear why the Brett Valley SLA extends beyond the valley landscape onto higher ground within Study Area AB.
- 6.26 The predominantly agricultural landscape in Study Area AB is broadly intact, although hedgerow loss and gappy hedgerows are relatively frequent. In addition, historic field patterns have been lost in some parts of the study area with the expansion of fields, such as land to the north and east of Hintlesham Woods. Arable land-use and a Golf Course have encroached on the parkland landscape at Hintlesham Hall, although woodland blocks and belts remain intact in the study area. Modern ribbon-style development along main roads also encroaches on the character of the rural landscape. Overall the landscape condition in Study Area AB is moderate.
- 6.27 As has been previously stated, the landscape within Study Area AB is of local value. The majority of Study Area AB crosses a plateau landscape between valleys and is broadly comprised of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. There is a valley landscape east of Burstall, through which Belstead Brook flows, but this is a relatively minor tributary of the River Orwell,

forming a less pronounced valley compared with other parts of the corridor. In addition, the presence of Bramford substation at the eastern end of the study area and the existing overhead lines crossing the study area mean that the landscape has capacity to accommodate a further overhead line. Overall and in relation to an additional overhead line, the landscape capacity of Study AB is high.

Assessment of effects

- 6.28 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on the local network of lanes as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land. The network of winding and sometimes sunken lanes is a component of the landscape character of this study area.
- 6.29 None of the overhead line options within Study Area AB would have indirect effects on the Dedham Vale AONB, due to distance, topography and intervening woodland.
- 6.30 The cumulative negative effect of an overhead line option on either Corridor 2A or 2B and the proposals for a converter station building at Bramford would not be significantly different from the negative effect of a new 400kV overhead line in isolation. The existing substation, particularly the outdoor elements, and associated overhead line pylons already have an influence on the local landscape character. The converter station building and associated infrastructure would be of a similar height to the existing substation and would sit within the context of nearby mature woodland blocks to the south and north. A building in an appropriate colour would add to the backgrounding of pylons by woodland in the area.

OHL 2A Alignment

- 6.31 A new overhead line in Corridor 2A would have a negative effect on the Belstead Brook SLA, Brett Valley SLA, the Rolling Valley Farmlands, Ancient Plateau Claylands and Ancient Estate Claylands Landscape Character Areas. Along a greater proportion of the route, the magnitude of effect (scale of change) on this landscape would be limited by the presence of the existing 132kV overhead line which would be removed and replaced with a new 400kV overhead line. In the western part of the study area, the magnitude of effect would be lessened further by the additional presence of the existing 400kV

overhead line. There would be a larger negative magnitude of effect (scale of change) in the area north of Burstall Bridge, where there is no overhead line at present. The potential effect on the landscape north of Bustall Bridge is a specific concern that has been expressed in feedback from consultation as representations have stated that this part of Corridor 2A is 'relatively unspoilt'.

- 6.32 In following the existing 132kV overhead alignment, it is anticipated that the potential negative effect of an overhead line on woodland and tree belts would be minimised. However this option would have a negative effect where the alignment crosses woodland belts or where hedgerow trees need to be removed. Woodland and hedgerow trees are components within the landscape character of the study area.
- 6.33 An overhead line in Corridor 2A would have a moderate negative magnitude of effect (scale of change) on the landscape, but the landscape is of local value, its condition is moderate and its capacity is high. Overall this option would result in a moderate negative effect on landscape character prior to mitigation.

OHL 2B Northern Alignment

- 6.34 A northern overhead alignment in Corridor 2B would have a negative effect on the Belstead Brook and Brett Valley SLAs and the Rolling Valley Farmlands and Ancient Plateau Claylands landscape character areas. However the magnitude of effect (scale of change) on this landscape would be limited by the presence of the existing 400kV overhead line.
- 6.35 In avoiding Hintlesham Woods SSSI, this option would extend the area affected to include the landscape to the north and west of Ramsey Wood. However proximity to mature woodland would assist in accommodating the additional overhead line in the local landscape.
- 6.36 This option could have a negative effect where the northern alignment crosses existing woodland belts and hedgerow trees, which are components of the landscape character of the study area.
- 6.37 An overhead line on a northern alignment in Corridor 2B would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and generally has high capacity for an overhead line. Overall this option would result in a moderate negative effect on landscape prior to mitigation.

- 6.38 Although an overhead alignment in Corridor 2A and a northern overhead alignment in Corridor 2B would both have moderate negative effects, a new overhead line in Corridor 2B would have a lower negative effect on landscape character than an overhead line in Corridor 2A as it would broadly parallel the existing 400kV overhead line, which would minimise the extent of area affected by 400kV overhead lines.
- 6.39 In addition, an overhead line on a northern alignment in Corridor 2B would result in a minor positive effect on the landscape in the vicinity of Corridor 2A where about 4km of 132kV overhead line would be removed and would not be replaced.

OHL 2B Southern Alignment

- 6.40 A southern overhead alignment in Corridor 2B would have a negative effect on the Belstead Brook and Brett Valley SLAs and the Rolling Valley Farmlands and Ancient Plateau Claylands landscape character areas. However the magnitude of effect (scale of change) on this landscape would be limited by the presence of the existing 400kV overhead line.
- 6.41 In avoiding Hintlesham Woods SSSI, this option would extend the local area affected by 400kV overhead lines to include the landscape to the north and west of Ramsey Wood. However proximity to mature woodland would assist in accommodating the additional overhead line in the local landscape.
- 6.42 This option could have a negative effect where the southern alignment crosses existing woodland belts. Woodland is a component of the landscape character of the study area.
- 6.43 An overhead line on a southern alignment in Corridor 2B would have a moderate magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has high capacity for an additional overhead line. Overall, this option would result in a moderate negative effect on landscape prior to mitigation.
- 6.44 Although both a northern and southern alignment in Corridor 2B would have moderate negative effects, a southern alignment in Corridor 2B would have a lower negative effect than an overhead alignment in Corridor 2A or a northern alignment in Corridor 2B as it would more closely parallel the existing 400kV overhead line for some distance. This would minimise the extent of the landscape affected by 400kV overhead lines.

- 6.45 In addition, an overhead line on a southern alignment in Corridor 2B would result in a minor positive effect on the landscape in the vicinity of Corridor 2A where about 4km of 132kV overhead line would be removed and not replaced.

Underground cable alignment

- 6.46 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area AB.
- 6.47 An underground cable route would not lead to any substantial long term negative effects on landscape character if disturbance to key features such as woodlands is avoided through routeing. There would be some localised and short term negative effects associated with the loss of hedgerow and trees within the study area, particularly where the cable route crosses Belstead Brook. An underground cable route in Study Area AB would have a moderate negative magnitude of effect (scale of change) on the landscape during construction and low negative magnitude of effect (scale of change) on the landscape in the long term and prior to mitigation. This scale of change would be experienced by a landscape of local value, which is in a moderate condition and has high capacity for this development. This would result in a minor negative long term effect on landscape prior to mitigation as a result of the underground cable option in Study Area AB.
- 6.48 There would be a minor positive effect on landscape, associated with the underground option, over a distance of about 6km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 6.49 At the western end of the study area, the siting of a sealing end compound is likely to lead to some localised negative landscape effects in the vicinity of Hadleigh Railway Walk. In the event of an underground cable route having to connect to a northern overhead alignment in Study Area C, the mature wooded belts to either side of Hadleigh Railway Walk would help to accommodate a sealing end compound in the landscape and would buffer it from the Brett Valley. A diversion of the underground cable route in Study Area AB of approximately 2.5km would be required to connect to a sealing end compound in this location. The landscape effects of this route would be similar to the effects of the main underground cable route.
- 6.50 If an underground cable were to connect to a southern overhead alignment in Study Area C, the mature wooded belts to either side of Hadleigh Railway Walk

would assist in the accommodation of a sealing end compound in the landscape. However, a sealing end compound on the western side of the Railway Walk and on the edge of the Brett Valley would result in greater negative effects on the landscape character of the Brett Valley.

- 6.51 Overall this option would result in a neutral effect on landscape in the long term.
- 6.52 There would not be any long term negative cumulative effect on the local landscape linked to the presence of an underground cable alignment and a converter station for the East Anglia Offshore Wind Ltd project in the vicinity of Bramford substation.

Potential for mitigation

- 6.53 It would be possible to minimise negative effects on the local lane network as a result of the construction of an overhead line or underground cable route through careful planning of access to avoid the need for road improvements, wherever possible. Effects on lanes could also be minimised by utilising existing gaps in hedgerows and existing field accesses as access points onto agricultural land. Modifications to highways would be planned to be reversible (see paragraph 5.66).

OHL Alignments

- 6.54 It is not possible for a new overhead line to avoid effects on the Special Landscape Areas or wider landscape character within the study area.
- 6.55 Mitigation by way of additional woodland and hedgerow planting in the vicinity of a new overhead line, depending on land owners' consent being granted, would be in keeping with the existing landscape character and could assist in lessening potential effects.

Underground cable alignment

- 6.56 There would be some unavoidable loss of trees and hedgerow as a result of an underground cable route through this study area. Loss of some trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree

planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.

- 6.57 The negative landscape effects of a sealing end compound could also be minimised through careful design and siting and the addition of new hedgerow and woodland planting within the site.

Summary

- 6.58 For all the overhead line options, the magnitude of effect (scale of change) would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. Overall, the overhead line options in Corridor 2B would result in a lesser effect on the landscape than that associated with Corridor 2A and there would also be a minor positive effect in the vicinity of Corridor 2A where around 4km of 132kV overhead line would be removed from the landscape. The greater amount of close paralleling associated with a southern alignment in Corridor 2B would have less effect on the landscape than the more widely spaced northern alignment. In the long term, the overhead line options would all lead to moderate negative effects on the landscape.
- 6.59 When the overhead alignment options are considered alongside other current proposals at Bramford substation, the cumulative negative effect would be no greater than moderate negative.
- 6.60 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area AB.
- 6.61 With mitigation, the magnitude of effect (scale of change) on landscape character as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on landscape. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on landscape would be negligible and the scale of effect on landscape would be broadly neutral.
- 6.62 There would be a minor positive effect on landscape character, associated with the underground option, where about 6km of the existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to influence the landscape.

- 6.63 Following the establishment of mitigation measures, the effect of a sealing end compound on landscape character close to Hadleigh Railway Walk would be limited to localised minor negative effects. Particular care would need to be taken in the design and siting of a compound at the eastern edge of the Brett Valley if a southern overhead alignment were to be adopted to the west (in Study Area C).
- 6.64 Overall, the long term effects on landscape character as a result of an underground cable option, following the establishment of mitigation measures, would be minor positive.

Environment - Visual Amenity

Baseline conditions

- 6.65 The public views in Study Area AB experienced by high sensitivity visual receptors are from public footpaths and cycle routes, particularly those which run directly beneath the existing overhead line. Hadleigh Railway Walk forms the western boundary of this study area and is a publicised footpath and also forms part of a National Cycleway (National Route 1), although views are often limited by vegetation and cuttings. From the southern end of Hadleigh Railway Walk, National Cycle Route 1 continues eastward along Woodlands Road and through Chattisham, close to Corridor 2A before travelling southward through Washbrook and Copdock toward the southern edge of Ipswich. In the main, there is a mixture of filtered and open views of the existing 132kV and 400kV overhead lines from this part of the route as far as the northern edge of Washbrook. A regional cycling route (Route 48) also runs to the north of the study area through Elmsett and Flowton from where there are some distant glimpsed views of the existing 400kV overhead line.
- 6.66 There are no long distance footpaths with views of the existing overhead lines in this study area. The Gipping Valley River Path lies approximately 2km to the east of the route corridor and is crossed by the overhead lines approaching Bramford substation from the east. Representations have highlighted that the local public right of way network within Study Area AB is used as part of a circular walk incorporating the Gipping Valley, although no published route has been identified.
- 6.67 Visual receptors of high sensitivity include the residents of a number of residential properties in Hintlesham and Chattisham and Burstall Bridge, who have open and filtered views of the existing 132kV overhead line and Corridor

- 2A. There are also open views from individual properties although wider views are increasingly limited by topography and vegetation, particularly due to the lower height of these pylons. Although properties in and to the east of Burstall do not currently have a view of an overhead line within Corridor 2A, properties have views toward Bramford substation and other overhead 132kV and 400kV overhead lines which connect to it.
- 6.68 There are open and filtered views of the existing 400kV overhead line from high sensitivity visual receptors at individual residential properties in close proximity, such as those on the A1071 to the northeast of Hintlesham Woods and also from the north eastern part of Burstall, where views extend to Bramford substation and the overhead lines which connect to it. Views of the existing 400kV overhead line from visual receptors of high sensitivity in Hintlesham are largely obscured by intervening woodland and tree cover associated with Hintlesham Golf Course. There are views of the existing 400kV overhead line from some properties on Duke Street to the south east of Hintlesham Woods. There are also some open and filtered views of the 400kV overhead line from residential properties in Chattisham but these are more distant (over 2km away). Views of the existing 400kV overhead line extend as far as Flowton (over 1km distant) and the southern edge of Elmsett (over 2km distant) to the north and to the northern edge of Copdock (up to 4km distant). The prominence of the existing 400kV overhead line in these views diminishes with distance, and with the effects of topography, woodland blocks and hedgerow vegetation which partly obscure, filter or provide backgrounds to views.
- 6.69 Guests at Hintlesham Hall Hotel and Hintlesham Golf Club house are categorised as high sensitivity visual receptors, whereas Hintlesham Golf Course users are categorised as moderate sensitivity. There is a mixture of glimpsed open and filtered views of both the 132kV and 400kV overhead lines from the driveway approach to the Hall and Hintlesham Golf Club. Due to the orientation of the Hall to the south west and the presence of intervening mature tree belts to the north, there are no views from the front of the Hall to the nearest part of the 400kV overhead line and mature trees also prevent views of the existing 132kV overhead line. Views from the front of the Hall at ground level are limited to the existing 400kV overhead line as it crosses Hintlesham Woods, such that only the upper half of the pylons are visible at a distance of approximately 2km. From the rear of the Hall views of the existing 132kV and 400kV overhead lines are obscured at ground level by mature trees and tree belts to the grounds of the hotel and Golf Course beyond. There are open and nearer views of the

existing 400kV overhead line from parts of Hintlesham Golf Course, as well as the club house itself.

- 6.70 In the western part of the study area, individual properties along Pond Hall Lane and to the immediate south have the nearest views of the existing 400kV and 132kV overhead lines. Feedback from consultation has drawn attention to these properties. There are some views of the overhead lines in this part of the study area from properties at the south eastern edge of Hadleigh and also from a few properties in the eastern edge where topography and vegetation does not prevent views. There are also more distant views from high ground to the north and west of Hadleigh, where views extend as far back as Hintlesham Woods.
- 6.71 As noted earlier, there are proposals for converter stations for the East Anglia Offshore Wind Ltd project to be located north of Bramford substation. There is potential for cumulative effects on views in the vicinity of Bramford substation as a result of this project and the Bramford to Twinstead Tee Connection project.
- 6.72 Given the scenic qualities of the landscape in Study Area AB and the commonplace nature of the views, views within Study Area AB are generally of local importance.

Assessment of effects

- 6.73 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on views as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land.
- 6.74 A new overhead line within Study Area AB would have a negative effect on the majority of public and private visual receptors within and to the immediate north and south of the study area. The effect on views of any of the overhead line options beyond 3km of the existing lines would be minor due to the presence of the existing lines, the distance of the viewer and the effects of intervening vegetation. For the majority of visual receptors either the existing 400kV and/or 132kV overhead lines are already present in these views. The presence of the existing overhead line would limit the magnitude of effect (scale of change) on views as a result of an additional overhead line.
- 6.75 The potential cumulative visual effects of an overhead line option in either Corridor 2A or 2B and the proposals for a converter station building at Bramford

would not be significantly different from the negative effect of a new 400kV overhead line in isolation. This is because the existing substation, particularly the outdoor elements, and associated overhead line pylons are already present in the majority of views. The converter station building and associated infrastructure would be of a similar height to the existing substation. A solid mass of a building in an appropriate colour would add to the backgrounding of views of pylons offered by woodland in the area.

OHL 2A Alignment

- 6.76 The greatest effect on views as a result of a 400kV overhead line in Corridor 2A in the eastern part of the study area would be experienced by high sensitivity visual receptors in closest proximity. In particular, the public rights of way and residential properties within and close to the part of Corridor 2A that do not have an existing overhead line would experience the greatest magnitude of effects (scale of change), although some of these receptors have existing views of other more distant overhead lines approaching Bramford substation. A greater magnitude of effect (scale of change) on views would also be experienced by residents within and close to Corridor 2A between Burstall Bridge and Primrose Farm, south west of Hintlesham Woods. This would include a number of visual receptors in both Hintlesham and Chattisham (approximately 0.5km distant). Views of a new 400kV overhead line from the southern edge of Hintlesham would be particularly prominent as the new 400kV overhead line would run along the opposite side of the valley to the village, foreshortening views. A greater magnitude of effect (scale of change) on views would also be experienced from the public rights of way and lanes that would run under the new overhead line within this part of the corridor or be in close proximity, such as National Cycle Route Number 1.
- 6.77 The increased height of pylons in Corridor 2A would result in partly filtered views of pylons from the driveway approach to Hintlesham Hall. It is unlikely that there would be any views of a new 400kV overhead line in Corridor 2A from the front of the Hall or from Hintlesham Golf Course, due to intervening mature trees and woodland.
- 6.78 In the western part of the study area (west of Primrose Farm), where an overhead alignment in Corridor 2A could follow a northern or southern closely paralleled 85m offset alignment, a new overhead line would have a negative effect on the majority of public and private visual receptors to the immediate north and south. However, for the majority of visual receptors the existing

400kV and 132kV overhead lines are already present in these views, which would limit the magnitude of effect (scale of change) in these views. A northern overhead alignment here would have a greater magnitude of effect on views, compared to a southern alignment, as it would bring the new 400kV overhead line closer to properties on Pond Hall Lane than the existing 400kV overhead line. This option would also result in a greater magnitude of effect (scale of change) to views in the vicinity of Primrose Farm and Hadleigh Bee Farm where a new overhead line would be constructed to the north of these properties. This would result in the removal of part of the existing 400kV overhead line to the east of these properties, which would benefit views from the residential property at Primrose Farm, which is closest to this part of the existing line.

- 6.79 Overall a new overhead line in Corridor 2A, on either a northern or southern alignment west of Hintlesham Woods, would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and views in the study area are generally of local importance. These options would result in a moderate negative effect on views in the long term and prior to mitigation.
- 6.80 Although a northern and southern overhead alignment (west of Hintlesham Woods) in Corridor 2A would both have moderate negative effects, a new overhead line on a southern overhead alignment would have a lower negative effect on views than a northern alignment as it would be further away from properties on Pond Hall Road.

OHL 2B Northern Alignment

- 6.81 The greatest effect on views as a result of a 400kV overhead line on a northern alignment in Corridor 2B would be experienced by high sensitivity visual receptors, who are users of the public rights of way which would cross beneath the new line, as well as occupiers of residential properties who would have nearer views of the new 400kV overhead line than at present. These residential properties would particularly include those at Burstallhill, which do not currently have views of the existing 400kV overhead line and also Ram's Farm and Ramsey Farm whose residents would have a much closer view of a new 400kV than the existing. Feedback from consultation has raised specific concerns as to the visual effects on residents as a result of a potential new 400kV overhead

line routed around the northern and western edge of Ramsey Wood. In addition, those properties on and to the immediate north of the A1071 (to the north of Hintlesham Woods) and the properties along Pond Hall Road would also have nearer views, including Kate's Hill Cottage in particular as its garden is oversailed in this option. In addition, some residential properties would have a 400kV overhead line to either side. These properties include Hill Farm, Park Farm and Kingsfield, Primrose Farm, Hadleigh Bee Farm and Pheasant House and the former Town House Fruit Farm. The existing 400kV overhead line is already present in many views and is often partly backgrounded or partly obscured in views experienced by visual receptors near Hintlesham Woods.

- 6.82 A northern alignment in Corridor 2B would provide a degree of separation between the new overhead line and Hintlesham Hall and Golf Course. This would lessen the magnitude of effect (scale of change) on views from the Golf Course and driveway approach to the Hall, but would not make any difference to views from the front of the Hall, which would see the upper half of new pylons around the northern edge of the Ramsey Woods (over 2km distant) with either a northern or southern alignment in Corridor 2B. In this view from the Hall the existing 400kV pylons would be closer.
- 6.83 Overall, a new overhead line on a northern alignment in Corridor 2B would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and views in the study area are generally of local importance. This option would result in a moderate negative effect on views in the long term and prior to mitigation.
- 6.84 Although an overhead alignment in Corridor 2A and northern overhead alignment in Corridor 2B would both have moderate negative effects, a new overhead line on a northern overhead alignment in Corridor 2B would result in minor positive effects in the vicinity of the existing 132kV overhead line as this would be removed from views. In addition, a northern alignment in Corridor 2B would affect views from fewer properties than Corridor 2A.

OHL 2B Southern Alignment

- 6.85 The greatest effect on views as a result of a 400kV overhead line on a southern alignment in Corridor 2B would be experienced by high sensitivity visual receptors in close proximity, which are users of public rights of way which would cross beneath the new line, as well as occupiers of residential properties who

would have nearer views of the new 400kV overhead line than at present. This would particularly include residents at Ram's Farm and Ramsey Farm who would have a much closer view of a new 400kV than the existing. Feedback from consultation has raised specific concerns as to the visual effects on residents as a result of a potential new 400kV overhead line routed around the northern and western edge of Ramsey Wood. In addition, a few residents at the north western edge of Burstall, properties at and near Mill Farm, Hintlesham Golf Course, properties at and near College Farm, and Kate's Hill Farm would also have nearer views. Feedback from consultation has highlighted the use of College Wood as an outdoor education resource for local schools and filtered views of a new 400kV overhead line would be likely to be visible from here. In addition, some residential properties would have a 400kV overhead line to either side as a result of this option. These properties include those on Church Hill between Burstall and Burstallhill, Kennels Cottage, Primrose Farm, Hadleigh Bee Farm and Pheasant House. The existing 400kV overhead line is already present in many views and is often partly backgrounded or partly obscured in views experienced by visual receptors near Hintlesham Woods.

- 6.86 Overall a new overhead line on a southern alignment in Corridor 2B would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and views in the study area are generally of local importance. This option would result in a moderate negative effect on views in the long term and prior to mitigation.
- 6.87 Although an overhead alignment in Corridor 2A and southern alignment in Corridor 2B would both have moderate negative effects, a new overhead line on a southern alignment in Corridor 2B would result in minor positive effects in the vicinity of the existing 132kV overhead line as this would be removed from views. In addition, a southern alignment in Corridor 2B would affect views from fewer properties than Corridor 2A.
- 6.88 Although a northern alignment in Corridor 2B and southern alignment in Corridor 2B would both have moderate negative effects, a southern alignment in Corridor 2B would closely parallel the existing 400KV for a greater proportion of Study Area AB which would limit the magnitude of effect (scale of change) on a number of views. A southern overhead alignment in Corridor 2B would also be better separated from existing residential properties, particularly in the western part of the study area (west of Hintlesham Woods). A southern alignment in Corridor 2B would bring the new overhead line closer to

Hintlesham Hall and Golf Course than a northern alignment, which would increase the magnitude of effect on views from the Golf Course and driveway approach to the Hall, but would not make any difference to views from the front of the Hall, which would be of the upper half of new pylons around the northern edge of the Ramsey Woods (over 2km distant) with either a northern or southern alignment in Corridor 2B. Overall a southern alignment in Corridor 2B would have a lower magnitude of effect on views compared to a northern alignment in Corridor 2B.

Underground cable alignment

- 6.89 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area AB.
- 6.90 An underground cable route would not lead to any substantial long term effects on views if disturbance to important features such as woodland is avoided through routeing, although it is recognised that some loss of trees and hedgerows will occur, which would have a localised negative effect on existing views. An underground cable route would have a moderate negative magnitude of effect (scale of change) on views in the temporary and short term and a low negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and views in the study area are generally of local importance. This would result in a minor negative effect on views without mitigation and in the long term, as a result of an underground cable route in Study Area AB.
- 6.91 There would be a minor positive effect on views, associated with this option, where 6km of the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line. Undergrounding would result in a neutral effect in the vicinity of Burstall (where there is no existing overhead line) and where there are views of the existing 400kV overhead line there would be no change to the existing view.
- 6.92 The siting of a sealing end compound at the western end of the study area is likely to lead to some localised negative visual effects in the vicinity of Hadleigh Railway Walk. In the event of an underground cable route having to connect to a northern overhead alignment in Study Area C, the mature wooded belts to either side of Hadleigh Railway Walk would assist in filtering views from cyclists and walkers using National Cycle Route 1. This vegetation and surrounding tall hedgerow vegetation would assist in limiting or filtering views of a sealing end

compound from the immediate surrounding area. An approximately 2.5km diversion of the underground cable route in Study Area AB would be required to connect to this location. This would utilise a route which would avoid woodland and orchards and visual effects would not differ from those of the main underground cable route assessed.

- 6.93 If an underground cable were to connect to a southern overhead alignment in Study Area C, the mature wooded belts to either side of Hadleigh Railway Walk and nearby woodland blocks would assist in limiting views from the north, east and south. However, the sealing end compound would be on the western side of the railway walk and on the edge of the Brett Valley, which would result in views from receptors within the valley and greater negative effects. The presence of the existing overhead line infrastructure would also assist in lessening the scale of change on the local landscape.
- 6.94 Overall, an underground cable option would result in a neutral effect on views in the long term prior to mitigation.

Potential for mitigation

- 6.95 For both the overhead and underground alignment options it would be possible to minimise negative effects on views as a result of road improvements to the local lane network through careful planning of access to avoid the need for road improvements, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term negative visual effects would be unavoidable until re-establishment.

OHL Alignments

- 6.96 Mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line, with the agreement of landowners, would be in keeping with the existing landscape character and could assist in lessening potential effects on views.

Underground cable alignment

- 6.97 The visual effects of an underground cable alignment would largely be temporary, subject to the avoidance of the majority of woodland through routing. Loss of some trees and hedgerow through this study area could be minimised through careful routing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the

cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.

- 6.98 The negative visual effects of a sealing end compound at the western end of Study Area AB could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the site.

Summary

- 6.99 For all the overhead line options, the magnitude of effect (scale of change) on views would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. Overall, the overhead line options in Corridor 2B would affect fewer visual receptors and would have a lesser magnitude of effect (scale of change) on views compared to an overhead line in Corridor 2A and would also result in a minor positive effect in the vicinity of Corridor 2A where around 4km of 132kV overhead line would be removed from the views. The greater amount of close paralleling associated with a southern alignment in Corridor 2B would have less magnitude of effect on views overall compared to a northern alignment in Corridor 2B. Overall and in the long term, the overhead line options would all lead to moderate negative effects on visual amenity.
- 6.100 When the overhead alignment options are considered alongside other current proposals at Bramford substation, the cumulative negative visual effect would be no greater than moderate negative.
- 6.101 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area AB.
- 6.102 With mitigation, the magnitude of effect (scale of change) on visual amenity as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on views. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on views, would be negligible and the scale of effects on visual amenity would be broadly neutral.

- 6.103 There would be a minor positive effect on views where about 6km of the existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to form part of many views.
- 6.104 Following the establishment of mitigation measures, the effect of a sealing end compound on views close to Hadleigh Railway Walk would be limited to localised minor negative effects. Particular care would need to be taken in the design and siting of a compound at the eastern edge of the Brett Valley if a southern overhead alignment were to be adopted to the west (in Study Area C).
- 6.105 Overall, the long term effects on visual amenity as a result of an underground cable option would be minor positive.
- 6.106 When the underground cable option is considered alongside other current proposals at Bramford substation, there would not be any long term negative cumulative effects on views as a result of the two proposals.

Environment - Cultural Heritage

Baseline conditions

- 6.107 Within Corridor 2A there are five Grade II listed buildings - Old Mill Cottage, Fenn Farmhouse, Doves Cottage, Manor Farmhouse and Wood Farmhouse. Immediately adjacent to Corridor 2A are a number of listed buildings at Burstall, Hintlesham and Chattisham and a Scheduled Monument at Cobblers Corner.
- 6.108 There are 12 non-designated heritage assets within Corridor 2A. These include four areas of historic woodland, two possible moats, the site of a Roman building, the Hadleigh Junction Branch Railway (disused), the findspot of a prehistoric axe, a bridge, an earthwork bank and a milestone.
- 6.109 Within Corridor 2B there are three Grade II listed buildings - Canes Farm, Park Farmhouse and Burstall Hill Cottages. Immediately adjacent to Corridor 2B are Grade II listed Norman's Farmhouse, Pond Hall, College Farm and Old Hall House. A further Grade II listed building, Mill Farm Cottage is recorded by English Heritage at Jubilee Cottages, but this location is incorrect; Mill Farm Cottage is to the north-east of Hintlesham Park.
- 6.110 There are nine non-designated heritage assets distinct to Corridor 2B. These include two areas of historic woodland, three findspots of medieval pottery, Pond Hall Deer Park and possible moat, a soilmark and remnants of the

designed landscape around Hintlesham Hall (discussed in more detail below). In addition, the underground alignment to the north of Corridor 2B is in close proximity to a cropmark complex, Bronze Age and medieval find spots and Hintlesham Priory, a Grade II listed building and the documented site of Sparkford deserted medieval village.

- 6.111 Hintlesham Hall is a Grade I listed building located between Corridors 2A and 2B. The associated Hintlesham Park lies, in part, within Corridor 2B. The service ranges, stables, former coach house and brewhouse attached to the Hall are Grade II* listed, and the gate piers, gates and railings, and Hintlesham Hall Lodge are Grade II listed. The park is not included on the National List of Registered Parks and Gardens, but is included in the local Historic Environment Record.
- 6.112 English Heritage, the Cultural Heritage Thematic Group and the relevant Community Forum have all advised that Hintlesham Hall requires specific consideration in terms of the likely effects of the connection options.
- 6.113 Hintlesham Hall is a country house (now hotel) dating originally to the late 16th century. It was altered in the 1680s by Henry Timperley and remodelled circa 1725-40 by Richard Powys. The lodge dates from this period, as do parts of the service ranges. The gate piers, gates and railings date from the late 18th Century. The Hall is listed grade I as a building of exceptional interest and is of national importance. The Historic Environment Record (HER) records the Hall and Park, noting in addition: the fishponds leading to hydraulic ram, 'The Basin' (possibly an ornamental fishpond), and the 'ice-house' marked on the first edition ordnance survey map of 1883 close to 'The Basin'. The HER notes that the Hall and park are shown on Hodkinson's map of Suffolk, 1783. The HER also notes that a map of 1595 appears to show an open ended rectangular moat, named 'Hintlesham Halle' at the same location, suggesting a medieval precursor to the later 16th Century house.
- 6.114 Feedback from consultation has suggested that the parkland surrounding the hall may have been designed by Capability Brown has not been validated by the research undertaken to date. Elements of the park may date from the 18th century refurbishment. The park is described in an account of the Hall dated 1827 (although this account describes the grounds around the Hall as "*by no means of a picturesque description*").
- 6.115 Ordnance Survey mapping of 1883 - 1905 shows the extent of the park around the Hall, defined to the north by strip of woodland, to the east and west by

hedgerows and trees and to the south by the Ipswich Road. In addition, a tree-lined avenue starts at the front of the Hall (the Hall is orientated facing south-west), crossing the park, the Ipswich Road and continuing across fields in a south-west direction, before a break of one field and then a cleared avenue extends the line between Hintlesham Little Wood and Hintlesham Great Wood. This deliberate vista from the front of the house is also likely to be contemporary to the remodelling. Hintlesham Park is shown on the Ordnance Survey maps throughout the 20th century, and still appears on the modern OS mapping, with the exception of the tree-lined/ tree-cleared vista which is significantly degraded by the 1930s and disappears completely by the 1950s. The Hall was used as a Red Cross Hospital during World War II, but stood empty for a time between the late 1960s and early 1970s. It was during this time that, according to a local history of the Hall, some of the park for was sold for farmland. The Hall was restored during the 1970s and became a hotel in the 1980s. The golf clubhouse was built in 1991, and a large part of the former parkland is now in use as a Golf Course. The existing 400kV overhead line is first shown on mapping dating from 1972.

- 6.116 As it appears today, a large part of the former parkland has been altered, most significantly the areas to the north and west of the Hall. These areas are now in use as arable farmland, which has resulted in the loss of parkland trees, and therefore loss of parkland character. The character of these areas is very different to that of the Golf Course and the intact parkland to the east of the main drive.
- 6.117 The primary interest and reason for designation of Hintlesham Hall is the architectural and historical value of the Hall and other buildings associated with the Hall, which form a group. The park is not mentioned in the list description, and is not registered. The former park does, however, illustrate the setting of Hintlesham Hall (including the area of the former avenue that extends beyond the limits of the park to the south-west). The setting of the Hall therefore extends to Square Pastures Covert to the north, Home Wood to the east, includes Hintlesham village to the south and Hintlesham Little and Great Woods to the east. This description of the setting of the Hall is based on the former extent of Hintlesham Park, rather than as it presently survives.
- 6.118 There are parts of the setting that survive well, namely: the core buildings of the Hall, service ranges, stables, coach house and brewhouse; the lodge; the main drive; and the intact parkland to the east of the drive. These parts of the setting make a positive contribution to the significance of the Hall and to the

ability to appreciate that significance. Conversely, the areas now in use as arable fields do not make a positive contribution towards the significance of the Hall, as they no longer characterise the former parkland in which it was set.

- 6.119 In the historic landscape characterisation carried out by Suffolk County Council, Study Area AB (with the exception of Hintlesham Park which is included as 'Post Medieval Park and Leisure') is described as predominantly post-1950s agricultural land within a wider setting of pre-18th century enclosure. Much of south Suffolk is characterised in this way due to the intact field system.
- 6.120 The underground route crosses three parish boundaries in Study Area AB, two of these are demarked by hedgerow, which would certainly be 'important' in terms of the Hedgerow Regulations³⁷. Other hedgerows will form part of a pattern of pre-18th century enclosure, as described by the Suffolk Historic Landscape Characterisation project, and will therefore also be 'important'.

Assessment of effects

- 6.121 For all of the connection options, improvements to the road network necessary for construction activities could negatively affect 'important' hedgerows and historic lanes. The magnitude of effect would be low on heritage assets of low sensitivity. An overall minor negative effect is therefore predicted.
- 6.122 For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including access tracks). The magnitude of effect would be low/moderate on heritage assets of low/moderate sensitivity. An overall minor negative effect is therefore predicted.
- 6.123 Effects of the overhead line options on the setting of designated heritage assets and an underground cable option on buried archaeology are discussed in more detail below.

OHL 2A Alignment

- 6.124 An overhead alignment in Corridor 2A would have a negative effect on views to and from listed buildings at Burstall, Hintlesham and Chattisham, including Grade II listed Chattisham Hall (albeit not at close proximity). Given the distance of separation, the magnitude of effect on these receptors (all of which are of high sensitivity) would be low.

³⁷ Hedgerow Regulations 1997 : 1997 No 1160

- 6.125 An overhead option in Corridor 2A would have a negative effect on the setting of Grade II listed Old Mill Cottage, Fenn Farmhouse, Doves Cottage, Wood Farm and Manor Farmhouse. These receptors are of high sensitivity. In relation to Old Mill Cottage and Fenn Farmhouse, the presence of the existing 132kV overhead line and the distance of separation between these listed buildings and the alignment lessens the negative effect. The magnitude of effect would be low. In relation to Doves Cottage, Wood Farm and Manor Farmhouse, which are in close proximity to the alignment, the presence of the existing 132kV and the screening provided by mature trees that surround the curtilage of these listed buildings lessens the negative effects and again the magnitude of effect would be low.
- 6.126 The overall scale of effect of an overhead alignment in Corridor 2A in relation to cultural heritage receptors would be minor negative.

OHL 2B Northern Alignment

- 6.127 An overhead option on a northern alignment in Corridor 2B would have a negative effect on the setting of Burstall Hill Cottages, Old Hall House, Norman's Farmhouse, Pond Hall and Park Farm, all Grade II listed buildings. This alignment would avoid Hintlesham Park and Hintlesham and Ramsey historic woods.
- 6.128 The receptors are all of high sensitivity. In relation to Burstall Hill Cottages, Pond Hall, Norman's Farmhouse and Old Hall House, the presence of the existing 400kV overhead line and screening provided by mature trees that bound the curtilage to the listed buildings lessens the negative effects and the magnitude of effect would be low.
- 6.129 At Park Farm there is limited existing screening around the listed building to lessen the effect of a new 400kV overhead line. The northern alignment would result in a 400kV overhead line to the north and south of the listed building. Because of this separation of the lines, the presence of the existing 400kV overhead line does not lessen the negative effects at Park Farm, nor would the views be screened or filtered. The magnitude of effect in relation to this receptor would therefore be moderate.
- 6.130 Taking the magnitude of effect on all of the receptors of high significance into account, the overall scale of effect of a northern alignment in Corridor 2B would be minor negative.

OHL 2B Southern Alignment

- 6.131 An overhead option on a southern alignment in Corridor 2B would have a negative effect on the setting of Canes Farm, Mill Farm Cottage, College Farm, and, common to the northern alignment Pond Hall and Old Hall House, all Grade II listed buildings. These receptors are all of high sensitivity. In relation to Canes Farm, the presence of the existing 400kV overhead line and the screening provided by mature trees that bound the curtilage to the listed buildings would lessen the negative effects and the magnitude of effect would be low. In relation to College Farm, there is less screening, but farm buildings between the southern alignment and the listed building would screen views and lessen the negative effects, as would the presence of the existing 400kV overhead line. In the case of Mill Farm Cottage, there is limited screening to reduce the negative effects, although the presence of the existing 400kV overhead line would lessen the negative effects. For these receptors the magnitude of effect would be low.
- 6.132 The southern alignment would also have a negative effect the setting of Hintlesham Hall, a Grade I listed building. This alignment would cross the former parkland to the north of Hintlesham Hall, closely paralleling the existing 400kV overhead line. The existing 400kV overhead line already impacts the setting of the Hall, which as elsewhere would reduce the negative effect of a new 400kV overhead line. As set out above, due to loss of parkland character and its appearance predominantly as an area of arable farmland, the part of the setting affected by the southern alignment does not make a positive contribution to, or better reveal, the significance of Hintlesham Hall.
- 6.133 The Hall is orientated to the south-west and was intentionally designed with long views in that direction, originally delineated by a tree lined avenue. The southern alignment is not visible in these views. In addition, there is screening by mature trees and hedgerow, and intervening modern buildings (namely the Golf Club clubhouse), that limit views from the Hall to the surrounding countryside, to the north, east and south. The visual amenity assessment identifies that views from the front of the Hall at ground level to the existing 400kV overhead line are limited, and that from the rear of the Hall views of the existing 400kV overhead line are obscured.
- 6.134 These factors would reduce the negative effect of a new 400kV overhead line on the setting of Hintlesham Hall, and the southern alignment would have only a low magnitude of effect on this receptor.

- 6.135 However, given that the southern alignment would have a negative effect on a receptor of very high sensitivity, as well as negative effects on a number of receptors of high sensitivity, the overall scale of effect of a southern alignment in Corridor 2B would be moderate negative.
- 6.136 An overhead option in Corridor 2B, on either a northern or southern alignment, would enhance the setting of Grade II listed Manor Farmhouse and Dove's Cottage through the removal of the existing 132kV overhead line, which currently has a negative effect on the setting of these designated heritage assets.

Underground cable alignment

- 6.137 An underground option in Study Area AB would negatively affect buried archaeological remains. Study Area AB has a large number of potentially 'important' hedgerows compared to other study areas, and the potential for the survival of buried archaeology is moderately high. Given the high probability of encountering known and previously unrecorded archaeological remains within an underground cable route, the magnitude of effect of an underground option in Study Area AB is predicted to be high.
- 6.138 An underground option would also negatively affect the historic landscape, through the removal of historic hedgerows, some of which are 'important' in terms of the Hedgerow Regulations criteria. The magnitude of effect would be low on heritage assets of low sensitivity.
- 6.139 In addition, an underground option in Study Area AB would require a sealing end compound. A compound to the east of the Hadleigh Railway could have negative effects on buried archaeology, as a Roman villa has been identified close to the former railway on land associated with the former Town House Fruit Farm. A sealing end compound could also have negative effects on the setting of listed buildings, particularly Benton End Farm, which given its agricultural associations has a setting that extends beyond its curtilage. The magnitude of effect would be low/ moderate on heritage assets of low/ moderate, high and very high sensitivity.
- 6.140 It is difficult to determine the scale of effect in relation to buried archaeology. However, given the predicted high magnitude of effect on receptors of moderate/low sensitivity, as well as the negative effects of sealing end compounds, the overall effect of an underground option is moderate negative.

- 6.141 An underground option would enhance the setting of Grade II listed Manor Farmhouse and Dove's Cottage through the removal of the existing 132kV overhead line, which currently has a negative effect on the setting of these designated heritage assets.
- 6.142 The construction of the East Anglia Offshore Wind Farm Ltd converter stations adjacent to Bramford substation would not affect the setting of any of the listed buildings referenced above, and no cumulative effects are therefore likely. In terms of direct physical impacts on buried archaeology and historic landscape features, following the implementation of appropriate mitigation in the case of each development, there would be a neutral cumulative impact on non-designated heritage assets.

Potential for mitigation

- 6.143 Mitigation of negative effects on buried archaeology and historic landscape features can be achieved. There is less scope to mitigate the negative effects on the setting of designated heritage assets.
- 6.144 For all options, potential effects on historic landscape features could be avoided, or mitigated through archaeological recording, careful reinstatement, and in the case of hedgerow loss, translocation or replanting.
- 6.145 For all options, an extensive programme of archaeological investigation, mitigation and monitoring would be required to mitigate effects on buried archaeology.

Summary

- 6.146 An overhead alignment in Corridor 2A would have a low negative magnitude of effect on five receptors of high sensitivity. The overall scale of effect of this alignment in relation to heritage assets would be minor negative.
- 6.147 An overhead alignment in Corridor 2B, to the north of the existing 400kV overhead line, would have a low negative magnitude of effect on five receptors of high sensitivity. The overall scale of effect of this alignment in relation to heritage assets would be minor negative.
- 6.148 An overhead alignment in Corridor 2B to the south of the existing 400kV overhead line would have a low negative magnitude of effect on five receptors of high sensitivity, and one receptor of very high sensitivity. There is limited scope to mitigate the negative effect on the setting of Grade I listed Hintlesham Hall, although the magnitude of effect is lessened by a number of factors: the

parkland character of the area affected by the southern alignment has been degraded and this part of the setting no longer makes a positive contribution towards the significance of the Hall; the orientation of the Hall is to the south-west and not in the direction of the southern alignment; the existing 400kV overhead line is present within the setting of the Hall; and, views towards the southern alignment from the Hall are limited and obscured. However, a low magnitude of effect on a receptor of very high significance would result in an overall scale of effect that is moderate negative. In light of this the overall effect of an overhead line on a southern alignment in Corridor 2B would be moderate negative.

- 6.149 An overhead alignment in Corridor 2A would affect the same number of heritage assets as a northern overhead alignment in Corridor 2B. Both would have a minor negative effect. However, when the negative effects are balanced against the positive effect on the setting of listed buildings that the removal of overhead line in Corridor 2A would have if Corridor 2B was taken forward, the scale of effect would be greater for an overhead alignment in Corridor 2A compared to an overhead alignment in Corridor 2B.
- 6.150 The overall effects on cultural heritage of a southern alignment in Corridor 2B would be greater than the overall effects of a northern alignment. Both would affect a similar number of heritage assets of high significance, but the southern alignment would also affect the setting of Hintlesham Hall, a Grade I listed building of very high significance. Although the magnitude of change on the setting of Hintlesham Hall would be limited, the overall scale of effect of this alignment would be assessed as moderate.
- 6.151 While mitigation of negative effects on buried archaeology and historic landscape features is achievable, preservation in situ is preferred. An underground option would require considerably more mitigation with respect to non-designated heritage assets, and result in direct physical impacts (as opposed to indirect visual impacts) compared to an overhead line. The effects of an underground cable in Study Area AB and an overhead line connection are very different in relation to heritage assets and difficult to compare. However, given the high probability of direct impacts and significant mitigation requirements in relation to an underground cable compared to an overhead alignment, the scale of effect would be greater for an underground cable option than an overhead line.

Environment - Ecology

Baseline conditions

- 6.152 There is one Site of Special Scientific Interest (SSSI) within Study Area AB. Hintlesham Woods SSSI, which is valued at the national level, is designated for its ancient semi-natural woodland habitat and associated bird communities. The designation includes Wolves Wood, Keeble Grove, Ramsey Wood and Hintlesham Great Wood. The latter two fall within the Corridor 2B and are connected by secondary woodland dating to the 16th and 19th centuries. The SSSI is also a RSPB Reserve.
- 6.153 There are six County Wildlife Sites (CWS) within Study Area AB, valued at county level:
- Fore and Bushy Grove CWS is a woodland site in the northeast of Corridor 2B;
 - Round Wood and Elms Grove CWS is an ancient woodland site in the northeast of Corridor 2A and is noted for supporting a wide range of woodland birds particularly warblers;
 - Sproughton Park CWS covers a range of habitat including wet grassland, alder carr, veteran trees, hedgerows, ponds and springs and fauna associated with the site includes birds, bats, badger, otter, water vole, water shrew and amphibians;
 - Tom's/Broadoak Wood CWS is an ancient woodland site (although a large proportion has been planted with conifers) located in the southwest end of the study area;
 - Valley Farm Meadow comprises wet grassland and a drier herb-rich meadow and is located in the far southwest of the study area;
 - Hadleigh Railway Walk CWS is a former railway line converted into a footpath and bridleway and designated as a Local Nature Reserve (LNR), it forms the west boundary of this study area and contains chalk grassland and woodland habitats and runs through Raydon Great Wood CWS south of the study area.
- 6.154 The study area contains several small watercourses including Belstead Brook, near Burstall, Spring Brook near Hintlesham and an un-named brook in the south west of the study area. There are records of otter in the wider area and

this species is likely to use watercourses within the study area. These watercourses are valued at the local level.

- 6.155 In addition to the woodland within the County Wildlife Site designations, there are numerous small woodland blocks and linear areas of woodland scattered across the study area, the latter are often associated with ditches and brooks. There are records of several species of bat in the wider area. Bats are likely to use woodlands for foraging and/or roosting. The woodland blocks are also likely to be used by a variety of bird species and there are records of dormice in woodlands in the wider area (to the northwest and southwest) which indicates potential for the species to be present within the study area. These small woodland blocks are likely to range in value from local to district level depending on composition and association with other species.
- 6.156 The study area is dominated by arable fields with some improved and semi-improved pasture land. There are a few small areas of species-rich semi-improved grassland in the southwest and some scattered unmanaged field margins in Corridor 2B. Species including badger, brown hare, hedgehog and various reptile species have been recorded within the study area and surrounding land. The intrinsic value of the grasslands is low but associations with valued species would increase their value.
- 6.157 A network of hedgerow field boundaries characterise the landscape, many of which are species-rich and/or contain hedgerow trees. The hedges are likely to have a connective function and could support a range of species including birds, bats, dormice and amphibians. The network of hedgerows is valued at the district level, but the value of individual hedgerows will vary depending on composition and association with other species.
- 6.158 Numerous ponds are also scattered across the countryside including fishing ponds, ornamental ponds, ponds associated with watercourses and ponds along field margins or in woodlands. There are records of great crested newt in the wider area (Wolves Wood in the northwest and Chattisham in the south) and there is potential for this species to be present within the Route Corridor. The study area and wider area also contains records for badger, brown hare, hedgehog amphibians and reptiles. The ponds are likely to range in value from local to district level depending on composition and association with other species.

Assessment of effects

OHL 2A Alignment

- 6.159 An overhead line option in Corridor 2A on both a northern and southern alignment would largely avoid impacts on the nationally valued SSSI although some disturbance of breeding birds using the SSSI may result from the 2A northern option during works immediately south of Ramsey Wood. This would result in a low negative, temporary magnitude of effect on the SSSI.
- 6.160 The Corridor 2A alignments avoid most of the county valued CWSs, although they have the potential to result in a small permanent loss of trees at the crossing of the county valued Hadleigh Railway Walk CWS/LNR. These small losses would have a low negative, long term magnitude of effect.
- 6.161 Small permanent losses of linear woodland habitat would also occur and this is likely to weaken the wildlife corridor function of these habitats resulting in a moderate negative, long term magnitude of effect. The permanent loss of individual hedgerow trees along the route cannot be ruled out resulting in a low negative, long term magnitude of effect. However, the hedgerow network will be retained. Impacts on ponds and watercourses would be avoided with this option and grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.
- 6.162 In combination the low magnitude of effects on receptors of local to county value would lead to an overall minor negative effect on ecology as a result of the Corridor 2A southern alignment prior to mitigation. This would rise to a moderate negative effect from the Corridor 2A northern alignment prior to mitigation, due to disturbance of breeding birds in the SSSI.

OHL 2B Alignments

- 6.163 An overhead line option on either a northern or southern alignment in Corridor 2B would have minimal impact on the nationally valued SSSI and avoid impacts on most county valued CWSs within the study area. Both options within Corridor 2B would require the construction of a new overhead line around the northwest edge of Ramsey Wood. The findings of an ornithological assessment³⁸ indicate that this is unlikely to result in bird collision incidents due to the species

³⁸ TEP : Bramford to Twinstead Tee Connection: Route Corridors Ornithological Assessment 2009-2011 (Report Ref 1980.087)

using the wood. The alignment around the SSSI would be offset from the woodland to avoid tree loss. However, there is the potential for tree canopies in some limited areas to infringe the required safety clearances and this may necessitate some lopping. The RSPB and Suffolk Wildlife Trust (SWT) have expressed a desire to maintain connectivity between the Ramsey Wood and Keebles Grove units of the SSSI. The hedgerows that extend north from Ramsey Wood towards Keebles Grove comprise mature trees and it is likely that some tree pollarding or removal will be required to achieve safety clearances beneath the overhead line. This could weaken connectivity between the SSSI units. Works adjacent to the SSSI are likely to have some temporary disturbance impacts on species using the wood. Both Corridor 2B alignments would result in a moderate negative, long term magnitude of effect on the SSSI.

6.164 The Corridor 2B alignments have the potential to result in a small permanent loss of trees at the crossing of the county valued Hadleigh Railway Walk CWS and LNR. These small losses would have a low negative, long term magnitude of effect.

6.165 Small permanent losses of linear woodland habitat would also occur and this is likely to weaken the wildlife corridor function of these habitats resulting in a moderate negative, long term magnitude of effect. The permanent loss of individual hedgerow trees along the route cannot be ruled out resulting in a low negative, long term magnitude of effect due to the loss of mature trees but allowing the hedgerow network to be retained. Impacts on ponds and watercourses would be avoided with this option and grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

6.166 In combination the low to moderate magnitude of effects on receptors of local to national value would lead to an overall moderate negative effect on ecology as a result of either of the Corridor 2B alignments prior to mitigation.

Underground cable alignment

6.167 An underground option in Study Area AB would have only minimal impact on the nationally valued SSSI. Effects could result from hedgerow losses outside the designation where the hedgerow provides a wildlife link between the Ramsey Wood and Keebles Grove units of the SSSI and from disturbance to

breeding birds where works are adjacent to the SSSI. This would result in moderate negative, long term magnitude of effect on the SSSI.

- 6.168 The underground option would avoid impacts on all the county valued CWSs. At Hadleigh Railway Walk CWS and LNR, the installation of cables would employ horizontal directional drilling to avoid impacts within the designation.
- 6.169 There would be losses of up to 65m of habitat at hedgerow crossings and permanent tree losses along the banks of Belstead Brook. These habitat losses are likely to impact bats, dormice (if present) and nesting birds and are also likely to weaken the wildlife corridor function of these habitats. This would result in a high negative, long term magnitude of effect. The species associated with the Brook such as otter, are also likely to experience temporary fragmentation effects and a reduction in water quality during construction leading to a moderate negative, medium term magnitude of effect. Grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.
- 6.170 The location of a sealing end compound at the western end of the study area is not expected to result in additional effects on ecology, with the possible exception of hedgerow disturbance to the east of Hadleigh Railway Walk should a cable connection to a northern overhead alignment be adopted.
- 6.171 In combination the low to moderate magnitude of effects on receptors of local to national value would lead to an overall major negative effect on ecology as a result of the underground option prior to mitigation.
- 6.172 The cumulative effects resulting from proposals for converter stations adjacent to Bramford substation as part of the East Anglia Offshore Wind Ltd project are not anticipated to alter the effects on ecology identified in the assessment of options within Study Area AB.

Potential for mitigation

- 6.173 For all options, existing field access points and watercourse crossings would be used for works traffic and standard environmental protection measures implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities onto retained habitats and implementation of pollution control methods.

6.174 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as dormice, amphibians and reptiles, if present. As losses of potential dormouse habitat in Study Area AB would be limited to linear features, impacts would be primarily ones of fragmentation of populations and feeding grounds. If any dormouse woodland or hedgerow habitats are removed, replacement linear planting of shallow rooting species (over underground cable easements) and areas of low height planting (along overhead line easements) can be used to mitigate for fragmentation impacts.

OHL Alignments

6.175 Where tree loss is required to achieve electrical safety clearances, pollarding or coppicing could be used to avoid total loss of habitat. Alternatively, where tree removal is required, hedgerow or scrub planting across the easement can be used to maintain habitat connectivity. Replacement tree planting could be undertaken outside the overhead line easement subject to landowner agreement.

6.176 Artificial trackways could be used to protect ground conditions. Alternatively, turf translocation or re-seeding would be employed where working areas affect important species-rich grassland habitats.

6.177 Where or if it is determined that disturbance from works will have a significant impact on breeding birds within the SSSI, these can be timed to avoid sensitive seasons.

Underground cable alignment

6.178 Working areas would be minimised when crossing valued habitat features to avoid or reduce impacts, habitats within the permanent easement would be reinstated on completion of works (with the exception of trees), although varying establishment periods will apply and loss of mature trees cannot be mitigated within a reasonable timeframe.

6.179 Where tree removal within woodland is required, hedgerow planting could be used to maintain habitat connectivity and replacement woodland planting could be undertaken outside the permanent easement, subject to landowner agreement, however, due to the uncertainty of securing landowner agreement for works outside the easement this form of mitigation has not been taken into account in the overview of effects which follows.

- 6.180 Temporary fragmentation impacts on bats and dormouse caused by hedgerow removal could be mitigated through the use of aerial bridges (across short distances). Where hedgerow loss impacts on important bat flyways or important dormouse connections then ducting could be used to install the underground cable which could avoid hedgerow loss.
- 6.181 Measures would be undertaken to ensure that drainage conditions outside the permanent easement are unaltered, which would be particularly important adjacent to Valley Farm Meadow CWS but also in the vicinity of wetland or aquatic habitats.
- 6.182 If any great crested newts (GCN) breeding ponds are removed, 2 for 1 replacement habitat would be created in advance of any losses (currently no ponds have been identified within the underground cable route).

Summary

- 6.183 The overhead alignments avoid substantial impacts on the SSSI and only cross a small number of linear areas of woodland, none of which are protected by a wildlife designation or listed as ancient woodland. Although loss of individual mature trees can only be compensated rather than mitigated, losses would be relatively small and impacts on species associated with these habitats are minimal. Mitigation including wildlife-friendly working methods and planting within the permanent easement (to minimise fragmentation impacts) would reduce impacts on ecology from all overhead line options in Study Area AB to minor negative.
- 6.184 The underground option within Study Area AB would avoid substantial impacts on the SSSI, avoid impacts on CWSs and largely avoid woodland habitat. However, it cannot avoid hedgerows and would result in hedgerow removal at route crossings. The resultant habitat fragmentation could have substantive impacts on species such as dormice and bats. It is not possible to mitigate within a reasonable timeframe the loss of mature trees and hedgerows associated with an underground option. However, temporary measures can lessen impacts on connectivity in the short term and replacement hedgerow planting can reduce effects in the long term. These mitigation methods in combination with wildlife-friendly working methods would reduce impacts on ecology from the underground option in Study Area AB to a moderate negative effect.

6.185 Substantial impacts on the nationally important SSSI and county valued CWSs can be avoided with all of the connection options. However, the overhead line options overall would have fewer ecological effects compared with the underground option. All overhead line alignment options would result in only minor negative effects but choosing either of the Corridor 2A alignments would remove the small risk that some trees along the edge of Ramsey Wood may require limb removal to achieve safety clearances.

Socio-economic – Economic activity

Baseline conditions

6.186 In the Hintlesham, Chattisham and Washbrook area the main sources of economic activity other than farming, are the Hintlesham Hall Hotel and Golf Club, local businesses benefitting from passing trade on the A12/A14 and A1071 including hotels, bed and breakfast premises and local pubs, alongside the commercial fishing lakes at Kate's Hill and Fen Farms.

Assessment of effects

6.187 With all options there would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. Given the density of the public right of way (PROW) network there is likely to be some minor highly localised disruptions to PROWs during construction. In addition there would be potential during construction for increased HGV traffic on the local road network including that covered by the National Cycle Route 1 [NCR1] which runs south of Hadleigh and then eastwards on the local road network to Chattisham and Washbrook on the way to Ipswich.

6.188 The construction phase, for all options, would also bring short term benefits to the local economy in terms of increased spend by the construction teams and additional income for local suppliers.

6.189 The overhead alignments have the potential to have minor negative impacts on businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.

OHL 2A Alignment

- 6.190 This part of the route corridor is not a particular focus for tourism activity, although there is the potential for some highly localised negative impacts for some visitors, recreational users and businesses.
- 6.191 There would be no direct impacts on the Hintlesham Golf Course or hotel grounds. Some open glimpses and filtered views of Corridor 2A would be possible in winter months on the driveway approach to the Hintlesham Hotel and Golf Club, however the effect would be neutral. Five tourist related businesses would have open views of a new transmission line in Corridor 2A. These comprise guest accommodation, an outdoor play area and a fishing lake.
- 6.192 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.
- 6.193 Both northern and southern alignments in Corridor 2A would run close to Kate's Hill Fishing Lakes and, depending on the detailed alignment, may oversail one of the lakes. Due to the proximity to the route alignment there is some potential for negative impacts during construction as disturbance from construction activity could deter visitors. Post construction the overhead line would be prominent in views alongside the existing 400kV overhead line. There would be no direct impacts on the Fen Farm fishing lakes.

OHL 2B Northern Alignment

- 6.194 There would be no direct impacts on the Hintlesham Golf Course or hotel grounds. The northern alignment would be separated from these facilities by the existing 400kV overhead line and intervening woodland and its effects would be minimal. There would be views from ground level at the front of the hotel building of the northern alignment where it runs around Hintlesham Woods. However this would be at a distance of about 2km and the existing 400kV overhead line, where it crosses the woods, already forms part of this view.
- 6.195 Three tourist related businesses would have views of the alignment, all of which would be open views.
- 6.196 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.
- 6.197 The alignment would run close to the Kate's Hill Fishing Lake and depending on the detailed alignment may oversail one of the fishing lakes. The existing

400kV overhead line already oversails one of the fishing lakes on the property. There is also, due to the proximity to the route alignment, some potential for negative impacts during construction. There would be no impacts on the Fen Farm fishing lakes.

OHL 2B Southern Alignment

- 6.198 There would be open views of the alignment from the Hintlesham Golf Course club house and a mix of open and partial views from parts of the Golf Course and the hotel grounds. There would be views from ground level at the front of the hotel building of the southern alignment to the north of Hintlesham Woods. However this would be at a distance of about 2km and the existing 400kV overhead line, where it crosses the woods, already forms part of this view.
- 6.199 Three tourist related businesses would have open views of the new overhead line.
- 6.200 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.
- 6.201 The alignment would run close to the Kate's Hill Fishing Lake and depending on the detailed alignment may oversail one of the fishing lakes. The existing 400kV overhead line already oversails one of the fishing lakes on the property. There are also, due to the proximity to the route corridor some potential for negative impacts during construction. There would be no impacts on the Fen Farm fishing lakes.

Underground cable alignment

- 6.202 The permanent removal of existing 132kV overhead lines and pylons would lead to improvements to views enjoyed by users of the public rights of way network and the national cycle network. It would result in a beneficial impact on visitors attracted to the area by the quality of the environment and the opportunities for informal recreation and on tourist-related businesses.
- 6.203 There would be no effects on the Hintlesham Golf Course or hotel grounds. The underground alignment would come close to an area of land to the north of Northlands Farm, Hintlesham which was granted planning permission in January 2011 [B/11/01190/FUL] for the erection of six holiday cabins and the creation of a new lake. However it would have no effect on this proposed development.

- 6.204 A sealing end compound in the western part of the area would have filtered views from the Hadleigh Railway Walk and other nearby PROWs, with potential open views from the PROWs east and west of Hadleigh Railway Walk. Depending on exact location there would also be filtered views of a sealing end compound from Kate's Hill Fishing Lake. Overall this would result in minor negative impacts which would be highly localised.
- 6.205 There is potential for minor localised impacts during construction on agricultural land resulting in partial crop or harvest loss. The option would result in the temporary loss of around 7.6 ha of Grade 2 agricultural land and 40.6 ha of Grade 3 agricultural land.

Potential for mitigation

- 6.206 There are a number of measures that can be put into place to mitigate the effects of temporary construction works on visitors' enjoyment of the area. This may include the programming of construction activities and routing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are disrupted during construction, alternative or diversionary routes would be provided.
- 6.207 Agricultural mitigation measures would include restoration of agricultural land disturbed during construction to productive quality. National Grid will pay appropriate compensation for temporary loss of crops and other effects on agricultural use and for permanent easements for its infrastructure.
- 6.208 The construction works in the vicinity of Kate's Hill Fishing Lake can be carefully managed to avoid disruption during construction to ensure a neutral impact.
- 6.209 The detailed design of an overhead line alignment would ensure the required clearance levels over the fishing lake are achieved so that that it can remain operational.

Summary

- 6.210 The southern overhead alignment in Corridor 2B has the potential to have a minor negative effect on the environs of Hintlesham Hall Hotel and Golf Course which are visitor attractions in the local area. The overall effect of the other alignments on economic activity would be broadly neutral as economic activity in the area is not particularly focussed on tourism. Both overhead alignments in Corridor 2B and an underground solution have the potential to benefit the

attractiveness of the area, by securing the removal of the 132kV overhead line, and negative effects are capable of mitigation.

Cost

Capital cost

6.211 The estimated capital costs, based on the assumptions referred to in Chapter 5 are as follows:

- Corridor 2A northern £18.2m
- Corridor 2A southern £16.3m
- Corridor 2B northern £17.0m
- Corridor 2B southern £18.8m
- Underground £171.8m

Lifetime cost

6.212 The estimated lifetime costs, based on the assumptions referred to in Chapter 5 are as follow :

- Corridor 2A northern £47m
- Corridor 2A southern £42m
- Corridor 2B northern £44m
- Corridor 2B southern £49m
- Underground £179m

Summary

6.213 In terms of both capital and lifetime costs, an underground option would be considerably more expensive than the overhead options. Of the overhead options, the Corridor 2A southern option would impose the lowest lifetime cost.

Interim overhead alignment

6.214 This section of the report first compares Corridor 2A with Corridor 2B and then addresses the differences between the northern and southern alignments in Corridor 2B.

6.215 Overall, the overhead line options in Corridor 2B would affect fewer visual receptors and would have a lesser magnitude of effect (scale of change) on

- landscape and views compared to an overhead line in Corridor 2A. An overhead line in Corridor 2B would also result in a minor positive effect in the vicinity of Corridor 2A where around 4km of 132kV overhead line would be removed from the landscape and views.
- 6.216 The overhead alignment in Corridor 2A would affect broadly the same number of heritage assets as an overhead alignment in Corridor 2B (with the exception of Hintlesham Hall Grade I listed building, which is only affected by a southern alignment in Corridor 2B). However, when the negative effects are balanced against the positive effect on the setting of listed buildings that the removal of overhead line in Corridor 2A would have if Corridor 2B was taken forward, the scale of effect would be greater for an overhead alignment in Corridor 2A compared to an overhead alignment in Corridor 2B.
- 6.217 While an alignment in Corridor 2A would avoid further impacts on the Hintlesham Woods SSSI, the impact of alignments in Corridor 2B would in any event be minimal. It would not therefore be appropriate to distinguish between the corridors on ecological grounds.
- 6.218 Adopting an alignment in Corridor 2B would permit the removal of the 132kV overhead line which occupies the gap between the settlements of Chattisham and Hintlesham. Removal of the line would benefit both landscape and visual amenity in this area. In so doing it would also enhance the attractiveness of the area to visitors. The effect of an alignment in Corridor 2A on economic activity would be broadly neutral as economic activity in the area is not particularly focussed on tourism.
- 6.219 Alignments in Corridor 2B would generally be more expensive than alignments in Corridor 2A because of the greater route length.
- 6.220 Although more expensive, alignments in Corridor 2B would be favoured over those in Corridor 2A on landscape, visual, heritage and socio-economic grounds, with little to choose between the corridors on grounds of ecology. Further consideration has therefore been given to the comparison of northern and southern alignments in Corridor 2B.
- 6.221 The greater amount of close paralleling associated with a southern alignment in Corridor 2B would have less negative magnitude of effect on landscape and views overall compared to a more widely spaced northern alignment in Corridor 2B.

- 6.222 The overall effects on cultural heritage of a southern alignment in Corridor 2B would be greater than the overall effects of a northern alignment. Both would affect a similar number of heritage assets of high significance, but the southern alignment would also affect the setting of Hintlesham Hall, a Grade I listed building of very high significance, albeit that the magnitude of effects on the setting of Hintlesham Hall would be limited.
- 6.223 There would be no significant difference between the alignments in terms of the effect on ecology in general and the Hintlesham Woods SSSI in particular.
- 6.224 A southern alignment would bring changes to the environs of Hintlesham Hall and Golf Course which have the potential to adversely affect these visitor attractions. However such effects are expected to be minor. The effect of a northern alignment on economic activity is expected to be broadly neutral.
- 6.225 A northern alignment in Corridor 2B would be about £5m less expensive than a southern alignment in terms of lifetime costs. As noted in paragraph 5.69, a northern approach to Bramford substation would be more difficult to engineer given the arrangement of overhead line entries to Bramford substation and the proposals of East Anglia Offshore Wind Ltd.
- 6.226 A southern alignment in Corridor 2B would be favoured in terms of landscape and views but not in terms of the effects on heritage assets or economic activity. Such effects (including the effects on the Grade I listed Hintlesham Hall) are however assessed as minor negative. Given that technical issues would also support a southern alignment, it is concluded that the interim overhead alignment in Study Area AB would be a southern alignment in Corridor 2B.

Undergrounding

- 6.227 In line with National Policy Statement EN-5, National Grid has considered the benefits of undergrounding in the context of the landscape in which the proposed connection would be set, together with the additional cost and the environmental and archaeological consequences of undergrounding. Comparisons are drawn between the interim overhead alignment described above and the underground option.

Landscape and visual considerations

- 6.228 Study Area AB is broadly comprised of unremarkable arable land on a plateau of higher ground between the River Gipping (to the east of Bramford substation), Belstead Brook and the River Brett. The majority of Study Area AB is designated a Special Landscape Area in Babergh District Local Plan. The landscape in Study Area AB west of Hintlesham Woods and east of Clay Lane is not designated. The boundary to locally designated Special Landscape Areas (SLA) in Study Area AB is not distinguishable in the landscape on the ground. In particular, it is not clear why the Brett Valley SLA extends beyond the valley landscape onto higher ground within Study Area AB. Given the designations within Study Area AB, the landscape is of local value.
- 6.229 There are no national landscape designations within this study area and the setting of the Dedham Vale AONB, whose boundary lies between 2km and 7km to the south west, would not be affected by a new overhead line within this study area.
- 6.230 The predominantly agricultural landscape in Study Area AB is broadly intact, although hedgerow loss and gappy hedgerows are relatively frequent. In addition, historic field patterns have been lost in some parts of the study area with the expansion of fields, such as land to the north and east of Hintlesham Woods. Arable land-use and a Golf Course have encroached on the parkland landscape at Hintlesham Hall, although woodland blocks and belts remain intact in the study area. Modern ribbon-style development along main roads also encroaches on the character of the rural landscape. Overall the landscape condition in Study Area AB is moderate.
- 6.231 The majority of Study Area AB crosses a plateau landscape between valleys and is broadly comprised of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. There is a valley landscape east of Burstall, through which Belstead Brook flows, but this is a relatively minor tributary of the River Orwell, forming a less pronounced valley compared with other parts of the corridor. In addition, the presence of Bramford substation at the eastern end of the study area and the existing overhead lines crossing the study area mean that the landscape has a greater capacity to accommodate a further overhead line. Overall and in relation to an additional overhead line, the landscape capacity of Study Area AB is high.

- 6.232 The beneficial effect on landscape character and visual amenity as a result of the removal of the 132kV overhead line is common to both a southern overhead alignment option in Corridor 2B and underground option in Study Area AB.
- 6.233 In the main, the baseline views, in and near Study Area AB, include the existing 400kV overhead line and the existing 132kV overhead line. The removal of the 132kV overhead line within Study Area AB and construction of a new 400kV overhead line would represent a negative scale of change to these views, but the change would generally be consistent with the existing baseline conditions. Given the qualities of the landscape in Study Area AB and the commonplace nature of the views, views within Study Area AB are generally of local importance.
- 6.234 Views of the southern alignment in Corridor 2B would be experienced by high sensitivity visual receptors, which would include users of public rights of way, particularly those which would cross beneath the new line. High sensitivity visual receptors from a relatively small number of private residential properties would experience closer views of 400kV overhead line infrastructure than at present. This would include residents at the north western edge of Burstall, properties at and near Mill Farm, properties at and near College Farm, Ram's Farm, Ramsey Farm and Kate's Hill Farm. In addition, some residential properties would have a 400kV overhead line to either side as a result of this option. These properties include Canes Farm and Orchard Lands between Burstall and Burstall Hill, Kennels Cottage, Primrose Farm, Hadleigh Bee Farm and Pheasant House. The existing 400kV overhead line is already present in these views. In addition the views of the existing 400kV overhead line experienced by those visual receptors in the vicinity of Hintlesham Woods are often partly backgrounded or partly obscured.
- 6.235 The landscape in Study Area AB has a high capacity to accommodate an additional 400kV overhead line on a southern alignment in Corridor 2B. Although, there would be views of a new 400kV overhead line for a number of high sensitivity visual receptors, existing views in the area are generally of local importance. In addition, the magnitude of effect (scale of change) to the landscape and views as a result of an additional 400KV overhead line would be no greater than moderate negative due to the presence of the existing overhead lines in the baseline conditions. Overall a southern overhead alignment in Corridor 2B would result in a moderate negative effect on landscape character and visual amenity. There would be minor positive effects

associated resulting from the removal of the 132kV overhead line, which would be secured by taking forward the southern overhead alignment in Corridor 2B.

6.236 An underground option would avoid the moderate negative effects on landscape and views associated with a southern overhead alignment option in Corridor 2B in Study Area AB.

6.237 The scale of effect on landscape and views as a result of undergrounding in Study Area AB would be broadly neutral in the long term. There would also be a positive effect on landscape and views, associated with the underground option, over a distance of about 6km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line. The greatest benefit to views would be experienced by those residents in Hintlesham and Chattisham (high sensitivity visual receptors) that have a view of the 132kV overhead line, but not of the existing 400kV overhead line, and also by users of public footpaths in closest proximity to the 132kV overhead line. There would be a benefit to those that currently see both the existing 132kV and 400kV overhead lines, particularly where the 132kV overhead line is closer in the view. There would be no benefit to those residents in individual properties north of Hintlesham, or footpaths and roads that only have a view of the existing 400kV overhead line, as the 400kV overhead line would remain in these views. Overall, the long term effects on landscape character and visual amenity as a result of an underground cable option would be minor positive.

6.238 The overall benefits of undergrounding in Study Area AB are the minor positive effects on landscape and views, compared to the moderate negative effects on landscape and views as a result of a southern overhead alignment option in Corridor 2B.

Undergrounding cost

6.239 The estimated capital cost of undergrounding through this section of the route is estimated at £171.8m, compared to a cost of £18.8m for the interim overhead alignment. The estimated lifetime costs are £179m and £49m respectively.

Environmental and archaeological consequences of undergrounding

6.240 An underground cable route would enable the negative effects which the interim overhead alignment would have on the setting of Grade II listed Canes Farm, Mill Farm Cottage, College Farm, Pond Hall and Old Hall House, to be avoided. In the main, these receptors would be screened from the interim overhead

- alignment by intervening vegetation, buildings or the presence of the existing 400kV overhead line and the magnitude of effect of the interim overhead alignment would be low.
- 6.241 An underground cable route would also enable the negative effect on the setting of Hintlesham Hall, a Grade I listed building, to be avoided. The existing 400kV overhead line already affects the setting of the Hall, but this part of the setting does not make a positive contribution to, or better reveal, the significance of Hintlesham Hall. The magnitude of effect of the interim overhead alignment would be low.
- 6.242 No particular ecological benefits would be associated with an underground cable route. Interim overhead alignment works adjacent to the Hintlesham Woods SSSI are likely to have some temporary disturbance impacts on species using the wood, which would be avoided with an underground cable route.
- 6.243 An underground cable route would avoid the minor negative effects which the interim overhead alignment could have on a small number of local businesses, including Hintlesham Hall hotel and Golf Course.
- 6.244 The length of underground cable route would lead to extensive ground disturbance which would lead to large negative effects on non-designated buried archaeology. The effects on buried archaeology would be much greater as a result of an underground cable, compared to an overhead alignment. The negative effects would be direct, and lead to total loss or substantial harm in relation to multiple non-designated heritage assets. Mitigation is available for the negative effects through archaeological investigation and recording, although buried archaeology is a finite and non-renewable resource and preservation *in situ* is preferred when possible.
- 6.245 An underground option could also result in negative effects on the historic landscape through the removal of historic hedgerow. Mitigation is available for these effects and no long term effects would remain.
- 6.246 The underground option within Study Area AB would avoid substantial ecology impacts on the SSSI, on CWSs and woodland habitat. However, as noted above, it cannot avoid hedgerows and would be likely to result in losses of up to 65m of habitat at hedgerow crossings. In addition, the resultant habitat fragmentation can have substantive impacts on species such as dormice and bats. Even with replacement hedgerow planting, impacts on ecology from the underground option in Study Area AB would have a moderate negative effect.

Conclusions

- 6.247 Although the landscape is of local value, it is of low sensitivity and the topography and landscape features of the study area mean that the capacity of the landscape to accept overhead electricity lines is high. It would not be regarded as a 'particularly sensitive location' in the context of paragraph 2.82 of National Policy Statement for Electricity Networks Infrastructure (EN-5). The assessment has considered whether 'the benefits from the non-overhead line alternative (underground cables) will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable'³⁹.
- 6.248 The interim overhead alignment would give rise to a moderate negative scale of effects on a landscape with a high capacity to absorb this type of effect. Putting the new line underground would avoid this negative effect and there would be a minor positive effect on the landscape resulting from the removal of the existing 132kV overhead line. The latter benefit would also be partly achieved with the interim overhead alignment.
- 6.249 The interim overhead alignment would give rise to a moderate scale of negative effects on the views from a relatively small number of receptors of high sensitivity. This scale of change reflects the fact that the existing 400kV overhead line is present in local views. These effects would be avoided if underground cables are used and there would be a minor positive effect on views resulting from the removal of the existing 132kV overhead line. The latter benefit would also be partly achieved with the interim overhead alignment.
- 6.250 The extra economic impacts of putting the line underground would involve incurring lifetime costs £130m higher than those of the overhead line equivalent.
- 6.251 The interim overhead alignment is anticipated to have minor negative socio-economic effects on a small number of tourist-related businesses, including Hintlesham Hall hotel and Golf Course which could be avoided by the use of underground cables.
- 6.252 There would be minor negative effects on buried archaeology from an overhead line because of the relatively small area of ground disturbed during pylon construction. The interim overhead alignment would have a moderate negative effect on cultural heritage because of impacts on the setting of heritage assets,

³⁹ National Policy Statement for Electricity Networks Infrastructure (EN-5) Paragraph 2.8.9

including the former parkland associated with the Grade I listed Hintlesham Hall, although the latter does not make a positive contribution to the setting of the Hall. The effects on buried archaeology of putting the line underground would also be moderate negative. It is preferable to leave archaeological remains in situ whereas undergrounding would bring a high degree of disturbance where excavations take place and some further potential effects from the use of the haul road. These effects can be mitigated by investigation and recording.

6.253 The effects on ecology of the interim overhead alignment would be minor negative. Effects on ecology of putting the line underground would arise because of disturbance to habitats, notably to sections of hedges, although no designated sites would be adversely affected by the installation of underground cables. The negative effects can be mitigated by planting and taking measures to reduce fragmentation during the construction period. The long term effects would be moderate negative.

6.254 There are no insurmountable technical difficulties associated with the installation of underground cables.

6.255 The benefits from the use of underground cables as an alternative to an overhead line in this location, which is assessed as not being particularly sensitive, will not clearly outweigh any extra economic, social and environmental impacts. Undergrounding would not therefore be appropriate in this study area.

Study area conclusion

6.256 It is recommended that an **overhead** line solution be taken forward for consultation for Study Area AB and that the **Corridor 2B southern alignment** be identified as the least constrained alignment. Subject to representations received during consultation, this is the alignment which National Grid should take forward to the next stage in the design process.

7 OPTIONS APPRAISAL STUDY AREA C - BRETT VALLEY

Study area boundaries

- 7.1 This study area covers a section of the corridor with the eastern boundary defined by the former Hadleigh branch railway (now Hadleigh Railway Walk) and the western boundary defined by Overbury Hall Road.
- 7.2 Hadleigh lies approximately 0.5km to the north of the existing 400kV overhead line and the villages of Upper Layham and Lower Layham are approximately 0.25km and 0.5km to the south of the existing 132kV overhead line respectively.
- 7.3 The options for Study Area C are shown on Figure 7.

Definition of options

OHL Northern Alignment

- 7.4 The northern overhead alignment would closely parallel the existing 400kV overhead line at an 85m offset at the eastern end of the study area, crossing the woodland just to the south of Benton End Farm. The alignment would diverge from the existing line northward to avoid Layham Park and would have a maximum separation from the existing line of almost 0.5km at the western boundary to the study area. The approximate length of this option would be 1.6km.

OHL Southern Alignment

- 7.5 The southern overhead alignment would broadly parallel the existing 400kV overhead line by following the alignment of the existing 132kV overhead line through the majority of the study area. The new overhead line would more closely parallel the existing 400kV overhead line for a short distance at the eastern extent and in the western half of the study area. The approximate length of this option would be 2km.

Underground cable alignment

- 7.6 The underground cable alignment would cross Hadleigh Railway Walk to the south of the route corridor and then run northward along the edge of the Railway Walk before following the approximate route of the existing 132kV

overhead line across the valley as far as Overbury Hall Road. The approximate length of this option would be 2.6km.

- 7.7 If an underground cable route were to be taken forward in Study Area C and not in the adjacent Study Areas AB and D, then at the western extent of Study Area C, it is anticipated that the underground cable route could connect to either a northern or southern overhead alignment at a point to the north of Overbury Hall and west of Overbury Hall Road.
- 7.8 At the eastern end of Study Area C, in order to connect to a northern overhead alignment, the underground cable would need to be routed to the eastern side of Hadleigh Railway Walk to a point west of the former Town House Fruit Farm. A connection to a southern overhead alignment in Study Area AB could be achieved through a minor diversion of the cable route to cross to the eastern side of the Hadleigh Railway Walk, at a point where the disused railway is on a slight embankment.

Other options considered but discounted

- 7.9 Consideration was given to a closely paralleled northern alignment at an 85m offset, however this option oversailed part of Layham Park and residential property on Layham Road. For these reasons it was considered necessary to route the northern overhead alignment option north of Layham Park.
- 7.10 Consideration was given to a closely paralleled southern alignment at an 85m offset, however this option oversailed a residential property on the west side of B1070 - Benton Street. For this reason it was considered necessary to route the southern option further south to a similar alignment as the existing 132kV overhead line.
- 7.11 Consideration was given to an underground route, which briefly followed the approximate route of the 132kV overhead line before crossing beneath the existing 400kV overhead line near the B1070 and continuing northward to avoid Layham Park, exiting the study area to the north of the route corridor. This option was discounted as it did not allow flexibility for a sealing end compound to connect to either a northern or southern alignment at the eastern study area boundary.

Environment – Landscape

Baseline conditions

- 7.12 Study Area C crosses the Brett Valley. This part of the Brett Valley is designated as a Special Landscape Area (SLA) in the Babergh District Local Plan and is of local value. Feedback from public consultation has revealed the cultural association with the lesser known artist Sir Cedric Morris who ran the East Anglian School of Painting and Drawing from Benton End Farm in the Brett Valley, (between 1939 and the 1960s), which in turn attracted a range of artists including Lucian Freud and Maggi Hambling.
- 7.13 Feedback from Thematic Group and Community Forum members has highlighted the local value placed on the Brett Valley and the desire to see the connection underground.
- 7.14 There are no regional or national landscape designations within this study area itself. However, the Brett Valley SLA extends north from the Dedham Vale AONB along the River Brett and the AONB boundary lies approximately 2km to the south.
- 7.15 The Suffolk Landscape Character Assessment characterises this study area as Rolling Valley Farmlands and Valley Meadowlands. The Valley Farmlands are described as having gently sloping valley sides within a wider rolling landscape. This landscape is comprehensively settled and contains locally distinctive villages often with late medieval cores. Woodland forms a distinctive feature in the land beyond the valley and is often present on the upper slope and framing views out from the valley.
- 7.16 The Valley Meadowlands are largely dominated by grazing land with small carr woodlands and willow plantation and occasional areas of fen.
- 7.17 The River Brett is a tributary of the River Stour which flows some 5km to the south of this study area. This is a small and unremarkable valley with gently sloping and rounded valley sides. The Brett Valley is broadly comprised of arable land to its valley sides with pockets of pastoral land at the valley bottom. Fields have a mixture of open and hedgerow boundaries. There are some small blocks of broadleaved woodland, woodland belts and mature trees which are found on the valley sides, some of which are associated with Layham Park. The landscape at Layham Park has been specifically referred to in feedback from

consultation, although this parkland landscape is not designated. The southern residential edge of Hadleigh extends into the part of the valley crossed by Corridor 2 and there are playing fields and a sewage works associated with this settlement edge.

- 7.18 The villages of Upper and Lower Layham are to the south of the route corridor. Lower Layham is an attractive village tucked away on the edge of the valley, predominantly consisting of traditional buildings, including a church. The village of Upper Layham predominantly consists of modern housing and is located in the valley bottom. Apart from these distinct settlements there are a few isolated residential properties, including Benton End Farm, Layham Hall and Layham Mill. Layham Mill sits on the river between Lower and Upper Layham and is an attractive hidden feature in the Brett Valley landscape, accessible by public footpath. This footpath link was highlighted by Hadleigh Community Forum as being particularly valued within the valley, along with other riverside walks along the Brett.
- 7.19 The predominantly agricultural landscape in Study Area C is broadly intact, although hedgerow loss and gappy hedgerows are relatively frequent. In addition, historic field patterns have been lost in some parts of the study area with the expansion of fields, such as land on the eastern valley side. Woodland blocks, parkland and field trees remain largely intact in the study area. Modern development at Upper Layham and the sports fields and sewage works at the southern edge of Hadleigh encroach on the character of the agricultural landscape. Overall the landscape condition in Study Area C is moderate.
- 7.20 As has been previously noted, the landscape within Study Area C is of local value. Study Area C crosses a valley landscape. Valley landscapes generally have less capacity to accommodate an overhead line compared with an open plateau landscape, as the overhead line can appear out of scale with the enclosed landscape. However this part of the Brett valley has gently sloping valley sides and is mainly comprised of large open arable fields, which lessens the degree of enclosure and increases the scale of the landscape. In addition, the existing overhead lines crossing the study area mean that the landscape has a greater capacity to accommodate a further overhead line. Overall and in relation to an additional overhead line, the landscape capacity of Study Area C is moderate.

Assessment of effects

- 7.21 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on the local network of lanes as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land. The network of sunken lanes is a component of the landscape character of this study area.
- 7.22 A new 400kV overhead line would be visible from parts of the northern edge of the AONB, but the distance of separation (2km) and the presence of the existing overhead lines would result in a negligible magnitude of change such that the indirect effects on the AONB as a result of either overhead line option in this study area would be neutral.

OHL Northern Alignment

- 7.23 A northern overhead alignment in Study Area C would have a negative effect on the Brett Valley SLA, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). A northern overhead alignment option would mean that the smaller 132kV pylons, to the south of the existing 400kV overhead line, would be removed and a new overhead line would be constructed to the north of the existing 400kV overhead line. In the western part of the study area, this alignment would not closely parallel the existing 400kV overhead line and this would increase the extent of the Special Landscape Area affected by 400kV overhead lines. Overall a northern alignment option would have a greater negative magnitude of effect (scale of change) compared to a southern alignment.
- 7.24 This option would also have a negative effect where the northern alignment would run through an area of woodland to the south of Benton End Farm. There is also likely to be a loss of some hedgerow trees due to the electrical safety clearances required. Woodland and hedgerow trees are components of the landscape character of the study area.
- 7.25 An overhead line on a northern alignment in Study Area C would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has moderate capacity for this development. Overall this option would result in a moderate negative effect on landscape prior to mitigation.

OHL Southern Alignment

- 7.26 A southern overhead alignment in Study Area C would have a negative effect on the Brett Valley SLA, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). In this option, a new overhead line would take the place of the existing 132kV overhead line which broadly parallels the existing 400kV overhead line and this would minimise the extent of the SLA affected by 400kV overhead lines.
- 7.27 A southern option would minimise any woodland loss by following the alignment of the existing 132kV overhead line in the western part of the study area and so could utilise the line of existing easements where the line currently crosses a corner of woodland to the immediate east of Overbury Hall Road. It is possible that some tree loss would still occur where hedgerow trees require removal due to the clearances required. This would represent a negative effect as hedgerow trees area component of the landscape character of the study area.
- 7.28 An overhead line on a southern alignment in Study Area C would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has moderate capacity for this development. Overall this option would result in a moderate negative effect on landscape prior to mitigation.
- 7.29 Although a northern and southern overhead alignment in Study Area C would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on landscape character as it would have a lesser negative magnitude of effect (scale of change) on the landscape.

Underground cable alignment

- 7.30 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area C.
- 7.31 An underground cable route would not lead to any substantial long term negative effects on the landscape character if disturbance to important features such as woodlands are avoided through routeing. It is recognised that there would be some loss of hedgerow and hedgerow trees within the study area and there would be tree losses where the route crosses a tree belt to the west of Hadleigh Railway Walk and part of a plantation woodland at the western end of the study area, which would lead to localised negative effects on landscape

- character. The use of directional drilling techniques to cross the River Brett and Hadleigh Railway Walk would minimise effects elsewhere.
- 7.32 An underground cable route in Study Area C would have a moderate negative magnitude of effect (scale of change) on the landscape during construction and low negative magnitude of effect (scale of change) on the landscape in the long term. This scale of change would be experienced by a landscape of local value, which is in a moderate condition and which has high capacity for this development. This would result in a minor negative long term effect on landscape prior to mitigation as a result of an underground cable option in Study Area C.
- 7.33 There would be a minor positive effect on landscape, associated with the underground option, over a distance of 2km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 7.34 If an underground cable route were to be established in Study Area C in isolation, then the siting of sealing end compounds would lead to some localised landscape effects. At the eastern extent of Study Area C this would introduce negative local landscape effects to the eastern side of Hadleigh Railway Walk. However, the mature tree belts to either side of Hadleigh Railway Walk, separating a cable sealing end compound from the main Brett Valley, would assist in the accommodation of the compound in the landscape. At the western end of Study Area C a sealing end compound would introduce negative local landscape effects in the area to the west of Overbury Hall Road, on the edge of the Brett Valley. Due to the presence of Overbury Hall and Valley Farm Woods to the immediate west of the study area boundary there are few opportunities to locate a compound at the western end of Study Area C which could connect to a southern overhead alignment in Study Area D. However, existing mature trees and woodland belts to the north of Overbury Hall would assist in accommodating a compound. A cable route, connecting to an overhead line on a northern alignment in Study Area D, could pass south and west across agricultural land to a point immediately east of Valley Farm Woods, where topography and mature vegetation would assist in accommodating a sealing end compound away from the edge of the Brett Valley.
- 7.35 Overall this option would result in a neutral effect on landscape in the long term prior to mitigation.

Potential for mitigation

- 7.36 It would be possible to minimise negative effects on the local lane network as a result of the construction of an overhead line or underground cable route through careful planning of access to avoid the need for road improvements, wherever possible. Effects on lanes could also be minimised by utilising existing gaps in hedgerows and existing field accesses as access points onto agricultural land. Modifications to highways would be planned to be reversible (see paragraph 5.66).

OHL Alignments

- 7.37 It is not possible to for a new overhead line to avoid effects on the SLA within the study area
- 7.38 For both overhead line options, mitigation by way of additional woodland and hedgerow planting in the vicinity of a new overhead line, depending on land owners' consent being granted, would be in keeping with the existing landscape character and could assist in lessening potential effects.

Underground cable alignment

- 7.39 The River Brett and Hadleigh Railway Walk would be crossed by a trenchless installation technique such as directional drilling which would also preserve any associated vegetation.
- 7.40 It is likely that there would be some unavoidable loss of trees and hedgerow as a result of an underground cable route through this study area. Mitigation by way of reduction of the working width of the cable swathe at hedgerows, replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.
- 7.41 The negative landscape effects of sealing end compounds could also be minimised through careful design and siting and the addition of new hedgerow and woodland planting within the site.

Summary

- 7.42 Both the overhead line options would have a moderate negative magnitude of effect (scale of change) on the landscape, due to the presence of the existing overhead lines in the landscape. An overhead line option to the south of the

- existing 400kV overhead line would have a lesser magnitude of effect on the landscape than an overhead line to the north as it would closely parallel the existing 400kV overhead line and would minimise the extent of the SLA affected by 400kV overhead lines. Both overhead line options would have a neutral indirect effect on the AONB to the south. In the long term, the overhead line options would lead to moderate negative effects on the landscape.
- 7.43 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area C.
- 7.44 With mitigation, the magnitude of effect (scale of change) on landscape character as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on landscape. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on landscape, would be negligible and the scale of effects on landscape would be broadly neutral.
- 7.45 There would be a minor positive effect on landscape character, associated with the underground option, where a 2km section of existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to influence the landscape.
- 7.46 Following the establishment of mitigation measures, the effect of sealing end compounds on landscape character would be limited to localised minor negative effects. Particular care would need to be taken in the design and siting of a compound close to the western edge of the Brett Valley if a connection to a southern overhead alignment were required.
- 7.47 Overall, the long term effects on landscape character as a result of an underground cable option, following the establishment of mitigation measures would be minor positive.

Environment - Visual Amenity

Baseline conditions

- 7.48 The main public views experienced by high sensitivity visual receptors in this study area are from public footpaths, cycleways and open space in the Brett Valley, particularly those public rights of way which run directly beneath the existing overhead line. Hadleigh Railway Walk is a publicised footpath and also

forms part of a National Cycle Route 1, although views of the existing overhead lines are limited by vegetation and cuttings. National Route 1 also passes beneath the existing overhead lines in the valley bottom on Layham Road, where there are open views of the existing lines. Views from National Route 1 and views from footpaths between Upper and Lower Layham and Hadleigh have been specifically referred to in recent representations, with requests that the connection be underground through the Brett Valley. There are no long distance footpaths within this part of the Brett Valley, although there are several published local circular walks which start from Hadleigh, some of which extend southward close to the study area. There are also some open views of the existing overhead lines from the River Brett riverside walk and picnic area at its southern extent.

- 7.49 Feedback from consultation has highlighted the use of the B1070 in the Brett Valley by tourists travelling from East Bergholt (at the heart of 'Constable Country' in the Dedham Vale AONB) to the medieval town of Lavenham via Hadleigh and also the use of Holbecks Park, to the southwest of Hadleigh, for the annual Hadleigh Farmer's Agricultural Show. There are open views of the existing overhead lines from the B1070 to the south of Hadleigh and from parts of Holbecks Park, although visitors to the show are of moderate sensitivity at a temporary annual event. The use of the River Brett by anglers has also been highlighted through consultation. There are open views of the existing overhead lines from the section of river between Hadleigh and Upper Layham, in particular.
- 7.50 There are open and filtered views south to the existing 400kV and 132kV overhead lines from some properties on the southern edge of the market town of Hadleigh. There are also open views from properties on the roads running south from Hadleigh to Upper and Lower Layham. Private residential visual receptors are of high sensitivity. There are a mixture of filtered and open views north to the existing 400kV and 132kV overhead lines from a number of properties in Upper Layham, and a more limited number of views from the northeastern part of Lower Layham. The existing overhead lines appear particularly prominent in views along the valley from Upper Layham, where the closest property is about 200m from the existing 132kV overhead line and a further 100m from the 400kV overhead line. There are also views from individual properties in the Brett Valley. Feedback from consultation has highlighted the density of the residential population in the Brett Valley, with

specific comments made about potential effects on Pipkin Lodge, houses in Upper Layham and properties on the edge of Hadleigh.

- 7.51 There are more distant views from visual receptors, also within the Brett Valley and to the south of Study Area C, such as at Lower Raydon and Raydon. There is also a view of pylons in the Brett Valley from higher ground at Aldham Mill Hill to the north of Hadleigh, however wider views are generally limited by topography and vegetation.
- 7.52 Given the scenic qualities of the landscape in Study Area C and the generally commonplace nature of the views, views within Study Area C are of local importance.

Assessment of effects

- 7.53 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on views as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land.
- 7.54 A new overhead line on a northern or southern alignment within Study Area C would have a negative effect on public and private visual receptors within the valley and on the valley sides within the study area and to the immediate north and south. The greatest effects on views would be experienced by high sensitivity visual receptors in closest proximity, such as users of public rights of way that run under the existing overhead lines and the nearest residential properties and river users. The majority of views of this area are relatively local with wider views restricted by the built form of Hadleigh, woodlands and topography, however where more distant views along the Brett Valley are possible, the effect on views would be relatively minor due to the presence of the existing lines and the distance of the viewer. For the majority of visual receptors, the existing 400kV and 132kV overhead lines are already present in these views. The presence of the existing overhead lines would limit the negative magnitude of effect (scale of change) on views as a result of an additional overhead line.

OHL Northern Alignment

- 7.55 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors as a result of a new 400kV overhead line on a northern alignment would be from visual receptors at the southern edge of Hadleigh and the individual properties along the roads running

south from Hadleigh that would be in closer proximity to a new 400kV overhead line than to the existing line. These properties are Benton End Farm, and also those properties west of Layham Road and within Layham Park, which would have 400kV overhead lines to the north and south. A greater effect on views would also be experienced from National Cycle Route 1 (on Layham Road in particular), the agricultural showground at Holbecks Park and public rights of way to the south of Hadleigh, including the southern edge of the River Brett riverside walk and picnic area.

- 7.56 A new overhead line on a northern alignment in Study Area C would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and the views in this study area are generally of local importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.

OHL Southern Alignment

- 7.57 The greatest negative magnitude of effects (scale of change) on views experienced by high sensitivity visual receptors would be from residential properties to the south of the existing 400kV overhead line, notably Pipkin Lodge, and properties at the northern edge of Upper Layham. Views would also be experienced from National Cycle Route 1 (on Layham Road in particular) and from public rights of way in the Brett Valley, the negative magnitude of effect would be greater where routes cross under the line.
- 7.58 A new overhead line on a southern alignment in Study Area C would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and the views in this study area are generally of local importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.
- 7.59 Although a northern and southern alignment in Study Area C would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on views compared with a northern alignment as it would more closely parallel the existing 400kV overhead line, following the alignment of the existing 132kV overhead line.

Underground cable alignment

- 7.60 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area C.
- 7.61 An underground cable route would not lead to any substantial long term effects on views if disturbance to important features such as the River Brett and vegetation along the Hadleigh Railway Walk are avoided. Some loss of hedgerows and hedgerow trees is likely to occur within the study area and there would be some loss of trees to the west of Hadleigh Railway Walk and from plantation woodland at the western end of the study area, which would have a localised negative effect on views. An underground cable route would have a moderate negative magnitude of effect (scale of change) on views in the temporary and short term and a low negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and views within the study area are generally of local importance. This would result in a minor negative effect on views without mitigation and in the long term as a result of an underground cable route in Study Area C.
- 7.62 There would be a minor positive effect on views, associated with this option, where 2km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line. In particular, this would improve views from Upper Layham which sits closer to the 132kV overhead line.
- 7.63 The siting of sealing end compounds would lead to some localised effects on views. At the eastern extent of Study Area C, if the underground cable route connected to a southern overhead alignment in Study Area AB, this would introduce negative effects on local views to the eastern side of Hadleigh Railway Walk. The mature tree belts to either side of Hadleigh Railway Walk would assist in screening views from the railway walk itself but there would be open views from the public footpath that joins the railway walk from the north. Views from nearby residential properties are likely to be limited by intervening agricultural buildings, orchards and mature vegetation associated with the tributary valley. The presence of the existing overhead line infrastructure would assist in lessening the scale of change to views from these locations.
- 7.64 At the western end of Study Area C a sealing end compound would introduce negative effects on views in the area to the west of Overbury Hall Road on the edge of the Brett Valley (at the eastern extent of Study Area D). Due to the presence of Overbury Hall and Valley Farm Woods to the west of the study area

boundary there are few opportunities to locate a sealing end compound beyond the edge of the Brett Valley which could connect to a southern overhead alignment in Study Area D. Existing mature trees and woodland belts to the north of Overbury Hall would assist in screening views of a compound. However, there could be views of the sealing end compound from a number of visual receptors within the Brett Valley as well as visual receptors in the immediate vicinity. A cable route, connecting to an overhead line on a northern alignment in Study Area D, could extend into Study Area D and pass further west across agricultural land to a point immediately east of Valley Farm Woods, where topography and mature vegetation would assist in screening views of a sealing end compound away from the edge of the Brett Valley.

- 7.65 Overall, an underground cable option would result in a neutral effect on views in the long term.

Potential for mitigation

- 7.66 For both the overhead and underground alignment options it would be possible to minimise negative effects on views as a result of road improvements to the local lane network through careful planning of access to avoid the need for road improvements, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term negative visual effects would be unavoidable until re-establishment.

OHL Alignments

- 7.67 Mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line would be in keeping with the existing landscape character and could assist in lessening potential effects on views.

Underground cable alignment

- 7.68 The visual effects of an underground cable alignment would largely be temporary, subject to the avoidance of the majority of woodland through routeing and the employment of directional drilling at the River Brett and Hadleigh Railway Walk. Loss of some trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.

- 7.69 The negative visual effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the site.

Summary

- 7.70 For both overhead line options the magnitude of effect (scale of change) on views would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. An overhead line on a southern alignment would generally give rise to a lower scale of change on views than a northern alignment, as this option would more closely parallel the existing 400kV overhead line through the study area and would replace the existing 132kV overhead line to the south. Overall and in the long term, both the overhead line options would lead to moderate negative effects on visual amenity.
- 7.71 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area C.
- 7.72 With mitigation, the magnitude of effect (scale of change) on visual amenity as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on views. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on views, would be negligible and the scale of effects on visual amenity would be broadly neutral. There would be positive effects on views where about 2km of the existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to form part of many views.
- 7.73 The effect of sealing end compounds on views would be limited to localised minor negative effects following the establishment of mitigation measures.
- 7.74 Overall, the long term effects on visual amenity as a result of an underground cable option would be minor positive.

Environment - Cultural Heritage

Baseline conditions

- 7.75 There are three listed buildings within the route corridor in Study Area C. These comprise one Grade II and one Grade II* listed building at Benton End Farm and Layham Park, a Grade II listed building.
- 7.76 The listed buildings at Benton End Farm include Benton End House, a Grade II* listed building dating from the 16th century and later. The outbuildings including the granary at Benton End House are listed separately (Grade II) and date to the 17th and 18th Century. Together these buildings form a group, along with other structures not listed in their own right. This group of buildings is surrounded by mature trees, and the boundary around the group defines the curtilage. The setting of Benton End Farm extends beyond this to include the surrounding landscape, given the association between a farm and the landscape in which it is situated. Benton End Farm was the location of the East Anglian School of Painting and Drawing founded by Cedric Morris and Arthur Lett-Haines in the 1930's.
- 7.77 Layham Park is surrounded by a designed landscape, with parkland trees that distinguish the character of the Park from the agricultural land that surrounds it. The setting of the listed building includes the Park.
- 7.78 There are three non-designated heritage assets within the route corridor in Study Area C. These comprise two ring ditches, both of which are indicative of prehistoric settlement or funeral activity, and the putative location of finds of medieval material. A review of LIDAR and aerial photograph data has identified two possible house platforms (the buried remains of a former building), as well as a number of former field boundaries.
- 7.79 The Cultural Heritage Thematic Group has advised that the river valleys have greater potential for the discovery of previously unrecorded buried archaeological remains, compared to other parts of the route corridor.
- 7.80 The Hadleigh Conservation Area lies immediately to the north of the Route Corridor. The conservation area extends along Benton Street and contains a large number of listed buildings. The conservation area appraisal for Hadleigh mentions the ribbon development of Benton Street having a very rural setting overlooking the river valley. The setting of the conservation area is therefore taken to include the rural area to the south of Benton Street. There are further Grade II listed buildings at Upper and Lower Layham.

- 7.81 The historic landscape character of the study area is described as predominantly post-1950s agricultural land. The underground alignment crosses one parish boundary which is not demarked by hedgerow. There are two hedgerows in this study area that may be 'important' in terms of the Hedgerow Regulations criteria through association with an archaeological site recorded by the historic environment record for Suffolk.

Assessment of effects

- 7.82 For all of the connection options, improvements to the road network necessary to construction activities could negatively affect 'important' hedgerows and historic lanes. The magnitude of effect would be low on heritage assets of low sensitivity. An overall minor negative effect would therefore be predicted.
- 7.83 For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including access tracks). The magnitude of effect would be low/moderate on heritage assets of low/moderate sensitivity. An overall minor negative effect would therefore be predicted.
- 7.84 Effects of the overhead line options on the setting of designated heritage assets and an underground cable option on buried archaeology are discussed in more detail below.

OHL Northern Alignment

- 7.85 An overhead alignment to the north of the existing 400kV overhead line in Study Area C would have a negative effect on the setting of Benton End Farm and Hadleigh Conservation Area. A northern alignment would also be closer to Layham Park and would introduce a line to the north of the designed landscape, in addition to the existing 400kV overhead line which lies immediately to the south of Layham Park. A northern alignment would therefore have a negative effect on two heritage assets of high sensitivity, and two heritage assets of very high sensitivity (Grade II* listed Benton End Farmhouse and Hadleigh Conservation Area). Hadleigh Conservation Area has open views towards the Brett Valley. Layham Park and Benton End Farm both have some mature trees surrounding the listed buildings, but are not well screened. The existing 400kV overhead line is present in the area which would lessen the magnitude of effect. At Layham Park this is not the case where the line separates around the property, although the separation would avoid oversailing the parkland. The magnitude of effect on all of these receptors would be moderate.

- 7.86 The overall scale of effect of the northern alignment in Corridor C in relation to cultural heritage would be moderate negative.

OHL Southern Alignment

- 7.87 An overhead option to the south of the existing 400kV overhead line would negatively affect views to and from approximately 10 Grade II listed buildings at Lower and Upper Layham, including the Grade II listed St Andrew's Church. However, the magnitude of effect on the setting of listed buildings at Lower and Upper Layham will be limited given the distance of separation between the southern alignment and these designated heritage assets. The 132kV overhead line is already present in the area, and the new overhead line would result in only a low magnitude of change on the setting of these designated heritage assets.

- 7.88 The overall scale of effect of a southern alignment in Corridor C in relation to heritage assets would be minor negative.

Underground cable alignment

- 7.89 An underground option in Study Area C would negatively affect buried archaeological remains. Study Area C has a comparatively low number of potentially 'important' hedgerows but the potential for the survival of buried archaeology is high. The Cultural Heritage Thematic Group has advised that the river valleys have a higher potential for the discovery of previously unrecorded archaeology than elsewhere in the Route Corridor. Given the high probability of encountering known and previously unrecorded archaeological remains within an underground cable route, the magnitude of effect of an underground option in Study Area C is predicted to be high.

- 7.90 An underground option would also negatively affect the historic landscape, through the removal of historic hedgerows, some of which are 'important' in terms of the Hedgerow Regulations criteria. The magnitude of effect would be low on heritage assets of low sensitivity.

- 7.91 In addition, an underground option in Study Area C would require sealing end compounds. A sealing end compound to the east of the Hadleigh Railway Walk could have negative effects on buried archaeology, as a Roman villa has been identified close to the former railway on land associated with Town House Fruit Farm. A sealing end compound could also have negative effects on the setting of listed buildings, particularly Benton End Farm, which given its agricultural associations has a setting that extends beyond its curtilage. A sealing end

compound in the vicinity of Overbury Hall could have a negative effect on the setting of a Grade II listed building. The garden surrounding Overbury Hall is a non-designated heritage asset, and includes the possible location of a moat. The setting of this heritage asset includes the garden.

- 7.92 It is difficult to determine the scale of effect in relation to buried archaeology. However, given the predicted high magnitude of effect on receptors of low - high sensitivity, as well as the negative effects of sealing end compounds, the overall effect of an underground option on buried archaeological remains would be moderate.

Potential for mitigation

- 7.93 Mitigation of negative effects on buried archaeology and historic landscape features can be achieved. There is less scope to mitigate the negative effects on the setting of designated heritage assets.
- 7.94 For all options, potential effects on historic landscape features could be avoided, or mitigated through archaeological recording, careful reinstatement, and in the case of hedgerow loss, translocation or replanting.
- 7.95 For all options, an extensive programme of archaeological investigation, mitigation and monitoring would be required to mitigate effects on buried archaeology.

Summary

- 7.96 An overhead alignment to the south of the existing 400kV overhead line in Study Area C would affect fewer cultural heritage receptors than a northern alignment. The southern alignment would have a minor negative scale of effect on cultural heritage assets, whereas a northern alignment would have a moderate negative scale of effect. This is due to the effects of a northern alignment on two heritage assets of very high significance and two of high significance. There is limited scope to mitigate the effects of a northern alignment on the setting of a Grade II* listed building and a Conservation Area.
- 7.97 While mitigation of negative effects on buried archaeology and historic landscape features is achievable, preservation in situ is preferred. An underground option would require considerably more mitigation with respect to non-designated heritage assets, and result in direct physical impacts (as opposed to indirect visual impacts) compared to an overhead line. The effects of an underground cable and an overhead line connection are very different in relation to heritage assets and difficult to compare. However, given the high

probability of direct impacts and significant mitigation requirements in relation to an underground cable compared to an overhead alignment, the scale of effect would be greater for an underground cable option than an overhead line on a southern alignment.

Environment - Ecology

Baseline conditions

- 7.98 There are no SSSI or CWS designations within Study Area C. Hadleigh Railway Walk CWS and LNR forms the east boundary of this Study Area and has been considered within Study Area AB.
- 7.99 The River Brett is partly designated as a CWS but not along the section within the study area. The section within the Route Corridor is not a CWS and therefore presumably does not meet the selection criteria to be valued at the county level. However, there are records of otter along this watercourse in the wider area (and, this being the case, otter are highly likely to use the section within the Route Corridor) and the River Brett is also a European eel migratory route, therefore this section of the River Brett is valued at the district level.
- 7.100 There are three small plantations or woodland blocks within the study area, and an area of parkland trees at Layham Park (which is covered by a tree preservation order). There are records of several species of bat in the wider area and bats are likely to use woodlands within the route corridor for foraging and/or roosting. The woodland blocks are also likely to be used by a variety of bird species and there are records of dormice in woodlands in the wider area (to the southeast and west) which indicates potential for the species to be present within the route corridor. These small woodland blocks are likely to range in value from local to district level depending on composition and association with other species.
- 7.101 The study area is dominated by arable fields although species-rich semi-improved pasture land is found along the banks of the River Brett. Species including badger, brown hare, hedgehog and various reptile species have been recorded within the study area and surrounding land. The intrinsic value of the grasslands is low but associations with valued species would increase their value.
- 7.102 There are fewer hedgerows in this study area than elsewhere in the corridor, although this is largely a factor of the size of the study area. Hedgerows are mainly associated with the roads and most are species-rich but do not generally

contain hedgerow trees. The hedges are likely to have a connective function and could support a range of species including birds, bats and dormice. The network of hedgerows is currently valued at the district level, but the value of individual hedgerows will vary depending on composition and association with other species.

- 7.103 Very few ponds have been identified within this study area and there are no records of amphibians within this study area. The ponds are valued at local level.

Assessment of effects

OHL Northern Alignment

- 7.104 An overhead line option on a northern alignment in Study Area C would result in permanent loss of mature plantation woodland at Bentley End Farm which could support dormice (as the wood is connected via Hadleigh Railway Walk CWS to Raydon Great Wood CWS). This would result in a high negative, long term magnitude of effect.
- 7.105 Impacts on hedgerows are negligible due to the scarcity of hedgerow trees along the alignment and impacts on ponds and watercourses will be avoided with this option. Grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.
- 7.106 In combination the low to high magnitude of effects on receptors of local to district value in Study Area C would lead to an overall moderate negative effect on ecology as a result of the northern alignment prior to mitigation.

OHL Southern Alignment

- 7.107 An overhead line option on a southern alignment in Study Area C would result in some tree loss within the linear plantation in the west of the study area. Although tree losses would be minimal as the route follows the existing 132kV alignment at this location, some additional tree or scrub clearance may be required. The plantation may support dormice which have been recorded in woodland to the west. These losses would result in a moderate negative, long term magnitude of effect.
- 7.108 Impacts on hedgerows are negligible due to the scarcity of hedgerow trees along the alignment and impacts on ponds and watercourses will be avoided with this option. Grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

7.109 In combination the low to moderate magnitude of effects on receptors of local to district value in Study Area C would lead to an overall minor negative effect on ecology as a result of the southern alignment prior to mitigation.

Underground cable alignment

7.110 An underground option in Study Area C would result in permanent tree loss within the woodland strip adjacent to Hadleigh Railway Walk and within the linear plantation in the west of the study area. Although the route would follow the existing 132kV overhead line alignment across the plantation, additional tree clearance will be required to create a working area. Both areas may support dormice which have been recorded in woodland to the east and west of the study area. These losses would result in a high negative, long term magnitude of effect.

7.111 There would be losses of up to 65m of habitat at hedgerow crossings. The hedgerows in this study area are unlikely to function as important wildlife corridors as they are largely fragmented. These losses would result in a moderate negative, long term magnitude of effect.

7.112 Impacts on ponds and watercourses would be avoided with this option with impacts on the River Brett avoided through the use of HDD. Grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

7.113 The location of sealing end compounds would not result in additional effects on ecology.

7.114 In combination the low to high magnitude of effects on receptors of local to district value in Study Area C would lead to an overall major negative effect on ecology as a result of an underground option prior to mitigation

Potential for mitigation

7.115 For all options, existing field access points and watercourse crossings would be used for works traffic and standard environmental protection measures implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities and implementation of pollution control methods.

7.116 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as dormice, amphibians and reptiles, if present.

OHL Alignments

- 7.117 Where tree loss is required to achieve electrical safety clearances, pollarding or coppicing would be used to avoid total loss of habitat. Alternatively, where tree removal is required, hedgerow or low height scrub planting would be used within the permanent easement to maintain habitat connectivity. This could be particularly important for the woodland at Benton End Farm (on a northern alignment) and the linear plantation in the west (on a southern alignment) if dormouse is present. Replacement woodland planting would be undertaken outside the overhead line easement, subject to landowner agreement.
- 7.118 Artificial trackways could be used to protect ground conditions and re-seeding species-rich grassland areas could be used to reduce the recovery time where these habitats are impacted by works (currently no important grassland areas have been identified within Study Area C).

Underground cable alignment

- 7.119 Ducting cables at the road crossings would incorporate the roadside hedgerows and thereby reduce fragmentation impacts by shortening the timeframe between hedgerow removal and reinstatement. Temporary fragmentation impacts on bats and dormouse caused by hedgerow removal could be mitigated through the use of aerial bridges (across short distances) or timing the works to avoid sensitive seasons.
- 7.120 Working areas would be minimised when crossing valued habitat features to avoid or reduce impacts, habitats within the permanent easement would be reinstated on completion of works (with the exception of trees), although varying establishment periods will apply and loss of mature trees cannot be mitigated within a reasonable timeframe.
- 7.121 Where complete tree removal is required, replacement woodland planting would be undertaken outside the permanent easement with the landowner's agreement. Scrub planting would be used within the permanent easement to reduce habitat fragmentation where the route crosses woodland blocks.

Summary

- 7.122 The northern overhead line option within Study Area C would result in loss of mature plantation at Benton End Farm, an area which could support dormice. Mitigation including wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts) would reduce

some impacts on ecology from this option. However, due to the relatively large loss of habitat within this mature plantation, the overall impacts from this option would remain within the moderate negative effects category.

7.123 The southern overhead alignment option within Study Area C would largely avoid effects on ecology, and wildlife-friendly working methods would reduce effects further. Overall this option would result in minor negative effects on ecology in Study Area C.

7.124 The underground option within Study Area C would avoid impacts on the River Brett but would result in woodland losses in the east and west of the study area. The resultant habitat loss and fragmentation can have substantive impacts on species such as dormice. It is not possible to mitigate within a reasonable timeframe the loss of mature trees associated with an underground option. However, temporary measures can lessen impacts on connectivity in the short term and scrub planting can reduce effects in the long term. These mitigation methods in combination with wildlife-friendly working methods would reduce overall impacts on ecology from the underground option in Study Area C to a moderate negative effect.

Socio-economic – Economic activity

Baseline conditions

7.125 The Brett Valley area is one of the smaller study areas, centred around the market town of Hadleigh. Hadleigh is an attractive market town popular with visitors as evidenced by the number of businesses reliant on tourism, including cafés, restaurants, bed & breakfast premises and hotels. The Brett Valley offers cycle trails and water-based activities and within Hadleigh, a riverside walk and picnic areas. It also provides a venue for the annual Hadleigh Agricultural Show. Hadleigh offers a range of shops and services and acts as a local employment centre reflecting its function as a market town serving a rural hinterland. Outside of Hadleigh there are no significant economic activities over and above agriculture. The villages of Upper and Lower Layham, to the south of Hadleigh, both have village pubs. The B1070 in the Brett Valley is used by tourists passing through the area.

Assessment of effects

7.126 The construction phase, for all options, would bring short term benefits to the local economy in terms of increased spend by the construction teams and additional income for local suppliers.

OHL Alignments

7.127 Hadleigh is a centre for tourist activity in the area, but the concentration of tourist-related businesses is within the town centre with no views of the route corridor. Overall the permanent impacts for visitors to, and tourist-related businesses in, the area would therefore be neutral with some localised negative impacts for particular types of visitors and participants in informal recreational activities.

7.128 There would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. Given the density of the PROW network there is likely to be some highly localised minor disruptions to PROWs during construction. In addition there would be potential during construction for increased HGV traffic on the local road network including that covered by the National Cycle Route 1 [NCR1] which runs south of Hadleigh on the local network to Lower Raydon and Higham. There is also an alternative on-road NCR Link which bypasses Hadleigh between Stratford-St-Mary and Raydon which may be impacted by increased HGV construction traffic.

7.129 The alignments would oversail National Cycle Route 1 and public rights of way. Short sections of the on-road NCR1 route would have partial and open views of the line. The off-road section of NCR1 between The Woodlands and Hadleigh, (Hadleigh Railway Walk), which is also used by walkers and riders, is heavily screened by boundary planting for most of its length. However, there are short sections of the path where screening planting is thinner and from which there would be both open and partial views of the route corridor. Existing views include the 400kV and 132kV overhead lines. There would be open views for users of the PROW network in many locations including the River Brett riverside walk and picnic area on the edge of Hadleigh.

7.130 Three tourist related businesses would have views of a new overhead line in Study Area C of which two would have partial views (a public house and the Golf Course) and one (another public house) would have open views.

7.131 The overhead alignments have the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional

400kV overhead line, taking account of the removal of the existing 132kV overhead line.

- 7.132 There is potential for highly localised temporary impacts on some agricultural operations during construction but, neither these, nor the location of permanent structures, would compromise the operation of individual farming units.

Underground cable alignment

- 7.133 The permanent removal of existing 132kV overhead lines and pylons would lead to improvements to views enjoyed by users of the public rights of way network and the national and regional cycle network. It would result in a beneficial impact on visitors attracted to the area by the quality of the environment and the opportunities for informal recreation and on tourist-related businesses.
- 7.134 There would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. Given the density of the PROW network there is likely to be some highly localised minor disruptions to PROWs during construction.
- 7.135 The underground route would transect National Cycle Route 1 in two locations, one on the off-road section around 2 km south east from the centre of Hadleigh and the other an on-road section between Hadleigh and Upper Layham. This could result in potential short term disruption to users. In addition there would be potential during construction for increased HGV traffic on the local road network including that covered by the National Cycle Route 1 [NCR1].
- 7.136 In the eastern part of the study area, there would be filtered views of a sealing end compound from the Hadleigh Railway Walk and other nearby PROWs, with potential open views from the PROW to the north of Town House Fruit Farm. Depending on exact location there would also be filtered views of a sealing end compound on the eastern side of Hadleigh Railway Walk from Kate's Hill Fishing Lake. A sealing end compound in the western part of the area potentially would result in open views from the PROW to the south of Hill Farm and the PROW to south of the sewage works may experience partly-obscured views of the compound. Overall this would result in minor negative impacts which would be highly localised.
- 7.137 There is potential for minor localised impacts during construction on agricultural land resulting in partial crop or harvest loss. The option would result in the temporary loss of around 4.2 ha of Grade 2 agricultural land and 6.9 ha of Grade 3 agricultural land.

Potential for mitigation

7.138 There are a number of measures that can be put into place to mitigate the effects of temporary construction works on visitors' enjoyment of the area. This could include the programming of construction activities and routing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are disrupted during construction, alternative or diversionary routes would be provided.

7.139 Agricultural mitigation measures would include restoration of agricultural land disturbed during construction to productive quality. National Grid will pay appropriate compensation for temporary loss of crops and other effects on agricultural use and for permanent easements for its infrastructure.

Summary

7.140 The overall effect of all of the overhead line alignments on economic activity would be broadly neutral as most of the economic activity is focussed on Hadleigh with no views of the route corridor from the town centre. An underground solution has the potential to benefit the attractiveness of the area, by securing the removal of the 132kV overhead line, without it being replaced, and temporary negative effects are capable of mitigation.

Cost

Capital cost

7.141 The estimated capital costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £2.9m
- OHL southern alignment £3.5m
- Underground cable alignment £57.6m

Lifetime cost

7.142 The estimated Lifetime costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £7m
- OHL southern alignment £9m
- Underground cable alignment £60m

Summary

7.143 In terms of both capital and lifetime costs, an underground option would be considerably more expensive than the overhead options. Of the overhead options, the northern option would impose lower lifetime costs.

Interim overhead alignment

7.144 An overhead line option to the south of the existing 400kV overhead line would have a lesser magnitude of effect on landscape and views than an overhead line to the north as it would closely parallel the existing 400kV overhead line and would replace the existing 132kV overhead line to the south. This would give rise to a lower scale of change on views and would minimise the extent of the SLA affected by 400kV overhead lines.

7.145 An overhead alignment to the south of the existing 400kV overhead line in Study Area C would affect fewer cultural heritage assets than a northern alignment. The southern alignment would have a minor negative scale of effect on cultural heritage assets, whereas a northern alignment would have a moderate negative scale of effect. This is due to the effects of a northern alignment on two heritage assets of very high significance and two of high significance. There would be limited scope to mitigate the effects of a northern alignment on the setting of one Grade II* listed building and a Conservation Area.

7.146 A southern alignment would avoid loss of plantation woodland at Benton End and associated impact on habitats and species which would result from a northern alignment.

7.147 The effects of both overhead alignments on economic activity would be broadly neutral.

7.148 The lifetime cost of a northern alignment would be £2m lower than that of a southern alignment.

7.149 Although the more costly option, a southern alignment would be favoured in terms of landscape and views, cultural heritage and ecology. It is therefore concluded that the interim overhead alignment in Study Area C would be a southern alignment.

Undergrounding

7.150 In line with National Policy Statement EN-5, National Grid has considered the benefits of undergrounding in the context of the landscape in which the proposed connection would be set, together with the additional cost and the environmental and archaeological consequences of undergrounding. Comparisons are drawn between the interim overhead alignment described above and the underground option.

Landscape and visual considerations

7.151 The River Brett is a tributary of the River Stour, which flows some 5km to the south of this study area. The Brett valley is small and unremarkable with gently sloping and rounded valley sides. Study Area C is designated a Special Landscape Area in Babergh District Local Plan and is a landscape of local value. There are no national landscape designations within this study area and the setting of the Dedham Vale AONB, whose boundary lies between 2km and 7km to the south west, would not be affected by a new overhead line within this study area.

7.152 The Brett Valley has cultural associations with the lesser known artists Sir Cedric Morris and Arthur Lett-Haines, who ran the East Anglian School of Painting and Drawing from Benton End Farm in the Brett Valley (between 1939 and the 1960s), which in turn attracted a range of artists including Lucian Freud and Maggi Hambling.

7.153 The predominantly agricultural landscape in Study Area C is broadly intact, although hedgerow loss and gappy hedgerows are relatively frequent. In addition, historic field patterns have been lost in some parts of the study area with the expansion of fields, such as land on the eastern valley side. Woodland blocks, parkland and field trees remain largely intact in the study area. Modern development at Upper Layham and the sports fields and sewage works at the southern edge of Hadleigh encroach on the character of the agricultural landscape. Overall the landscape condition in Study Area C is moderate.

7.154 Valley landscapes generally have less capacity to accommodate an overhead line compared with an open plateau landscape, as the overhead line can appear

out of scale with the enclosed landscape. However this part of the Brett Valley has gently sloping valley sides and this part of the valley is mainly comprised of large open arable fields, which lessens the degree of enclosure and increases the scale of the landscape. Overall and in relation to an additional overhead line, the landscape capacity of Study Area C is moderate.

- 7.155 The beneficial effect on landscape character and visual amenity as a result of the removal of the 132kV overhead line is common to both a southern overhead alignment option and an underground option in Study Area C.
- 7.156 The baseline landscape views in and near Study Area C include the existing 400kV overhead line and a 132kV overhead line. The removal of the 132kV overhead line within Study Area C and construction of a new 400kV overhead line on a similar alignment would represent a change to these views, but the change would be consistent with the existing baseline conditions. Given the scenic qualities of the landscape in Study Area C and the commonplace nature of the views, views within Study Area C are generally of local importance.
- 7.157 There are a number of residential properties close to the route of the existing overhead lines across the Brett Valley between the southern edge of Hadleigh and Upper Layham. The greatest negative magnitude of effect (scale of change) on views as a result of a new 400kV overhead line on a southern alignment would be from high sensitivity visual receptors that would be closer to the new overhead line than the existing 400kV overhead line. In Study Area C this would include users of public footpaths which cross and are close to the corridor. National Cycle Route 1 runs within the valley bottom along the local road network and underneath the existing overhead lines (National Cycle Route 1 also runs along Hadleigh Railway Walk on the east side of the Brett Valley but views are largely filtered or obscured from here). Private residential visual receptors that would be closer to a new southern 400kV overhead alignment than the existing 400kV overhead line include residents within Upper Layham, as well as individual properties within the valley. A new overhead line on a southern alignment would not be any closer to Upper Layham than the existing 132kV overhead line, although the existing overhead lines are already prominent in views along the valley from Upper Layham. There are no long distance footpath routes that would be affected by a new 400kV overhead line in Study Area C.
- 7.158 The landscape in Study Area C has a moderate capacity to accommodate an additional 400kV overhead line on a southern alignment. Although, there would be views of a new 400kV overhead line for a number of high sensitivity visual

receptors, existing views in the area are generally of local importance. In addition, the magnitude of effect (scale of change) to the landscape and views as a result of an additional 400kV overhead line would be no greater than moderate due to the presence of the existing overhead lines in the baseline conditions and the removal of the 132kV overhead line. Overall a southern overhead alignment would result in a moderate negative effect on landscape character and visual amenity.

- 7.159 An underground option would avoid the moderate negative effects on landscape and views associated with a southern overhead alignment option in Study Area C.
- 7.160 The scale of effect on landscape and views as a result of undergrounding in Study Area C would be broadly neutral in the long term. There would be a positive effect on landscape and views associated with the underground option, over a distance of 2km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line, although the existing 400kV overhead line would remain in views. Overall, the long term effects on landscape character and visual amenity as a result of an underground cable option would be minor positive.
- 7.161 The overall benefit of undergrounding in Study Area C would be the minor positive effects on landscape and views, compared to the moderate negative effects on landscape and views as a result of a southern overhead alignment option.

Undergrounding cost

- 7.162 The estimated capital cost of undergrounding through this section of the route is estimated at £57.6m, compared to a cost of £3.5m for the interim overhead alignment. The estimated lifetime costs are £60m and £9m respectively.

Environmental and archaeological consequences of undergrounding

- 7.163 An underground option would avoid minor negative effects, associated with the interim overhead alignment, on the setting of listed buildings at Upper and Lower Layham, though these buildings are some distance from the alignment. The setting of these buildings would benefit from the removal of the existing 132 kV overhead line, as part of an underground option.
- 7.164 The removal of the 132kV overhead line may benefit the attractiveness of the area which may have a minor positive effect on economic activity.

- 7.165 The underground option within Study Area C would avoid impacts on the River Brett. However, it cannot avoid woodland losses at two locations. In addition, the resultant habitat loss and fragmentation could have substantive impacts on species such as dormice. Even with scrub planting along the permanent easement, impacts on ecology from the underground option in Study Area C would have a moderate negative effect.
- 7.166 An underground option would result in extensive ground disturbance which would lead to large negative effects on non-designated buried archaeology. The effects on buried archaeology would be much greater as a result of an underground cable, compared to an overhead alignment. The negative effects would be direct, and lead to total loss or substantial harm in relation to multiple non-designated heritage assets. Mitigation is available for the negative effects through archaeological investigation and recording, although buried archaeology is a finite and non-renewable resource and preservation *in situ* is preferred when possible.
- 7.167 An underground option could also result in negative effects on the historic landscape through the removal of historic hedgerow. Mitigation is available for these effects and if implemented, no long term effects would remain.
- 7.168 The location of a sealing end compound to the east of Hadleigh Railway Walk would be close to the site of a Roman villa. A sealing end compound at the western end of the study area could affect the setting of the listed Overbury Hall.

Conclusions

- 7.169 An overhead line solution would have a moderate negative effect on landscape and views in a small area of locally designated landscape where overhead lines are already present. Although the landscape is designated as being of local value, it is of moderate sensitivity and the topography and landscape features of the study area mean that it has a moderate capacity to accept overhead electricity lines. This part of the Brett Valley is not particularly noted for its scenic quality. Its cultural associations are with a formerly influential school for artists but the local landscape in the immediate area is not acknowledged as inspirational to well-known artists in the same way that Dedham Vale and the Stour Valley is associated with Constable and Gainsborough.
- 7.170 Study Area C would not be regarded as a 'particularly sensitive location' in the context of paragraph 2.82 of National Policy Statement for Electricity Networks Infrastructure (EN-5). The assessment has considered whether 'the benefits

from the non-overhead line alternative (underground cables) will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable’.

- 7.171 The interim overhead alignment would give rise to a moderate negative scale of effect on a landscape with a moderate capacity to accommodate overhead electricity lines. Putting the new line underground would avoid this negative effect and there would be a minor positive effect on the landscape resulting from the removal of the existing 132kV overhead line, although the existing 400kV overhead line would remain in the landscape.
- 7.172 The interim overhead alignment would give rise to a moderate scale of negative effects on views from a relatively small number of receptors of high sensitivity. These effects would be avoided if underground cables are used and in that case there would be a minor positive effect on views resulting from the removal of the existing 132kV overhead line. This scale of effect reflects the fact that the existing 400kV overhead line is present in local views and would remain if undergrounding were adopted.
- 7.173 The extra economic impacts of putting the line underground would involve incurring lifetime costs £51m higher than those of the interim overhead alignment.
- 7.174 The socio-economic effects of an overhead alignment are anticipated to be neutral while, with undergrounding, some minor benefits may accrue from the removal of the existing 132kV overhead line.
- 7.175 There would be minor negative effects on buried archaeology from an overhead line because of the relatively small area of ground disturbed during pylon construction. The interim overhead alignment would have a minor negative effect on cultural heritage because of impacts on the setting of heritage assets, albeit at some distance from the alignment. These effects would be avoided if the connection used underground cables. The effects on buried archaeology of putting the line underground would be moderate negative. It is preferable to leave remains in situ whereas undergrounding would bring a high degree of disturbance where excavations take place and some further potential effects from the use of the haul road. These effects can be mitigated by investigation and recording.
- 7.176 The effects on ecology of the interim overhead alignment would be minor negative. Effects on ecology of putting the line underground would arise because of small losses of woodland and hedgerows that could be used by

dormice, although no designated sites would be adversely affected by the installation of underground cables. The long term effects would be moderate negative.

7.177 There are no insurmountable technical difficulties associated with the installation of underground cables.

7.178 The benefits from the use of underground cables as an alternative to an overhead line in this location, which is assessed as not being particularly sensitive, will not clearly outweigh any extra economic, social and environmental impacts. Undergrounding would not therefore be appropriate in this study area.

Study Area conclusion

7.179 It is recommended that an **overhead** line solution be taken forward for consultation for Study Area C and that the **southern alignment** be identified as the least constrained alignment. Subject to representations received during consultation, this is the alignment which National Grid should take forward to the next stage in the design process.

8 OPTIONS APPRAISAL STUDY AREA D – POLSTEAD

Study area boundaries

- 8.1 This study area covers a section of the corridor with the eastern boundary defined by Overbury Hall Road and the western boundary defined by the Dedham Vale AONB boundary, west of Polstead Heath.
- 8.2 The village of Polstead Heath lies immediately north of the existing overhead lines. The hamlets of Bower House Tye and Hadleigh Heath sit on the A1071, approximately 1.5km to the north of the existing lines. Polstead lies approximately 1km to the south.
- 8.3 The options for Study Area D are shown on Figure 8.

Definition of options

OHL Northern Alignment

- 8.4 The northern overhead alignment in this Study Area D would start at a point approximately 0.5km north of the existing 400kV overhead line, and to the north of Overbury Hall. From here the northern overhead option would run to the south west to a point west of Rands Road from which it would closely parallel the existing 400kV overhead line at an 85m offset. At the western end of Study Area D the alignment would start to deviate northward to avoid properties at Sprott's Farm. The approximate length of this option would be 3.7km.

OHL Southern Alignment

- 8.5 The southern overhead option would closely parallel the existing 400kV overhead line throughout this study area. At the eastern end of the study area, the southern alignment would follow the existing 132kV alignment as this would minimise effects by utilising the line of existing easements. The approximate length of this option would be 3.3km.

Underground cable alignment

- 8.6 The underground option would run from a point north of Overbury Hall, northward, beyond the corridor and existing overhead lines to avoid Valley Farm Wood and Layham Quarry. The underground route would then turn south and

would cross beneath the existing 400kV overhead line and run between the woodland blocks at Millfield Wood. From Millfield Wood the route would stay south of the existing 400kV overhead line but run broadly parallel with it. The approximate length of this option would be 4.5km.

- 8.7 If an underground cable route were to be taken forward in Study Area D and not in the adjacent Study Areas C and E, then at the eastern extent of Study Area D, it is anticipated that the underground cable route could connect to either a northern or southern overhead alignment at a point to the north of Overbury Hall and west of Overbury Hall Road.
- 8.8 At the western extent of Study Area D, it is anticipated that the underground cable route would connect to an overhead alignment in Study Area E, via a sealing end compound located east of Sprott's Farm. Whether connecting to a northern or southern alignment, this would be likely to require a minor diversion of the underground cable route.

Other options considered but discounted

- 8.9 Consideration was given to a closely paralleled northern alignment in Study Area D. However the necessary adjustment to the route in Study Area C to avoid oversailing property at the eastern edge of Layham Park and Layham Park itself resulted in the northern overhead alignment being routed north to avoid these constraints. A close parallel alignment would also have resulted in greater woodland loss from Valley Farm Wood.
- 8.10 The northern overhead alignment option in Study Area D would oversail private residential properties at the southern edge of Polstead Heath, however a northern overhead alignment which avoids oversailing would require an alignment that deviates 0.5km further north. This would result in 400kV overhead lines passing close to both sides of Polstead Heath which would not be appropriate. It is possible that a site specific assessment could result in a reduction in the separation distance, which would mean that oversailing could be avoided.
- 8.11 Consideration was given to an underground cable route at the eastern end of Study Area D, which crossed into Study Area C to the north of Layham Park. However, this option would have restricted potential locations for sealing end compounds on the western side of the Brett Valley. As a result the underground cable route was amended so that it could connect with either a northern or southern overhead alignment.

Environment – Landscape

Baseline conditions

- 8.12 Study Area D comprises an area of higher ground (interfluvium) between the Brett and Box Valleys. The eastern part of the study area forms part of the Special Landscape Area, designated in the Babergh District Plan, which extends north from the Dedham Vale AONB along the River Brett. The SLA is of local value.
- 8.13 There are no regional or national landscape designations within this study area. However, the boundary to the Dedham Vale AONB lies immediately to the west and approximately 1.5km to the south of the study area.
- 8.14 The Suffolk Landscape Character Assessment characterises this study area as predominantly being 'Ancient Rolling Farmlands'. The Ancient Rolling Farmlands landscape character type is described as a rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular sinuous field patterns and ancient and plantation woodlands form a significant feature.
- 8.15 There is a smaller area of 'Rolling Valley Farmlands' at the eastern extent of the study area, where a tributary to the River Brett extends into the study area. This landscape character type is described as having gently sloping valley sides within a wider rolling landscape. Woodlands form distinctive features in the land beyond the valley and are often present on the upper slope and framing views out from the valley.
- 8.16 Layham Quarry occupies part of the route corridor within the centre of the study area. Part of the allocated site (in Babergh District Council's Local Plan) is under arable use and the mineral extraction areas are generally well contained by mature woodland and tall hedgerows.
- 8.17 Study Area D is broadly comprised of an unremarkable landscape consisting of arable land on a plateau of higher ground between the River Brett and River Box. Arable fields are generally bound by hedgerows with hedgerow trees, interspersed by blocks of broadleaved woodland. There is a small tributary valley connected to the Brett which extends into the eastern part of the study area and which contains a number of woodland belts. Apart from isolated residential properties, including farmsteads, the small village of Polstead Heath is the only settlement in the study area. Polstead Heath is comprised of predominantly modern buildings. There are a number of smaller fields in the vicinity of Polstead Heath some of which contain fruit trees. Layham Quarry occupies a significant parcel of land in this study area. The Brett Valley SLA,

which extends into the eastern half of this study area and includes the Brett Aggregates Quarry site. It is not clear why the Brett Valley SLA extends beyond the valley landscape and the landscape on the plateau of high ground in Study Area D is comparable throughout.

- 8.18 The predominantly agricultural landscape in Study Area D is broadly intact, apart from the eastern part of the study area where Brett Aggregates' Layham Quarry is located. There are few gappy hedgerows or open field boundaries in this study area and the landscape generally appears well managed. Woodland blocks and woodland belts remain largely intact in the study area (although Polstead and Dedham Vale Community Forum members highlighted that part of Millfield Wood was removed to accommodate the existing overhead lines). Modern development at Upper Layham and the sports fields and sewage works at the southern edge of Hadleigh encroach on the character of the agricultural landscape. Overall the landscape condition in Study Area D is moderate.
- 8.19 In terms of the capacity or sensitivity of the landscape in Study Area D to a new 400kV overhead line, as has been previously noted, the landscape within Study Area D is of local value. Study Area D crosses a plateau landscape between valleys and is broadly comprised of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. In addition, the existing overhead lines crossing the study area mean that the landscape has a greater capacity to accommodate a further overhead line. Overall and in relation to an additional overhead line, the landscape capacity of Study Area D is high.

Assessment of effects

- 8.20 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on the local network of lanes as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land. The network of winding and sometimes sunken lanes is a component of the landscape character of this study area.
- 8.21 To the south of the study area a new 400kV overhead line in Study Area D would be visible from the northern edge of the AONB to the immediate south (1.5km distant), from Stoke-by-Nayland within the AONB (approximately 3km to the southwest) and from Lower Raydon within the AONB (approximately 3km to the southeast). The degree of separation, the presence of intervening

mature hedgerows and hedgerow trees and the presence of the existing overhead lines mean that the magnitude of effect on the AONB to the south would be negligible and in turn the scale of indirect effects neutral. Within the AONB on high ground to the immediate west of Study Area D there would be views of an additional 400kV overhead line extending into the study area as far as Polstead Heath. However, this new overhead line would be viewed in the context of the existing overhead line; there would not be views of an overhead line in Study Area D from the Box Valley itself, and the mature woodland (Dollops Wood) at the boundary between Study Areas D and E provides a degree of separation. All these factors would lessen the magnitude of effect (scale of change) on the AONB, resulting in a low negative magnitude of effect. Both overhead line options would have minor negative indirect effects on the setting of the AONB to the west of Study Area D.

OHL Northern Alignment

- 8.22 A northern overhead alignment in Study Area D would have a negative effect on the SLA and the wider character of the study area, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). A northern overhead alignment option would mean that the smaller 132kV pylons, to the south of the existing 400kV overhead line, would be removed and a new overhead line would be constructed to the north of the existing 400kV overhead line. In the eastern half of the study area this alignment would not closely parallel the existing 400kV overhead line and this would increase the extent of the SLA affected by 400kV overhead lines. The northern alignment option would closely parallel the existing 400kV overhead line in the western part of the study area, which is not designated a SLA. Overall a northern alignment option would have a greater negative magnitude of effect (scale of change) compared to a southern alignment.
- 8.23 This option would also have a negative effect on landscape character where the northern alignment crosses existing woodland belts that form part of Valley Farm Wood and the northern part of Millfield Wood, resulting in tree losses. It is likely that some hedgerow tree losses would also occur. Woodland and hedgerow trees are components of the landscape character of the study area.
- 8.24 An overhead line on a northern alignment in Study Area D would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has high capacity. Overall

this option would result in a moderate negative effect on landscape prior to mitigation.

OHL Southern Alignment

- 8.25 A southern overhead alignment in Study Area D would have a negative effect on the SLA and the wider character of the study area, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). In this option, a new overhead alignment would largely follow the route of the existing 132kV overhead line which closely parallels the existing 400kV overhead line and this would minimise the extent of the landscape affected by 400kV overhead lines.
- 8.26 A southern option would minimise any woodland loss by following the alignment of the existing 132kV overhead line and so utilising existing easements. It is likely that some tree loss would still occur, which would represent a negative effect as woodland and hedgerow trees are components of the landscape character of the study area.
- 8.27 An overhead line on a southern alignment in Study Area D would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has high capacity for an additional overhead line. Overall this option would result in a moderate negative effect on landscape prior to mitigation.
- 8.28 Although a northern and southern overhead alignment in Study Area D would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on landscape character as it would have a lesser magnitude of effect (scale of change) on the landscape.

Underground cable alignment

- 8.29 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area D.
- 8.30 An underground cable route would not lead to any substantial long term negative effects on the landscape character if disturbance to important features such as woodlands are avoided through routeing. There would be some loss of hedgerow and hedgerow trees within the study area, which would lead to localised negative effects on landscape character. An underground cable route in Study Area D would have a moderate negative magnitude of effect (scale of change) on the landscape during construction and low negative magnitude of

effect (scale of change) on the landscape in the long term. This scale of change would be experienced by a landscape of local value, which is in a moderate condition and which has high capacity. This would result in a minor negative long term effect on landscape prior to mitigation as a result of the underground cable option in Study Area D.

- 8.31 There would be a minor positive effect on landscape, associated with the underground option, over a distance of about 3km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 8.32 The sealing end compounds would introduce some localised landscape effects. At the eastern extent of Study Area D this would introduce negative local landscape effects in the area to the west of Overbury Hall Road, on the edge of the Brett Valley. Existing mature trees and woodland belts to the north of Overbury Hall would assist in accommodating a compound. A cable route connecting to an overhead line on a northern alignment in Study Area C, could pass southward across agricultural land to a point immediately east of Valley Farm Woods, where topography and mature vegetation would assist in accommodating a sealing end compound away from the edge of the Brett Valley.
- 8.33 At the western end of Study Area D, a sealing end compound would introduce negative local landscape effects in Study Area D to the east of Sprott's Farm. As well as the existing presence of overhead lines in this local landscape, nearby mature woodland at Dollops Wood means that the existing landscape character has some capacity to accommodate a sealing end compound.
- 8.34 Overall this option would result in a neutral effect on landscape in the long term.

Potential for mitigation

- 8.35 It would be possible to minimise negative effects on the local lane network as a result of the construction of an overhead line or underground cable route through careful planning of access to avoid the need for road improvements, wherever possible. Effects on lanes could also be minimised by utilising existing gaps in hedgerows and existing field accesses as access points onto agricultural land. Modifications to highways would be planned to be reversible (see paragraph 5.66).

OHL Alignments

- 8.36 It is not possible to for a new overhead line to avoid effects on the SLA or wider landscape character within the study area, or indirect effects on the AONB.
- 8.37 For both overhead alignments, mitigation by way of additional woodland and hedgerow planting in the vicinity of a new overhead line, depending on land owners' consent being granted, would be in keeping with the existing landscape character and could assist in lessening potential effects.

Underground cable alignment

- 8.38 There would be some unavoidable loss of trees and hedgerow as a result of an underground cable route through this study area. Loss of some trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.
- 8.39 The negative landscape effects of sealing end compounds could also be minimised through careful design and siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 8.40 Both the overhead line options would have no greater than a moderate negative magnitude of effect (scale of change) on the landscape, due to the presence of the existing overhead lines in the landscape. An overhead line option to the south of the existing 400kV overhead line would have a lesser negative magnitude of effect on the landscape than an overhead line to the north as it would follow the alignment of the existing 132kV overhead line and would more closely parallel the existing 400kV overhead line. Both overhead line options would have a minor negative effect on the setting of the AONB to the west. Overall and in the long term, the overhead line options would lead to a moderate negative effect on the landscape.
- 8.41 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area D.
- 8.42 With mitigation, the magnitude of effect (scale of change) on landscape character as a result of an underground option would continue to be moderate

negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on landscape. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on landscape, would be negligible and the scale of effects on landscape would be broadly neutral.

- 8.43 There would be a minor positive effect on landscape character, associated with the underground option, where a 3km section of existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to influence the landscape.
- 8.44 Following the establishment of mitigation measures, the effect of sealing end compounds on landscape character would be limited to localised minor negative effects. Particular care would need to be taken in the design and siting of a compound close to the western edge of the Brett Valley if a southern overhead alignment were to be adopted to the east.
- 8.45 Overall, the long term effects on landscape character as a result of an underground cable option, following the establishment of mitigation measures, would be minor positive.

Environment - Visual Amenity

Baseline conditions

- 8.46 The public views of the existing overhead lines experienced by high sensitivity visual receptors in Study Area D are from public footpaths and cycle routes, particularly those which run directly beneath the existing overhead line. There are no national or regional cycle routes, or long distance footpaths that have views of the existing overhead lines in Study Area D. There is a local cycle route (Suffolk Cycle Route – Bures Loop A2) which follows the lane between Shelley and Shelley Priory Farm which has a mixture of open and filtered views of the existing 400kV and 132kV overhead lines from a distance of approximately 1.5km.
- 8.47 There are a number of glimpsed open and filtered views south to the existing 400kV and 132kV overhead lines experienced by high sensitivity visual receptors at private residential properties in Polstead Heath. Concerns about the effects of an overhead line on views from Polstead Heath have been specifically raised in representations. Intervening buildings and the woodland to

the south of Polstead Heath (Millfield Wood) screens views from some residential properties entirely. There are few open and filtered views from properties at Bower House Tye and Hadleigh Heath on the A1071. There are views of the existing overhead lines in Study Area D from individual properties to the north and south. To the south, land falls away toward the Box and Brett Valleys and there are no views beyond 2km of the existing lines at this point (this includes Polstead, which lies close to the western boundary of the study area).

- 8.48 Study Area D is on higher ground between valleys which allows distant views from some viewpoints. These more distant views include from the edges of Stoke-by-Nayland (including part of the Stour Valley Path, a long distance footpath and regional route, to the east of Stoke-by-Nayland), from viewpoints at Lower Raydon and Raydon and from the A1071 to the east of Hadleigh. The majority of more distant viewpoints, particularly to the south, are however limited by vegetation and topography.
- 8.49 Given the scenic qualities of the landscape in Study Area D and the generally commonplace nature of the views, the views within Study Area D are generally of local importance.

Assessment of effects

- 8.50 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on views as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land.
- 8.51 A new overhead line on a northern or southern alignment within Study Area D would have a negative effect on the majority of public and private visual receptors to the immediate north and south of the study area. The effect on views beyond the locality would be relatively minor due to the presence of the existing lines, the distance of the viewer and the effects of intervening vegetation. For the majority of visual receptors the existing 400kV and 132kV overhead lines are already present in these views. The presence of the existing overhead lines would limit the magnitude of effect (scale of change) on views as a result of an additional overhead line.

OHL Northern Alignment

- 8.52 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be from residential

properties in Polstead Heath to the north of the existing overhead line, particularly those that would be oversailed by this option, and isolated properties that would be closer to a new 400kV overhead line than the existing, such as Whitehall and properties at and near Rands Farm. A greater negative magnitude of effect (scale of change) on views would also be experienced from the public rights of way that would run under the new overhead line.

- 8.53 A new overhead line on a northern alignment in Study Area D would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and the views in this study area are generally of local importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.

OHL Southern Alignment

- 8.54 The greatest negative magnitude of effects (scale of change) on views experienced by high sensitivity visual receptors would be from isolated residential properties to the south of the existing 400kV overhead line, particularly Valley Farm which currently sits between the 400kV and 132kV overhead lines. Overbury Hall, residential properties on Rands Road at and near Lot's Farm/Layham Lodge and Pope's Green Farm (although it is currently heavily screened) would also experience a greater negative magnitude of effect (scale of change) on views as a new 400kV overhead line would be closer to these receptors than the existing.
- 8.55 Residential properties on the southern edge of Polstead Heath would experience negative effects on visual amenity as a result of a new overhead line to the south, but these effects would be less than if the overhead line were to the north. A greater effect on views would also be experienced from the public rights of way that run under the existing overhead lines.
- 8.56 Other properties to the south of Study Area D on Stoke Road and Millwood Road are at a distance of 0.5km from the existing 132kV overhead line and negative effects would be less at this distance and with intervening vegetation partly screening views.
- 8.57 A new overhead line on a southern alignment in Study Area D would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual

receptors of high sensitivity and the views in this study area are generally of local importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.

- 8.58 Although a northern and southern alignment in Study Area D would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on views compared with a northern alignment as it would more closely parallel the existing 400kV overhead line, following the alignment of the existing 132kV overhead line.

Underground cable alignment

- 8.59 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area D.
- 8.60 An underground cable route would not lead to any substantial long term effects on views if disturbance to important features such as woodland is largely avoided. Some loss of hedgerows and hedgerow trees is likely to occur within the study area, which would have a localised negative effect on views. An underground cable route would have a moderate negative magnitude of effect (scale of change) on views in the temporary and short term and a low negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and views in the study area are generally of local importance. This would result in a minor negative effect on views without mitigation and in the long term as a result of an underground cable route in Study Area D.
- 8.61 There would be a minor positive effect on views associated with this option where 3km of the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 8.62 The sealing end compounds would lead to some localised effects on views. At the eastern extent of Study Area D this would introduce negative effects on views in the area to the west of Overbury Hall Road on the edge of the Brett Valley. Existing mature trees and woodland belts to the north of Overbury Hall would assist in screening views of a sealing end compound to an extent.
- 8.63 At the western end of Study Area D a sealing end compound would introduce negative local visual effects to the east of Sprott's Farm. As well as the existing presence of overhead lines in this local landscape, nearby mature woodland at Dollops Wood and tall hedgerows within the landscape mean that a compound could be partly screened from view from nearby visual receptors.

- 8.64 Overall an underground cable option would result in a neutral effect on views in the long term prior to mitigation.

Potential for mitigation

- 8.65 For both the overhead and underground alignment options it would be possible to minimise negative effects on views as a result of road improvements to the local lane network through careful planning of access to avoid the need for road improvements, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term negative visual effects would be unavoidable until re-establishment.

OHL Alignments

- 8.66 For both overhead line options, mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line, subject to landowner agreement, would be in keeping with the existing landscape character and could assist in lessening potential effects on views.

Underground cable alignment

- 8.67 The negative visual effects of an underground cable alignment would largely be temporary, subject to the avoidance of the majority of woodland through routing. Loss of some trees and hedgerow through this study area could be minimised through careful routing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.
- 8.68 The negative visual effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 8.69 For both overhead line options the magnitude of effect (scale of change) on views would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. An overhead line on a southern alignment would give rise to a lower scale of change on views generally than a northern alignment, as this option would more closely parallel the existing 400kV overhead line through the study area and would replace the existing 132kV overhead line to the south. This option would also maximise separation

- from Polstead Heath, where there is the greatest concentration of private views and would avoid the oversailing of any properties. Overall and in the long term and after mitigation, both the overhead line options would lead to moderate negative effects on visual amenity.
- 8.70 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area D.
- 8.71 With mitigation, the magnitude of effect (scale of change) on visual amenity as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on views. There would be some tree losses in the cables swathe and there would not be replacement tree planting in the swathe. The long term magnitude of effect of an underground cable route on views, would be negligible and the scale of effects on visual amenity would be broadly neutral.
- 8.72 There would be a minor positive effect on views where a 3km section of existing 132kV overhead line would be removed. The benefits of undergrounding would be limited as the existing 400kV overhead line would continue to be a component in many views.
- 8.73 Following the establishment of mitigation measures, the effect of sealing end compounds on views would be limited to localised minor negative effects, with some wider potential effects on views in the Brett Valley.
- 8.74 Overall, the long term effects on visual amenity as a result of an underground cable option would be minor positive.

Environment - Cultural Heritage

Baseline conditions

- 8.75 There are four Grade II listed buildings within the route corridor in Study Area D. These comprise Overbury Hall, Lot's Farm, Valley Farm and Pope's Green Farm. Grade II listed Rands Farm and White Hall lie to the north of the corridor. The garden surrounding Overbury Hall is a non-designated heritage asset, recorded as a formal garden and the possible location of a moat. The setting of this heritage asset includes the garden.

- 8.76 There are two other non-designated heritage assets within the route corridor in Study Area D. These comprise two areas of historic woodland. To the north of the route corridor metal detecting at Deaves Farm has identified a quantity of Medieval, Roman and Bronze Age finds, the number of Roman finds in particular is indicative of settlement activity.
- 8.77 A review of aerial photography and LIDAR data for Study Area D identified a possible enclosure and house platforms, as well as a number of former field boundaries.
- 8.78 The underground route would cross a parish boundary, demarked by a hedgerow, which would certainly be 'important' in terms of the Hedgerow Regulations. Other hedgerow will form part of a pattern of pre-18th century enclosure, as described by the Suffolk Historic Landscape Characterisation project, and will therefore also be 'important'.

Assessment of effects

- 8.79 For all of the connection options, improvements to the road network necessary to construction activities could negatively affect 'important' hedgerows and historic lanes. The magnitude of effect would be low on heritage assets of low sensitivity. An overall minor negative effect is therefore predicted.
- 8.80 For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including access tracks). The magnitude of effect would be low/moderate on heritage assets of low/moderate sensitivity. An overall minor negative effect is therefore predicted.
- 8.81 Effects of the overhead line options on the setting of designated heritage assets and an underground cable option on buried archaeology are discussed in more detail below

OHL Northern Alignment

- 8.82 An overhead option on a northern alignment in Study Area D would have a negative effect on the setting of two Grade II listed buildings, Rand's Farm and White Hall. The receptors are of high sensitivity. The distance of separation, presence of the existing 400kV overhead line and screening provided by mature trees that bound the curtilage to the listed buildings would lessen the negative effects and the magnitude of effect would be low.

- 8.83 The overall scale of effect of an overhead line on a northern alignment in Study Area D would be minor negative.

OHL Southern Alignment

- 8.84 An overhead option to the south of the existing 400kV overhead line in Study Area D would negatively affect the setting of two Grade II listed buildings, Pope's Green Farm and Valley Farm, as well as views to and from Lots Farm and Overbury Hall. Due to the separation distance between the southern alignment and Lots Farm and Overbury Hall the magnitude of effect in these cases would be low. A southern alignment would introduce a new 400kV overhead line to the north of Valley Farm, as well as the existing 132kV overhead line to the south. However, the setting of Valley Farm is limited by Layham Quarry to the south. The magnitude of effect on both receptors would also be lessened by the existing mature trees that screen both listed buildings, and the existing 132kV overhead line, which is already present in this area. The magnitude of effect in relation to Pope's Green Farm and Valley Farm would therefore be low.

- 8.85 The overall scale of effect of an overhead line on a southern alignment in Study Area D would be minor negative.

Underground cable alignment

- 8.86 An underground option in Study Area D would negatively affect buried archaeological remains. Study Area D has a moderate number of potentially 'important' hedgerows and the potential for the survival of buried archaeology is moderately high. Given the probability of encountering known and previously unrecorded archaeological remains within an underground cable route, the magnitude of effect of an underground option in Study Area D is predicted to be high.
- 8.87 An underground option would also negatively affect the historic landscape, through the removal of historic hedgerows, some of which are 'important' in terms of the Hedgerow Regulations criteria. The magnitude of effect would be low on heritage assets of low sensitivity.
- 8.88 In addition, an underground option in Study Area D would require sealing end compounds. A sealing end compound would have negative effects on buried archaeology, and on the setting of listed buildings, particularly Overbury Hall and Sprott's Farm. The magnitude of effect would be low/moderate on heritage assets of low/moderate, high and very high sensitivity.

- 8.89 It is difficult to determine the scale of effect in relation to buried archaeology. However, given the predicted high magnitude of effect on receptors of low/moderate sensitivity, as well as the negative effects of sealing end compounds, the overall effect of an underground option on buried archaeological remains would be moderate.
- 8.90 An underground option would have a minor positive effect on the setting of Grade II listed Pope's Green Farm through the removal of the existing 132kV overhead line.

Potential for mitigation

- 8.91 Mitigation of negative effects on buried archaeology and historic landscape features can be achieved. There is less scope to mitigate the negative effects on the setting of designated heritage assets.
- 8.92 For all options, potential effects on historic landscape features could be avoided, or mitigated through archaeological recording, careful reinstatement, and in the case of hedgerow loss, translocation or replanting.
- 8.93 For all options, an extensive programme of archaeological investigation, mitigation and monitoring would be required to mitigate effects on buried archaeology.

Summary

- 8.94 An overhead alignment to the north or south of the existing 400kV overhead line in Study Area D would have a minor negative effect with regard to heritage assets. The negative effects on the setting of Grade II listed buildings would be the same for each option, and in each case the effect would be lessened by the presence of existing mature trees which would limit views to and from the listed buildings towards the new overhead lines and pylons
- 8.95 In relation to effects on cultural heritage receptors, there would be no difference between these options.
- 8.96 While mitigation of negative effects on buried archaeology and historic landscape features is achievable, preservation *in situ* is preferred. An underground option would require considerably more mitigation with respect to non-designated heritage assets, and result in direct physical impacts (as opposed to indirect visual impacts) compared to an overhead line. The effects of an underground cable and an overhead line connection are very different in relation to heritage assets and difficult to compare. However, given the high

probability of direct impacts and significant mitigation requirements in relation to an underground cable compared to an overhead alignment, the scale of effect would be greater for an underground cable option than an overhead line on either alignment.

Environment - Ecology

Baseline conditions

- 8.97 There are four CWS designations within Study Area D, valued at county level:
- Valley Farm Wood CWS is designated for its mix of wet and ancient woodland and hedges which support dormice and a number of reptile and bird species;
 - Layham Grove CWS is an ancient woodland site;
 - Layham Pit Woodland and Meadow CWS is an active quarry with an undisturbed area of wet woodland and unimproved wet meadow and supports invertebrate, amphibian, reptile and bird communities;
 - Milfield Wood CWS is an ancient woodland site covering two blocks of woodland separated by arable land.
- 8.98 Study Area D has a greater range of habitats compared with other areas of the Route Corridor. The quarrying activities at Layham Quarry have resulted in a complex habitat mosaic with interesting floristic and faunal communities and this is reflected in its CWS designation. The woodland blocks in this study area (mainly found within the CWS designations) are likely to be used by a variety of bird and bat species and there are records of dormice in several of the woodlands. Outside of CWS designations, these woodland areas are valued at the local level but the value of individual areas will vary with composition and association with other species.
- 8.99 Outside of the woodland and quarry habitats, the predominant habitat is arable land. Species including badger, brown hare and various reptile species have been recorded within Study Area D and surrounding land. The intrinsic value of the grasslands is low but associations with valued species would increase their value.
- 8.100 The fields are bordered with species-rich hedgerows. The hedges are likely to have a connective function and could support a range of species including birds, bats, dormice and amphibians. The network of hedgerows is currently valued

at the district level, but the value of individual hedgerows will vary depending on composition and association with other species.

8.101 There is one minor watercourse within the study area which runs through Valley Farm Wood and its value is considered as part of the CWS designation.

8.102 There are a number of waterbodies in the study area including those associated with the quarrying activities and ponds within Valley Farm Wood CWS. There are records of great crested newt outside the Route Corridor in the Polstead Heath area and the ponds within the study area may support this species. Ponds outside the CWS designations are currently valued at the local level.

Assessment of effects

OHL Northern Alignment

8.103 A northern overhead alignment in Study Area D would avoid impacts on Layham Pit Woodland and Meadow CWS but would result in permanent tree loss within Valley Farm Wood CWS and Millfield Wood CWS. Both sites have records of dormouse but only the latter is classed as ancient woodland. Tree loss at Valley Farm CWS would be relatively small resulting in a moderate negative, long term magnitude of effect. Tree loss at Millfield would be relatively large resulting in a high negative, long term magnitude of effect.

8.104 The permanent loss of individual hedgerow trees along the route cannot be ruled out resulting in a low negative, long term magnitude of effect. However, the hedgerow network would be retained. Impacts on ponds and watercourses would be avoided with this option and grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

8.105 In combination the low to high magnitude of effects on receptors of local to county value would lead to an overall major negative effect on ecology in Study Area D as a result of the northern overhead alignment prior to mitigation.

OHL Southern Alignment

8.106 A southern overhead alignment in Study Area D would avoid impacts on Millfield Wood CWS but would result in permanent tree loss within Valley Farm Wood CWS and Layham Pit Woodland and Meadow CWS. Dormouse has been recorded in the former and has potential to be present in the latter. Neither site contains ancient woodland. Tree loss at Valley Farm CWS would be relatively small, crossing two plantation areas and resulting in a moderate negative, long term magnitude of effect. Tree loss at Layham Pit Woodland and

Meadow CWS would be negligible and the magnitude of disturbance effects to other habitats within the site would be limited by the current quarrying activities although there is potential for impacts to ponds within the quarry. This would result in a moderate negative, medium term magnitude of effect.

8.107 The permanent loss of individual hedgerow trees along the route cannot be ruled out resulting in a low negative, long term magnitude of effect. However, the hedgerow network would be retained. Outside of the CWSs, impacts on ponds and watercourses would be avoided with this option and grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

8.108 In combination the low to moderate magnitude of effects on receptors of local to county value would lead to an overall moderate negative effect on ecology in Study Area D as a result of the southern overhead alignment prior to mitigation.

Underground cable alignment

8.109 The underground option in Study Area D would run outside the Route Corridor to avoid impacts on CWSs and woodland habitat. There would be losses of up to 65m of habitat at hedgerow crossings. These habitat losses are likely to impact bats, dormice and nesting birds and are also likely to weaken the wildlife corridor function of these habitats. This would result in a high negative, long term magnitude of effect. Grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

8.110 The location of sealing end compounds would not result in additional effects on ecology.

8.111 In combination the low to high magnitude of effects on receptors of local to district value would lead to an overall major negative effect on ecology in Study Area D as a result of the underground option prior to mitigation.

Potential for mitigation

8.112 For all options, existing field access points and watercourse crossings would be used for works traffic and standard environmental protection measures implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities onto retained habitats and implementation of pollution control methods.

- 8.113 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as dormice, amphibians and reptiles, if present.

OHL Northern Alignment

- 8.114 Where tree loss is required to achieve electrical safety clearances, pollarding or coppicing could be used to avoid total loss of habitat. Alternatively, where tree removal is required, hedgerow or low height scrub planting across the easement can be used to maintain habitat connectivity. This would be particularly important for dormouse habitat such as Millfield Wood and Valley Farm Wood. Replacement woodland planting could be undertaken outside the overhead line easement subject to landowner agreement. This would be most important to compensate for loss of ancient woodland at Millfield Wood CWS.

OHL Southern Alignment

- 8.115 Using the route of the existing 132kV overhead line in Valley Farm Wood CWS and Layham Pit Woodland and Meadow CWS would reduce tree loss and habitat fragmentation. Where tree loss is required to achieve safety clearances, pollarding or coppicing could be used to avoid total loss of habitat. Alternatively, where complete tree removal is required, hedgerow planting can be used to maintain habitat connectivity and replacement woodland planting could be undertaken outside the overhead line easement, subject to landowner agreement.
- 8.116 Artificial trackways could be used to protect ground conditions or turf translocation or re-seeding where working areas affect important floristic communities as might be present within Layham Pit Woodland and Meadow CWS.

Underground cable alignment

- 8.117 Working areas would be minimised when crossing valued habitat features and habitats within the permanent easement would be reinstated on completion of works (with the exception of trees), although varying establishment periods will apply and loss of mature trees cannot be mitigated within a reasonable timeframe.
- 8.118 Ducting at road crossings could incorporate the roadside hedgerows and thereby reduce fragmentation impacts by shortening the timeframe between hedgerow removal and reinstatement. Temporary fragmentation impacts on

bats and dormouse caused by hedgerow removal could be mitigated through the use of aerial bridges (across short distances) or timing the works to avoid sensitive seasons.

8.119 Where tree removal is required, hedgerow planting would be used to maintain habitat connectivity and replacement woodland planting would be undertaken outside the permanent easement.

8.120 Measures would be undertaken to ensure drainage conditions outside the permanent easement are unaltered - this would be particularly important adjacent to wet habitats within Valley Farm Wood CWS.

Summary

8.121 The northern overhead alignment in Study Area D would result in woodland loss within two CWSs, both sites support dormouse and one is ancient woodland. Mitigation including wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts) would reduce some impacts on ecology from this option. However, due to the relatively large loss of ancient woodland loss within Millfield Wood CWS, the overall impacts from this option would remain within the major negative effects category.

8.122 The southern overhead alignment in Study Area D would result in tree loss at Valley Farm Wood CWS (which supports dormouse) and disturbance to habitats and species within Layham Pit Woodland and Meadow CWS. Mitigation including keeping to the existing managed habitats of the 132kV easement, wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts) would lessen impacts on ecology from this option and reduce overall impact from this option to minor negative effects.

8.123 The underground cable option within Study Area D would avoid impacts on the CWSs. However, it cannot avoid hedgerows and would result in up to 65m of hedgerow removal where the route crosses. The resultant habitat fragmentation can have substantive impacts on species such as dormice and bats. It is not possible to mitigate within a reasonable timeframe the loss of mature trees and hedgerows associated with an underground option. However, temporary measures can lessen impacts on connectivity in the short term and replacement hedgerow planting can reduce effects in the long term. These mitigation methods in combination with wildlife-friendly working methods would reduce impacts on ecology from the underground option in Study Area D to a moderate negative effect.

8.124 All three connection options have the potential to result in impacts on ecology. However, by following the existing 132kV overhead line easement, the southern overhead alignment option would have the fewest overall ecological effects. A northern overhead alignment would result in major negative effects, mainly resulting from the loss of CWS ancient woodland. Whereas the underground option would result in moderate negative impacts mainly resulting from hedgerow losses.

Socio-economic – Economic activity

Baseline conditions

8.125 The study area is predominantly rural with agriculture the dominant economic activity. Polstead Heath village lies within the area and is a residential community with no tourist-related facilities. There are a number of tourist-related facilities along the A1071 including a pub and caravan and camping site. Layham Quarry (operated by Brett Aggregates Ltd) covers a large site within and to the south of the route corridor. Parts of the quarry are allocated in the Suffolk Waste Core Strategy as a strategic non-hazardous waste landfill site.

Assessment of effects

8.126 The construction phase, for all options, would bring short term benefits to the local economy in terms of increased spend by the construction teams and additional income for local suppliers.

OHL Alignments

8.127 Overall the permanent impacts for visitors to, and tourist-related businesses in, the area would be neutral with some localised negative impacts for particular types of visitors and participants in informal recreational activities.

8.128 Two tourist related businesses would have partial views of a new overhead line in Study Area D - a public house and a caravan site.

8.129 The overhead alignments have the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.

8.130 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.

8.131 The options oversail Layham Quarry operated by Brett Aggregates Ltd. National Grid's understanding, having consulted with the Operator, is that most mineral resources associated with the extant planning permission have been extracted. As such the options would not sterilise any reserves on the site and the impact would be neutral. The allocated site for future mineral working (referred to in paragraph 2.69) lies to the south of the route corridor and would not be affected by either overhead line or underground options.

Underground cable alignment

8.132 Overall the permanent impacts for visitors to and tourist-related businesses in the area would be beneficial.

8.133 The permanent removal of existing 132kV overhead lines and pylons would lead to improvements to views enjoyed by users of the public rights of way and local highway network. It would result in a beneficial impact on visitors attracted to the area by the quality of the environment and the opportunities for informal recreation and on tourist-related businesses.

8.134 A sealing end compound in the eastern part of the area potentially would result in open views from the PROW to the south of Hill Farm and the PROW to south of the sewage works may experience partly-obscured views of a compound. Depending on the final siting and design of a sealing end compound in the western part of this area, potentially there could be views from the PROW to the north of Sprott's Farm. Overall this would result in minor negative impacts which would be highly localised.

8.135 There would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. There is also potential for minor localised impacts during construction on agricultural land resulting in partial crop or harvest loss. The option would result in the temporary loss of around 22.7 ha of Grade 2 agricultural land and 6.4 ha of Grade 3 agricultural land.

Potential for mitigation

8.136 There are a number of measures that can be put into place to mitigate the temporary construction works on visitors' enjoyment of the area. This is likely to include the programming of construction activities and routeing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are

disrupted during construction, alternative or diversionary routes would be provided.

8.137 Agricultural mitigation measures would include restoration of agricultural land disturbed during construction to productive quality. National Grid will pay appropriate compensation for temporary loss of crops and other effects on agricultural use and for permanent easements for its infrastructure.

Summary

8.138 The overall effect of all of the overhead line alignments on economic activity would be broadly neutral. An underground solution has the potential to benefit the attractiveness of the area, by securing the removal of the 132kV overhead line, without it being replaced, and temporary negative effects are capable of mitigation.

Cost

Capital cost

8.139 The estimated capital costs, based on the assumptions referred to in Chapter 5 are as follows :

- OHL northern alignment £6.6m
- OHL southern alignment £5.9m
- Underground cable alignment £98.6m

Lifetime cost

8.140 The estimated Lifetime costs, based on the assumptions referred to in Chapter 5 are as follows :

- OHL northern alignment £17m
- OHL southern alignment £15m
- Underground cable alignment £103m

Summary

8.141 In terms of both capital and lifetime costs, an underground option would be considerably more expensive than the overhead options. Of the overhead options, the southern option would impose lower lifetime costs.

Interim overhead alignment

- 8.142 An overhead line option to the south of the existing 400kV overhead line would have a lesser negative magnitude of effect on landscape and views than an overhead line to the north as it would follow the alignment of the existing 132kV overhead line, which would be removed, and would more closely parallel the existing 400kV overhead line. This southern overhead alignment option would also maximise separation from Polstead Heath, where there is the greatest concentration of private visual receptors and would avoid the oversailing of any properties.
- 8.143 An overhead alignment to the north or south of the existing 400kV overhead line in Study Area D would have a minor negative effect with regard to heritage assets. The negative effects on the setting of Grade II listed buildings would be the same for each option and in each case the effect would be lessened by the presence of existing mature trees. In relation to effects on cultural heritage receptors, there would be no difference between these options.
- 8.144 A northern alignment would have a greater effect on woodland (including County Wildlife Sites) than a southern alignment and this would be detrimental both in landscape and habitat terms.
- 8.145 The southern alignment would cross more of Layham Quarry than a northern alignment, but the operator has indicated that this would not be a constraint.
- 8.146 The lifetime cost associated with a northern alignment would be £2m greater than that of a southern alignment.
- 8.147 Given that a southern alignment would be favoured on landscape, visual, ecological and cost grounds, with no other distinguishing factors, this would be the interim overhead alignment in Study Area D.

Undergrounding

- 8.148 In line with National Policy Statement EN-5, National Grid has considered the benefits of undergrounding in the context of the landscape in which the proposed connection would be set, together with the additional cost and the environmental and archaeological consequences of undergrounding. Comparisons are drawn between the interim overhead alignment described above and the underground option.

Landscape and visual considerations

- 8.149 Study Area D is broadly comprised of an unremarkable landscape consisting of arable land on a plateau of higher ground between the River Brett and River Box. A valley landscape extends into the study area from the east, however this is a relatively minor tributary of the River Brett, forming a less pronounced valley. The Brett Valley SLA extends into the eastern half of Study Area D. The remainder of the study area is undesignated. It is not clear why the Brett Valley SLA extends beyond the valley landscape and the landscape on the plateau of high ground in Study Area D is comparable throughout. Given the designations within Study Area D, the landscape is of local value.
- 8.150 Although there are no regional or national landscape designations within the study area, the Dedham Vale AONB lies to the immediate west (in Study Area E) and approximately 2km to the south.
- 8.151 The predominantly agricultural landscape in Study Area D is broadly intact, apart from the eastern part of the study area where Layham Quarry is located. There are few gappy hedgerows or open field boundaries in this study area and the landscape generally appears well managed. Woodland blocks and woodland belts remain largely intact in the study area. Modern development at Upper Layham and the sports fields and sewage works at the southern edge of Hadleigh encroach on the character of the agricultural landscape. Overall the landscape condition in Study Area D is moderate.
- 8.152 Study Area D crosses a plateau landscape between valleys and is broadly comprised of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. Existing overhead lines cross the study area. Overall the landscape of Study Area D has a high capacity to accommodate overhead electricity lines.
- 8.153 The beneficial effect on landscape character and visual amenity as a result of the removal of the 132kV overhead line is common to both a southern overhead alignment option and underground option in Study Area D.
- 8.154 The baseline views in and near Study Area D include the existing 400kV overhead line and 132kV overhead line. The removal of the 132kV overhead line within Study Area D and construction of a new 400kV overhead line in close would represent a negative scale of change to these views, but the change would be consistent with the existing baseline conditions. Given the qualities of

- the landscape in Study Area D and the commonplace nature of the views, views with Study Area D are generally of local importance.
- 8.155 The greatest negative magnitude of effects on views as a result of a new 400kV overhead line would be experienced by high sensitivity visual receptors that would be closer to the new overhead than the existing. This would affect only a small number of individual properties to the south of the existing 400kV overhead line, in particular Valley Farm which would sit between the existing and proposed 400kV overhead lines. Views would also be experienced by the public footpaths which cross and are close to the corridor. There are no national trails or long distance footpath routes that would be affected by a new 400kV overhead line in Study Area D.
- 8.156 The landscape in Study Area D has a high capacity to accommodate an additional 400kV overhead line on a southern alignment. Although, there would be views of a new 400kV overhead line for a number of high sensitivity visual receptors, existing views in the area are generally of local importance. In addition, the magnitude of effect (scale of change) to the landscape and views as a result of an additional 400kV overhead line would be no greater than moderate negative due to the presence of the existing overhead lines in the baseline conditions. The addition of a new overhead line in Study Area D would have a minor negative indirect effect on the AONB to the west, but this effect is not so great as to affect the statutory purpose to conserve the AONB. Overall, a southern overhead alignment in Study Area D would result in a moderate negative effect on landscape character and visual amenity.
- 8.157 An underground option would avoid the moderate negative effects on landscape and views associated with a southern overhead alignment option in Study Area D.
- 8.158 The scale of effect on landscape and views as a result of undergrounding in Study Area D would be broadly neutral in the long term. There would also be a positive effect on landscape and views, associated with the underground option, over a distance of 3km where the existing 132kV overhead line would be removed and would not be replaced by the larger 400kV overhead line. Overall, the long term effects on landscape character and visual amenity as a result of an underground cable option would be minor positive.
- 8.159 The overall benefit of undergrounding in Study Area D are the minor positive effects on landscape and views, compared to the moderate negative effects on landscape and views as a result of a southern overhead alignment option.

Undergrounding cost

8.160 The estimated capital cost of undergrounding through this section of the route is estimated at £98.6m, compared to a cost of £5.9m for the interim overhead alignment. The estimated lifetime costs are £103m and £15m respectively.

Environmental and archaeological consequences of undergrounding

8.161 An underground option would avoid losses of habitat in Valley Farm Wood CWS and Layham Pit Woodland and Meadow CWS which would be associated with the interim overhead alignment. Such losses would however be small and temporary as the route of the existing 132kV overhead line would be followed.

8.162 An underground option would avoid minor negative effects on the Grade II listed Valley Farm and Pope's Green Farm which would be associated with the interim overhead alignment. The setting of both buildings is already affected by overhead lines. An underground option would have a minor positive effect on the setting of Grade II listed Pope's Green Farm through the removal of the existing 132kV overhead line.

8.163 The removal of the 132kV overhead line may benefit the attractiveness of the area which may have a minor positive effect on economic activity.

8.164 An underground option would result in extensive ground disturbance which would lead to large negative effects on non-designated buried archaeology. The effects on buried archaeology would be much greater as a result of an underground cable, compared to an overhead alignment. The negative effects would be direct, and lead to total loss or substantial harm in relation to multiple non-designated heritage assets. Mitigation is available for the negative effects through archaeological investigation and recording, although buried archaeology is a finite and non-renewable resource and preservation in situ is preferred when possible.

8.165 An underground option could also result in negative effects on the historic landscape through the removal of historic hedgerow. Mitigation is available for these effects and if implemented, no long term effects would remain.

8.166 The underground cable option within Study Area D cannot avoid hedgerows and would likely result in losses of up to 65m of habitat at hedgerow crossings. In addition, the resultant habitat fragmentation can have substantive impacts on species such as dormice and bats. Even with replacement hedgerow planting, impacts on ecology from the underground option in Study Area D would have a moderate negative effect.

Conclusions

- 8.167 An overhead line in Study Area D would have limited effects on the largely undesignated landscape, part of which has been affected by quarrying. The landscape in Study Area D has a high capacity to accommodate an additional 400kV overhead line. It would not be regarded as a 'particularly sensitive location' in the context of paragraph 2.82 of National Policy Statement for Electricity Networks Infrastructure (EN-5). The assessment has considered whether 'the benefits from the non-overhead line alternative (underground cables) will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable'.
- 8.168 An overhead line solution would have a moderate negative effect on landscape and views in an area where overhead lines are already present. Putting the new line underground would avoid this negative effect and there would be a minor positive effect on the landscape resulting from the removal of the existing 132kV overhead line, although the existing 400kV overhead line would remain in the landscape.
- 8.169 The interim overhead alignment would give rise to a moderate scale of negative effects on views from a relatively small number of receptors of high sensitivity. These effects would be avoided if underground cables are used and there would be a minor positive effect on views resulting from the removal of the existing 132kV overhead line. Although the existing 400kV overhead line is present in local views and would remain if undergrounding were adopted.
- 8.170 The extra economic impacts of putting the line underground would involve incurring lifetime costs £88m higher than those of the interim overhead alignment.
- 8.171 The socio-economic effects of an overhead alignment are anticipated to be neutral while, with undergrounding, some minor benefits may accrue from the removal of the existing 132kV overhead line.
- 8.172 There would be minor negative effects on buried archaeology from an overhead line because of the relatively small area of ground disturbed during pylon construction. The interim overhead alignment would have a minor negative effect on cultural heritage because of impacts on the setting of two Grade II listed buildings close to the alignment. This setting is already affected by the existing 132kV overhead line whose route would be adopted by the interim alignment. These effects would be avoided if the connection used underground cables. The effects on buried archaeology of putting the line underground would

be moderate negative. It is preferable to leave remains in situ whereas undergrounding will bring a high degree of disturbance where excavations take place and some further potential effects from the use of the haul road. These effects can be mitigated by investigation and recording.

8.173 The effects on ecology of the interim overhead alignment would be minor negative. Effects on ecology of putting the line underground would arise mainly because of losses of species-rich hedgerows. No designated sites would be adversely affected by the installation of underground cables. The long term effects would be moderate negative.

8.174 There are no insurmountable technical difficulties associated with the installation of underground cables.

8.175 The benefits from the use of underground cables as an alternative to an overhead line in this location, which is assessed as not being particularly sensitive, will not clearly outweigh any extra economic, social and environmental impacts. Undergrounding would not therefore be appropriate in this study area.

Study Area conclusion

8.176 It is recommended that an **overhead** line solution be taken forward for consultation for Study Area D and that the **southern** alignment be identified as the least environmentally constrained alignment. Subject to representations received during consultation, this is the alignment which National Grid should take forward to the next stage in the design process.

9 OPTIONS APPRAISAL STUDY AREA E – DEDHAM VALE AONB

Study area boundaries

- 9.1 Study Area E covers a section of the corridor with the eastern boundary defined by the Dedham Vale AONB boundary, west of Polstead Heath, and the western boundary defined by the AONB boundary on Brick Kiln Hill lane. A small triangular area of farmland within the corridor and this study area sits outside the AONB designation.
- 9.2 The hamlet of Whitestreet Green is 0.5km to the north of the existing overhead lines and the hamlets of Stone Street and Calais Street and the village of Boxford lie north of this. The village of Polstead is less than 1km to the south of the existing overhead lines with the village of Stoke-by-Nayland beyond this. A substantial area of orchard (Boxford Fruit Farm) and a fruit processing plant (Copella) is to be found at the western end of the study area.
- 9.3 The options for Study Area E are shown on Figure 9.

Definition of options

OHL Northern Alignment

- 9.4 The northern overhead alignment would diverge away from the existing 400kV overhead line for the majority of this study area to a maximum distance of approximately 300m to avoid the listed building at Sprott's Farm (at this point the northern overhead alignment is outside the route corridor) and the listed building at The Nussteads further west. From the maximum point of separation (just west of Sprott's Farm) the northern overhead alignment would steadily run southward to closely parallel the existing 400kV overhead line south of Peyton Hall, where it would cross Boxford Fruit Farm orchards and would lie just to the south of the Copella processing plant, at the western end of the study area. The approximate length of this option would be 3.3km.

OHL Southern Alignment

- 9.5 The southern overhead option would closely parallel the existing 400kV overhead line at an 85m offset through this study area. This option would cross the orchards at Boxford Fruit Farm at the western end of the study area. The approximate length of this option would be 3.3km.

Underground cable alignment

- 9.6 From the AONB boundary at the eastern edge of the study area, the underground option would run from a point within the corridor south of the existing 400kV overhead line through a woodland belt south of Sprott's Farm. At a point south of Whitestreet Green, between Bushy Park Wood and Broom Hill Wood, the underground cable alignment would run southward across the River Box and between a gap in the Boxford Fruit Farm orchards, meeting the B1068 at the western boundary to the study area. The approximate length of this option would be 3.2km.
- 9.7 If an underground cable route were to be taken forward in Study Area E and not in the adjacent Study Areas D and F, then at the eastern extent of Study Area E, it is anticipated that the underground cable route would connect to an overhead alignment in Study Area D via a sealing end compound located east of Sprott's Farm. Whether connecting to a northern or southern alignment, this would require a minor diversion of the underground cable route.
- 9.8 At the western extent of Study Area E, it is anticipated that the underground cable route could connect to either a northern or southern overhead alignment at a point to the west of Boxford Fruit Farm and east of the A134 (within Study Area F).

Other options considered but discounted

- 9.9 Consideration was given to an alignment which closely paralleled the existing 400kV overhead line to the north adopting an 85m offset. This option was discounted as it would have resulted in the overhead line oversailing, or being very close to, listed buildings at Sprott's Farm and The Nussteads.
- 9.10 Consideration was given to an underground cable route which ran between Sprott's Farm and Sprott's Hall, in order to avoid TPO woodland. However, it was considered that this option would still result in loss of woodland and would impact upon the curtilages of property. The option was therefore discounted and a more direct route adopted which could employ directional drilling to avoid effects on woodland at Dollops Wood.

Environment – Landscape

Baseline conditions

- 9.11 Study Area E comprises a section of the Box Valley which forms the northern extent of the statutorily protected Dedham Vale Area of Outstanding Natural Beauty (AONB) which is of national significance and is designated under the 1949 National Parks and Access to the Countryside Act, the primary purpose of which is to conserve and enhance the natural beauty of the landscape. A small triangular area of farmland within the corridor and this study area sits outside the AONB designation. The Box Valley extends northward through Boxford. This area to the north of the AONB is a Special Landscape Area (designated in the Babergh District Local Plan). Consistent representation has been made by Statutory Consultees, Community Forum Members and the wider public as to the importance of the AONB and the value of its landscape and that particular consideration should be given to undergrounding in this area. Legislation and national and regional policy reflect the high value of this landscape.
- 9.12 Suffolk Landscape Character Assessment characterises the majority of the study area as Rolling Valley Farmlands and Valley Meadowlands. The Valley Farmlands are described as having gently sloping valley sides within a wider rolling landscape. This landscape is comprehensively settled and contains locally distinctive villages often with late medieval cores. Woodlands form a distinctive feature in the land beyond the valley and are often present on the upper slope and framing views out from the valley.
- 9.13 The Valley Meadowlands are largely dominated by grazing land with small carr woodlands and willow plantation and occasional areas of fen.
- 9.14 The margins of the study area, at the edges of the valley sides, are characterised by the Suffolk Landscape Character Assessment as Ancient Rolling Farmlands. Ancient Rolling Farmlands are described as being a gently rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular fields and ancient and plantation woodlands form a significant feature.
- 9.15 The River Box is a tributary of the River Stour, which flows approximately 4km to the south. This is a small, secluded valley with gently sloping sides. The valley is mainly comprised of pastoral land with some broadleaved woodland blocks to the valley sides, some of which is associated with parkland. On the western extent of the valley side are orchards and related infrastructure,

- including agricultural buildings, which form part of Boxford Fruit Farm. There is also the Copella fruit pressing plant.
- 9.16 At its eastern end, Study Area E includes a tributary of the River Box and its valley. This minor valley is flanked by a broadleaved woodland belt on its eastern side. The upper valley sides and the area of higher ground between the Box and this tributary valley are in arable use. Fields within this study area have a mixture of open and hedgerow boundaries.
- 9.17 Apart from a few isolated residential properties in the Box Valley, which include farmsteads and Peyton Hall, the attractive villages of Polstead, Stone Street and Boxford lie close to the study area. Further settlement at Whitestreet Green and Calais Street comprises ribbon style development along the lanes, with a higher proportion of modern houses. The existing overhead lines and development at Boxford Fruit Farm and Copella already influence the character of this landscape.
- 9.18 The predominantly agricultural landscape in Study Area E is broadly intact, apart from the Boxfruit Farm and Copella pressing plant development on the western edge of the study area. There are a number of gappy hedgerows or open field boundaries in this study area. Woodland blocks and woodland belts remain intact in the study area. Overall the landscape condition in Study Area E is moderate.
- 9.19 In terms of the capacity or sensitivity of the landscape in Study Area E, as has been previously noted, the landscape within Study Area E is of national value. Study Area E crosses a valley landscape. Valley landscapes generally have less capacity to accommodate an overhead line compared with an open plateau landscape, as the overhead line can appear out of scale with the enclosed landscape. This part of the Box Valley is narrow and well enclosed by gently sloping valley sides, which creates an intimate feel to the landscape. This is accentuated by woodland blocks on the valley sides. The existing overhead lines cross this study area which influences the capacity of the landscape to accommodate a further overhead line. However, the landscape capacity of Study Area E, in relation to an additional overhead line is low.

Assessment of effects

- 9.20 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on the local network of lanes as a result of the possible need for road improvement for access, as well as the creation of points of access to cross agricultural land. The network of winding and sometimes sunken lanes is a component of the landscape character of this study area.

OHL Northern Alignment

- 9.21 An overhead line to the north of and not closely paralleled to the existing 400kV overhead line would have a negative effect on the Dedham Vale AONB, which is a landscape of national significance, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). A northern overhead alignment option would mean that the smaller 132kV pylons, to the south of the existing 400kV overhead line, would be removed and a new overhead line would be constructed to the north of the existing 400kV overhead line. In the majority of the study area this alignment would not closely parallel the existing 400kV overhead line and this would increase the extent of the AONB affected by 400kV overhead lines. Overall a northern alignment option would have a greater negative magnitude of effect (scale of change) compared to a southern alignment.
- 9.22 This option could have a potential negative effect on woodland north of 'The Nussteads' and a small area of woodland to the north of Sprott's Farm, as well as the likely need to remove hedgerow trees. Woodland and hedgerow trees are components of the landscape character of the study area.
- 9.23 An overhead line on a northern alignment in Study Area E would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of national value, has a moderate condition and has a low capacity to accommodate this change. Overall this option would result in a major negative effect on landscape prior to mitigation.

OHL Southern Alignment

- 9.24 An overhead line to the south of and closely parallel to the existing 400kV overhead line would have a negative effect on the Dedham Vale AONB, which is a landscape of national significance. The presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). In this option a new overhead line, although not on the exact same alignment,

would take the place of the existing 132kV overhead line which closely parallels the existing 400kV overhead line and this would minimise the extent of the AONB affected by 400kV overhead lines.

- 9.25 This option is likely to have a negative effect on existing woodland to the south of Sprott's Farm, where the southern alignment would not precisely match the existing easement of the 132kV overhead line, and could have a potential negative effect on woodland at the northern tip of Bushy Park Wood. Woodland is a component of the landscape character of the study area.
- 9.26 An overhead line on a southern alignment in Study Area E would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of national value, has a moderate condition and has a low capacity to accommodate this change. Overall this option would result in a major negative effect on landscape prior to mitigation.
- 9.27 Although a northern and southern overhead alignment in Study Area E would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on landscape character as it would have a lesser negative magnitude of effect (scale of change) on the landscape.

Underground cable alignment

- 9.28 An underground option would avoid the major negative effects on landscape associated with an overhead line option in Study Area E.
- 9.29 An underground cable route would not lead to any substantial long term negative effects on the landscape character if disturbance to woodland is largely avoided through routeing. The use of directional drilling techniques to cross the River Box and Dollops Wood would minimise effects elsewhere. There would be some loss of hedgerow and hedgerow trees within the study area, which would result in some localised negative effects on landscape character. An underground cable route in Study Area E would have a moderate negative magnitude of effect (scale of change) on the landscape during construction and low negative magnitude of effect (scale of change) on the landscape in the long term. This scale of change would be experienced by a landscape of national value, which is in a moderate condition and which has high capacity to accommodate this change. This would result in a minor negative long term effect on landscape prior to mitigation as a result of an underground cable option in Study Area E.

- 9.30 There would be a minor positive effect on landscape, associated with the underground option, over a section of 3km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 9.31 The siting of sealing end compounds outside the AONB boundary would be likely to lead to some localised landscape effects. At the eastern extent of Study Area E this would introduce negative local landscape effects in Study Area D to the east of Sprott's Farm. As well as the existing presence of overhead lines in this local landscape, there is nearby mature woodland at Dollops and Millfield Woods. This means that the existing landscape character has capacity to accommodate a sealing end compound.
- 9.32 A compound at the western end of Study Area E would introduce negative local landscape effects at a point to the west of Boxford Fruit Farm and east of the A134 (within Study Area F). Here, some mature landscape features could assist in accommodating a compound within the landscape. Furthermore, the presence of existing overhead lines in the landscape, infrastructure at Boxford Fruit Farm and the nearby busy A134, means that there would be some separation from the AONB to the east and the landscape has capacity to accommodate a compound.
- 9.33 Overall this option would result in a neutral effect on landscape in the long term.

Potential for mitigation

- 9.34 It may be possible to minimise negative effects on the local lane network as a result of the construction of an overhead line or underground cable route through careful planning of access to avoid the need for road improvements, wherever possible. Effects on lanes could also be minimised by utilising existing gaps in hedgerows/field accesses as access points onto agricultural land. Modifications to highways would be planned to be reversible (see paragraph 5.66).

OHL Alignments

- 9.35 It is not possible to avoid effects on the Dedham Vale AONB with either overhead line option.
- 9.36 For both overhead alignments, mitigation by way of additional woodland and hedgerow planting in the vicinity of a new overhead line, depending on land

owners' consent being granted, would be in keeping with the existing landscape character and could assist in lessening potential effects.

Underground cable alignment

- 9.37 The River Box and Dollops Wood and its associated watercourse would be crossed by a trenchless installation technique such as directional drilling which would preserve associated vegetation. There would be some unavoidable loss of hedgerow trees and hedgerow as a result of an underground cable route through this study area. Loss of some trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.
- 9.38 The negative landscape effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 9.39 Both the overhead line options would have no greater than a moderate negative magnitude of effect (scale of change) on the landscape, due to the presence of the existing overhead lines in the landscape. Notwithstanding the presence of existing overhead lines and the development associated with Copella and Boxford Fruit Farm, this landscape is designated at a national level and consultation with statutory consultees and consistent representations made by the public have confirmed its high value. An overhead line option to the south of the existing 400kV overhead line would have a lower negative magnitude of effect than an overhead line to the north as it would closely parallel the existing line. However in the long term, the overhead line options would both lead to a major negative effect on this landscape, which is of national importance. As a result both overhead line options would fail to comply with the statutory purpose to conserve and enhance the natural beauty of the AONB.
- 9.40 An underground option would avoid the major negative effects on landscape associated with an overhead line option in Study Area E.
- 9.41 With mitigation, the magnitude of effect (scale of change) on landscape character as a result of an underground option would continue to be moderate negative during construction and would be low negative during the

reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on landscape. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on landscape, would be negligible and the scale of effects on landscape would be broadly neutral. There would be minor positive effect on landscape character, associated with the underground option, where about 3km of the existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to be a component in the landscape.

- 9.42 Following the establishment of mitigation measures, the effect of sealing end compounds on landscape character would be limited to localised minor negative effects. Overall, the long term effects on landscape character as a result of an underground cable option, following the establishment of mitigation measures, would be minor positive. Therefore the underground option would comply with the statutory purpose to conserve and enhance the AONB.

Environment - Visual Amenity

Baseline conditions

- 9.43 The Dedham Vale AONB and Stour Valley project promotes the Dedham Vale AONB to tourists via its website and publications. The main public views of the existing overhead lines in this study area are experienced by visual receptors of high sensitivity using public footpaths, and cycleways in the study area, some of which run directly beneath the existing overhead lines. There are open views of the existing overhead lines from part of the Suffolk Way, a published long distance walking route between Flatford and Lavenham which follows the public right of way that runs in a north-south direction along the River Box. Representations have highlighted concerns as to effects of a new 400kV overhead line on views in the Box valley. There are also open views of the existing overhead lines from a local cycle route - Suffolk Cycle Route (Boxford Link A3) which runs along the minor road network and passes beneath the existing overhead lines to the south of Whitestreet Green, on higher ground in the eastern part of the study area. There are particularly long and distant views of the existing overhead lines to the east across Study Area D and west toward Twinstead Tee, at the point where the lane (Calais Street) runs beneath the existing lines.

- 9.44 There are a limited number of open or filtered views of the existing overhead lines where they cross the Box Valley experienced by high sensitivity visual receptors in individual properties, which include Peyton Hall Farm and 'The Nussteads'. Depending on location, properties at the southern edge of Calais Street and the western edge of Whitestreet Green have a mixture of open and filtered views of the existing overhead lines within the valley, and on high ground to the east and to the west into Study Area F. Representations have highlighted concerns as to the potential effects of a new connection on views from Whitestreet Green.
- 9.45 The majority of views of the existing lines within Study Area E from the villages of Polstead and Boxford and the hamlet of Stone Street are obscured by intervening landform, vegetation and built form.
- 9.46 There are a number of open and filtered views from the northern edge of Stoke-by-Nayland, and also some views from a section of the Stour Valley Path (long distance footpath route and regional route) west of Stoke-by-Nayland, of the existing overhead lines where they cross higher ground in the triangular section outside the AONB boundary to the eastern part of the study area, however these views are at a distance of over 2km. There are also some glimpsed views of the existing overhead lines along the Box Valley from a section of the Stour Valley Path to the east of Stoke-by-Nayland, although again these are at a distance of over 2km.
- 9.47 The scenic value of views in Study Area E is promoted in tourist literature published for the Dedham Vale AONB. However in the part of the AONB crossed by the route corridor views are of less than national or high importance. Some views are of commercial orchard and the Copella Fruit Pressing Plant, as well as the existing overhead lines. Views within Study Area E are therefore generally of moderate importance.

Assessment of effects

- 9.48 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on views as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land.
- 9.49 A new overhead line within Study Area E would have a negative effect on public and private visual receptors of high sensitivity within the valley, on the valley sides and on higher ground within the study area to the east. For the majority of the study area, an overhead line option would give rise to a change in view

from a relatively small number of public and private receptors because of the general lack of settlement within the Box Valley. The greatest effects on views would be experienced from public rights of way and lanes that run under the existing overhead lines. There are more distant views from viewpoints in the wider area, such as at Stoke-by-Nayland, which has been highlighted in consultation feedback and parts of the Stour Valley Path (long distance footpath and regional route) in the vicinity of Stoke-by-Nayland. However the effect on these more distant views would be relatively minor due to the presence of the existing lines, the distance of the viewer and intervening vegetation and topography which would in part obscure views. The existing 400kV and 132kV overhead lines are already present in the majority of public and private views. The presence of the existing overhead lines would limit the negative magnitude of effect (scale of change) on views as a result of an additional overhead line.

OHL Northern Alignment

- 9.50 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be from residential properties to the north of the existing 400kV overhead line, particularly those individual properties at Sprott's Farm and 'The Nussteads', where a northern overhead alignment would introduce a new 400kV overhead line to the north of these properties and the existing 400kV overhead line would remain to the south. Other properties to the north of the existing 400kV overhead line that would be particularly affected are Peyton Hall Farm and Peyton Hall and also a number of properties at Whitestreet Green.
- 9.51 A new overhead line on a northern alignment in Study Area E would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a small number of visual receptors of high sensitivity and views in this study area are generally of moderate importance. Overall, this option would result in a moderate negative effect on views in the long term and prior to mitigation.

OHL Southern Alignment

- 9.52 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be from private residential properties to the south of the existing 400kV overhead line. The closest properties to the south are Rouses Farm and Polstead Hall, which are over 0.5km to the south of the existing 400kV overhead line. Although a southern overhead alignment would be closer to Polstead, views from the village are restricted, apart from a few properties which could have views from its north eastern edge.
- 9.53 A new overhead line on a southern alignment in Study Area E would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a small number of visual receptors of high sensitivity and views in this study area are generally of moderate importance. Overall, this option would result in a moderate negative effect on views in the long term and prior to mitigation.
- 9.54 Although a northern and southern alignment in Study Area E would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on views compared with a northern alignment as it would closely parallel the existing 400kV overhead line.

Underground cable alignment

- 9.55 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area E.
- 9.56 An underground cable route would not lead to any substantial long term effects on views if disturbance to important features such as the River Box and woodlands is avoided. Some loss of hedgerows and hedgerow trees is likely to occur within the study area, which would have a localised negative effect on views. An underground cable route would have a moderate negative magnitude of effect (scale of change) on views in the temporary and short term and a low negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a small number of visual receptors of high sensitivity and the views in this study area are generally of moderate importance. This would result in a minor negative effect on views without mitigation and in the long term, as a result of an underground cable route in Study Area E.

- 9.57 There would be a minor positive effect on views, associated with this option, where 3km of the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 9.58 The siting of sealing end compounds would lead to some localised effects on visual amenity. At the eastern extent of Study Area E this would introduce negative visual effects for public receptors within the vicinity of Sprott's Farm (in Study Area D). The presence of existing mature woodland and hedgerows would assist in screening a compound.
- 9.59 A sealing end compound at the western end of Study Area E would introduce negative local effects on views at a point to the west of Boxford Fruit Farm and east of the A134 (within Study Area F). Here, some mature landscape features could assist in screening views of a compound within the landscape and the presence of the existing overhead lines in many views would minimise the scale of change experienced compared to if there was no existing infrastructure.
- 9.60 Overall, An underground cable option would result in a neutral effect on views in the long term.

Potential for mitigation

- 9.61 For both the overhead and underground alignment options it would be possible to minimise negative effects on views as a result of road improvements to the local lane network through careful planning of access to avoid the need for road improvements, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term negative visual effects would be unavoidable until re-establishment.

OHL Alignments

- 9.62 Mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line, subject to landowner agreement, would be in keeping with the existing landscape character and could assist in lessening potential effects on views.

Underground cable alignment

- 9.63 The visual effects of an underground cable alignment would largely be temporary, subject to the avoidance of the majority of woodland through routeing and the employment of directional drilling at the River Box and Dollops Wood. Loss of some trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of

the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.

- 9.64 The negative visual effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 9.65 For both overhead line options the magnitude of effect (scale of change) on views would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. Changes to views as a result of a new overhead line in Study Area E would be experienced by a relatively small number of public and private receptors. These visual receptors would include users of the Suffolk Way long distance footpath route. An overhead line on a southern alignment would give rise to a lower scale of change on views generally than would a northern alignment, as this option would more closely parallel the existing 400kV overhead line through the study area and would replace the existing 132kV overhead line to the south. Overall and in the long term, both the overhead line options would lead to moderate negative effects on visual amenity.
- 9.66 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area E.
- 9.67 With mitigation, the magnitude of effect (scale of change) on visual amenity as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on views. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on views, would be negligible and the scale of effects on visual amenity would be broadly neutral.
- 9.68 There would be a minor positive effect on views where a 3km section of existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to form part of many views.
- 9.69 Following the establishment of mitigation measures, the effect of sealing end compounds on views would be limited to localised minor negative effects.

- 9.70 Overall, the long term effects on visual amenity as a result of an underground cable option would be minor positive.

Environment - Cultural Heritage

Baseline conditions

- 9.71 There are two Grade II listed buildings within the Route Corridor in Study Area E. These comprise Sprott's Farmhouse and The Nussteads.
- 9.72 Outside the Route Corridor, there is a Grade II listed building at Peyton Hall. Peyton Hall dates to the 15th Century. Some trees surrounding the Hall have a character that suggests they may be remnants of a former parkland landscape. The setting of the listed building includes the farmland immediately surrounding the Hall.
- 9.73 The Polstead Conservation Area is to the south of the Route Corridor. The Conservation Area includes an area of parkland around the church. Although now in arable use, the parkland includes a group of parkland trees and is well defined by mature hedgerows, both of which provide a distinction in character between the Conservation Area and adjacent farmland.
- 9.74 There are five non-designated heritage assets within the Route Corridor in Study Area E. These comprise two areas of historic woodland, two flint axe find spots (which could indicate prehistoric settlement activity) and a possible rectangular cropmark feature with metalwork finds and tile. This could indicate Roman or later settlement activity. No further non-designated heritage assets have been identified to the south of the study area, within the underground alignment.
- 9.75 The Cultural Heritage Thematic Group has advised that the river valleys have greater potential for the discovery of previously unrecorded buried archaeological remains, compared to other parts of the route corridor.
- 9.76 Outside the study area, there is a further Grade II Listed Building at Peyton Hall and the Polstead Conservation Area, which is immediately to the south of the Route Corridor. The Polstead Conservation Area includes an area of parkland around the church.
- 9.77 A review of aerial photograph and LIDAR data for Study Area E identified a number of former field boundaries and also some areas of ridge and furrow. Ridge and furrow indicates good survival of the historic field pattern.

- 9.78 The historic landscape character of the study area is described as predominantly pre-18th century enclosure. Much of south Suffolk is characterised in this way due to the intact field system. Some hedgerow will form part of a pattern of pre-18th century enclosure, as described by the Suffolk Historic Landscape Characterisation project, and will therefore be 'important' in terms of the Hedgerow Regulations, 1997.

Assessment of effects

- 9.79 For all of the connection options, improvements to the road network necessary to construction activities could negatively affect 'important' hedgerows and historic lanes. The magnitude of effect would be low on heritage assets of low sensitivity. An overall minor negative effect is therefore predicted.
- 9.80 For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including access tracks). The magnitude of effect would be low moderate on heritage assets of low/moderate sensitivity. An overall minor negative effect is therefore predicted.
- 9.81 Effects of the overhead line options on the setting of designated heritage assets and an underground cable option on buried archaeology are discussed in more detail below.

OHL Northern Alignment

- 9.82 An overhead option to the north of the existing 400kV overhead line in Study Area E would negatively affect the setting of listed buildings; specifically Peyton Hall, Sprott's Farm and The Nussteads. The latter two would lie between the existing 400kV overhead line and a northern alignment. The listed buildings are Grade II and these receptors are of high sensitivity. The presence of the existing 400kV overhead line and screening provided by mature trees that bound the curtilage to the listed buildings would lessen the negative effects and the magnitude of effect in each case would be low.
- 9.83 The overall scale of effect of a northern overhead alignment in Study Area E would be minor negative.

OHL Southern Alignment

- 9.84 An overhead option to the south of the existing 400kV overhead line in Study Area E would negatively affect the setting of Polstead Conservation Area. This receptor is of very high significance. However, views to and from the

Conservation Area are limited by the topography and the mature trees that bound the Conservation Area. Also the presence of the existing 132kV overhead line means that a new 400kV overhead line would result only in a change in scale of the effect of overhead lines on the setting of this designated heritage asset. These factors would lessen the negative effects of the southern alignment on the designated heritage asset, and the magnitude of effect would be low.

- 9.85 The overall scale of effect of a southern overhead alignment in Study Area E would be minor negative.

Underground cable alignment

- 9.86 An underground option in Study Area E would negatively affect buried archaeological remains. Study Area E has a comparatively low number of potentially 'important' hedgerows but the potential for the survival of buried archaeology is high. The Cultural Heritage Thematic Group has advised that the river valleys have a higher potential for the discovery of previously unrecorded archaeology than elsewhere in the Route Corridor. Given the high probability of encountering known and previously unrecorded archaeological remains within an underground cable route, the magnitude of effect of an underground option in Study Area E is predicted to be high, on heritage assets of low, moderate or high sensitivity.
- 9.87 An underground option would also negatively affect the historic landscape, through the removal of historic hedgerows, some of which are 'important' in terms of the Hedgerow Regulations criteria. The magnitude of effect would be low on heritage assets of low sensitivity.
- 9.88 The underground option would have a minor positive effect in terms of removal of the 132kV overhead line where it currently impacts the setting of Polstead Conservation Area, although the benefit is limited by the topography and mature trees which reduce the visibility of the existing 132kV overhead line from the Conservation Area.
- 9.89 In addition, an underground option in Study Area E would require sealing end compounds. A sealing end compound could have negative effects on buried archaeology, and on the setting of listed buildings, particularly Sprott's Farm. A sealing end compound could also have a negative effect on the setting of the Polstead Conservation Area which has an open, rural setting to the north.

- 9.90 It is difficult to determine the scale of effect in relation to buried archaeology. However, given the predicted high magnitude of effect on receptors of low - high sensitivity, as well as the negative effects of sealing end compounds, the overall effect of an underground option on buried archaeological remains would be moderate negative.

Potential for mitigation

- 9.91 Mitigation of negative effects on buried archaeology and historic landscape features can be achieved. There is less scope to mitigate the negative effects on the setting of designated heritage assets.
- 9.92 For all options, potential effects on historic landscape features could be avoided, or mitigated through archaeological recording, careful reinstatement, and in the case of hedgerow loss, translocation or replanting.
- 9.93 For all options, an extensive programme of archaeological investigation, mitigation and monitoring would be required to mitigate effects on buried archaeology.

Summary

- 9.94 An overhead alignment to the north or south of the existing 400kV overhead line in Study Area E would have a minor negative effect with regard to heritage assets. The negative effects on the setting of Grade II listed buildings and a Conservation Area in each case would be lessened by the presence of existing mature trees which would limit views to and from the heritage assets towards the new overhead lines and pylons
- 9.95 In relation to effects on cultural heritage receptors, there would be no difference between these options.
- 9.96 While mitigation of negative effects on buried archaeology and historic landscape features is achievable, preservation *in situ* is preferred. An underground option would require considerably more mitigation with respect to non-designated heritage assets, and result in direct physical impacts (as opposed to indirect visual impacts) compared to an overhead line. The effects of an underground cable and an overhead line connection are very different in relation to heritage assets and difficult to compare. However, given the high probability of direct impacts and significant mitigation requirements in relation to an underground cable compared to an overhead alignment, the scale of

effect would be greater for an underground cable option than an overhead line on either alignment.

Environment - Ecology

Baseline conditions

- 9.97 There are two CWS designations within Study Area E, valued at county level:
- Broom Hill Wood CWS is an ancient woodland site;
 - Bushy Park Wood is an ancient woodland site which contains old oak pollards and wet flushes. There are dormouse records associated with this wood.
- 9.98 The River Box crosses the study area and there are records of otter along this watercourse in the wider area (and as such are highly likely to use the section within the Route Corridor). The River Box is also a European eel migratory route, therefore this section of the River Box is valued at the district level. There are two minor watercourses within the study area, one runs through Dollops Wood and the other runs along the small linear woodland in the west and joins with the River Box. These watercourses may also be used by otter and eel and are valued at the local level.
- 9.99 The wooded valley and associated stream known as Dollops Wood is an important wildlife corridor across the study area. It is understood by Suffolk Wildlife Trust to be ancient woodland and is valued at the local level.
- 9.100 There are fewer species-rich hedgerow field boundaries in this study area and hedges show less connectivity as compared to other study areas. However, the hedges are still likely to have a connective function and could support a range of species including birds, bats, dormice and amphibians. The network of hedgerows is currently valued at the district level, but the value of individual hedgerows will vary depending on composition and association with other species.
- 9.101 Land in the east of Study Area E is dominated by arable farmland while land to the west is predominantly improved pasture except for the commercial orchards in the far western part of the study area. Species including badger, brown hare and various reptile species have been recorded within the study area and surrounding land. The intrinsic value of the grasslands is low but associations with valued species would increase their value.

9.102 There are several waterbodies in the study area and there are records of great crested newt outside the route corridor near Polstead Heath and therefore ponds within the corridor may support this species. Ponds are valued at the local level.

Assessment of effects

OHL Northern Alignment

9.103 An overhead option on a northern alignment in Study Area E would result in permanent ancient woodland loss within Broom Hill Wood CWS and impacts on associated species. Dormouse may use this woodland as they have been recorded in neighbouring Bushy Park Wood CWS. Tree loss at Broom Hill Wood would be relatively large resulting in a high negative, long term magnitude of effect.

9.104 The permanent loss of individual hedgerow trees along the route cannot be ruled out resulting in a low negative, long term magnitude of effect. However, the hedgerow network will be retained. Impacts on ponds and watercourses would be avoided with this option and grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

9.105 In combination the low to high magnitude of effects on receptors of local to county value would lead to an overall major negative effect on ecology in Study Area E as a result of the northern overhead alignment prior to mitigation.

OHL Southern Alignment

9.106 A southern overhead alignment in Study Area E would result in a very small loss of ancient woodland on the northern tip of Bushy Park Wood CWS. This would result in a moderate negative, long term magnitude of effect.

9.107 Some tree loss within the Dollops Wood TPO and the linear woodland in the west would result from this alignment. This would have a fragmentation effect on a locally important wildlife corridor and would impact associated woodland species. This would result in a moderate negative, long term magnitude of effect.

9.108 The permanent loss of individual hedgerow trees along the route cannot be ruled out resulting in a low negative, long term magnitude of effect. However, the hedgerow network will be retained. Impacts on ponds and watercourses would be avoided with this option and grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

9.109 In combination the low to moderate magnitude of effects on receptors of local to county value would lead to an overall moderate negative effect on ecology in Study Area E as a result of the southern overhead alignment prior to mitigation.

Underground cable alignment

9.110 The underground option in Study Area E would use HDD to cross the River Box and Dollops Wood, thereby avoiding impacts on these receptors. There would be losses of up to 65m of habitat at hedgerow crossings. The hedgerows in this study area are unlikely to function as important wildlife corridors as they are largely fragmented and heavily managed. These losses would result in a moderate negative, long term magnitude of effect.

9.111 Impacts on ponds would be avoided with this option. Grasslands and the minor watercourse in the west and associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

9.112 The location of sealing end compounds is not expected to result in additional effects on ecology.

9.113 In combination the low to moderate magnitude of effects on receptors of local to district value in Study Area E would lead to an overall moderate negative effect on ecology as a result of the underground option prior to mitigation.

Potential for mitigation

9.114 For all options, existing field access points and watercourse crossings would be used for works traffic and standard environmental protection measures implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities on retained habitats and implementation of pollution control methods.

9.115 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as dormice, amphibians and reptiles, if present.

OHL Northern Alignment

9.116 Where tree loss is required to achieve electrical safety clearances, pollarding or coppicing could be used to avoid total loss of habitat. Alternatively, where tree removal is required, hedgerow or scrub planting across the easement would be used within the permanent easement to maintain habitat connectivity; this would be particularly important for Broom Hill Wood as dormouse has been recorded in neighbouring woodland. Replacement tree and woodland planting

would be undertaken outside the overhead line easement subject to landowner agreement. This would be most important to compensate for loss of ancient woodland at Broom Hill Wood CWS.

OHL Southern Alignment

9.117 The new crossing of Dollops Wood would result in some tree loss although this would be reduced due to the existing 132kV easement. Where tree loss is required to achieve electrical safety clearances, pollarding or coppicing would be used to avoid total loss of habitat. Alternatively, where tree removal is required, hedgerow or low height scrub planting can be used to maintain habitat connectivity. Replacement woodland planting would be undertaken outside the overhead line easement, subject to landowner agreement. With detailed design it may be possible to move the alignment very slightly north to avoid or minimise tree loss within Bushy Park Wood CWS.

9.118 Artificial trackways could be used to protect ground conditions. Alternatively, turf translocation or re-seeding would be employed where working areas affect important species-rich grassland habitats.

Underground cable alignment

9.119 HDD would avoid impacts on the River Box, (which the Environment Agency has indicated is a European eel migratory route) and Dollops Wood (which is thought to be ancient woodland). Working areas would be minimised when crossing important hedgerows and temporary fragmentation impacts on bats and dormouse caused by hedgerow removal could be mitigated through the use of ducting (by shortening the timeframe between hedgerow removal and reinstatement), aerial bridges (across short distances) or timing the works to avoid sensitive seasons.

9.120 Hedgerow within the permanent easement would be reinstated on completion of works, although establishment periods will apply and loss of mature hedgerow cannot be mitigated within a reasonable timeframe.

Summary

9.121 The northern overhead line option would result in ancient woodland loss within Broom Hill Wood CWS, an area which could support dormouse. Mitigation including wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts) would reduce some impacts on ecology from this option. However, due to the loss of ancient

woodland within this CWS, the overall impacts from this option would remain within the major negative effects category.

- 9.122 The southern overhead line option within Study Area E would result in some tree loss at Dollops Wood and the woodland in the west. Mitigation including following the existing 132kV overhead line easement, wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts) would lessen some impacts on ecology from this option. This would reduce the overall impacts from this option to the minor negative effects category.
- 9.123 The underground option in Study Area E would avoid impacts on the River Box, CWSs and Dollops Wood but will result in hedgerow losses of up to 65m at each crossing. Adjusting working areas at hedgerows would minimise losses. Including hedgerows in road ducting would reduce the time between habitat removal and replacement, although hedgerow loss is unlikely to have a significant fragmentation effect. Replacement hedgerow planting cannot mitigate for loss of mature hedgerow within a reasonable timeframe. These mitigation methods in combination with wildlife-friendly working methods would lessen overall impacts on ecology from the underground option in Study Area E but impacts would remain within the moderate negative effect category.
- 9.124 All three connection options have the potential to result in impacts on ecology. However, the southern overhead alignment option would have the fewest overall ecological effects, resulting in minor negative effects following mitigation. A northern overhead alignment would result in major negative effects, mainly resulting from the loss of CWS ancient woodland. Whereas the underground option would result in moderate negative impacts mainly resulting from hedgerow losses.

Socio-economic – Economic activity

Baseline conditions

- 9.125 Area E covers the northern fringe of the Dedham Vale AONB. The villages of Stoke-by-Nayland and Polstead contain a number of tourist-related businesses such as pubs, hotels and bed and breakfast premises. The village of Stoke-by-Nayland, 2km south of the route corridor, is popular with visitors. The AONB Visitors Perception Survey⁴⁰ found that 36% of people surveyed visited Stoke-by-Nayland. The small village of Polstead is also popular with visitors and the

⁴⁰ Choose Suffolk : Dedham Vale AONB Visitors' Perception Survey : 2009

AONB Visitor Perception Survey showed that 24% of people surveyed had visited Polstead. There are a number of tourist-related businesses in Polstead including a village pub and bed and breakfast premises, although there are no views of the corridor from the main part of the village. The Stour Valley Path and St Edmund Way run through Stoke-by-Nayland.

9.126 The village of Boxford to the north of the route corridor has a number of tourist-related facilities including a village pub but is approximately 2 km from the route corridor and has no views of it.

9.127 Otherwise the main source of economic activity relates to farming in the area including established orchards, notably Boxford Fruit Farm and the Copella fruit juice business near Leavenheath, which are important local employers.

Assessment of effects

9.128 The construction phase, for all options, would also bring short term benefits to the local economy in terms of increased spend by the construction teams and additional income for local suppliers.

OHL Northern Alignment

9.129 Overall the permanent impacts for visitors to, and tourist-related businesses in, the area would be neutral with some localised negative impacts for particular types of visitors and participants in informal recreational activities.

9.130 There would be some minor negative impacts during the construction period which may lead to localised impacts for visitors to the area.

9.131 The line would oversail public rights of way within the AONB and there would be open views of the route alignment for users of the PROW network in many locations including some within the AONB. There would be limited views (approximately 2km distant) from the Stour Valley Path/St Edmund Way with an open view likely from a short section of path on higher ground west of Stoke-by-Nayland and a glimpse of pylons likely along the Box Valley north of Scotland Place. Existing overhead lines are present in these views.

9.132 Four tourist related businesses would have views of the alignment of which two would have partial views and two open views.

9.133 The alignment has the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.

- 9.134 There is potential for highly localised temporary impacts during construction and the location of permanent structures on some agricultural businesses but overall these would not compromise the operation of individual farming units.
- 9.135 The option would oversail the orchards of Boxford Fruit Farm and run close to the processing operation run by Copella. The option would result in the loss of areas under permanent cultivation as orchards. The owners of the Boxford Fruit Farm business have provided information that indicates that the viability of the business would be threatened by the loss of these areas. A northern alignment would also oversail the access to the Copella processing plant

OHL Southern Alignment

- 9.136 Overall the permanent impacts for visitors to, and tourist-related businesses in, the area would be neutral with some localised negative impacts for particular types of visitors and participants in informal recreational activities.
- 9.137 There would be some minor negative impacts during the construction period which may lead to localised impacts for visitors to the area.
- 9.138 The line would oversail public rights of way within the AONB and there would be open views of the route alignment for users of the PROW network in many locations including some within the AONB. There would be limited views (approximately 2km distant) from the Stour Valley Path/St Edmund Way with an open view likely from a short section of path on higher ground west of Stoke-by-Nayland and a glimpse of pylons likely along the Box Valley north of Scotland Place. Existing overhead lines are present in these views.
- 9.139 Four tourist related businesses would have views of the alignment of which two would have partial views (a public house and guest accommodation) and two would have open views (both guest accommodation).
- 9.140 The alignment has the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.
- 9.141 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.
- 9.142 The option would oversail the orchards of Boxford Farm and would result in the loss of areas under permanent cultivation, to a greater extent than with a northern alignment. The owners of the Boxford Fruit Farm business have

provided information that indicates that the viability of the business would be threatened by the loss of these areas.

Underground cable alignment

- 9.143 Overall the permanent impacts for visitors to and tourist-related businesses in the area would be beneficial.
- 9.144 The AONB is an important attractor for visitors in terms of the quality of the environment and the opportunities for informal recreation. The permanent removal of the 132kV overhead line and pylons from the AONB would result in a beneficial impact. In particular there would be improvements to views for users of the public rights of way network and visitors travelling to the villages of Stoke-by-Nayland and Polstead in the northern fringe of the AONB, although the existing 400kV overhead line would remain in these views.
- 9.145 Depending on the final siting and design of a sealing end compound in the eastern part of the area, potentially there could be views from the PROW to the north of Sprott's Farm and in the western part of this area, potentially there could be views from the PROW to the south of Stewards Farm. Overall this would result in minor negative impacts which would be highly localised.
- 9.146 There would be some temporary negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. There is potential for localised minor impacts during construction on agricultural land resulting in partial crop or harvest loss. The option would result in the temporary loss of around 6.7 ha of Grade 2 agricultural land and 14 ha of Grade 3 agricultural land.
- 9.147 The underground option would utilise a corridor between the productive orchards of Boxford Fruit Farm to avoid disruption to growing areas.

Potential for mitigation

OHL Alignments

- 9.148 There are a number of measures that can be put into place to mitigate the impact of temporary construction works on visitors' enjoyment of the area. This may include the programming of construction activities and routing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are disrupted during construction, alternative or diversionary routes would be provided.

- 9.149 Agricultural mitigation measures would include full restoration of the agricultural land post-construction to full productive quality. National Grid will pay appropriate compensation for temporary loss of crops and other effects on agricultural use and for permanent easements for its infrastructure.
- 9.150 Although the route alignment and positioning of structures would seek to minimise land take associated with the orchards at Boxford Fruit Farm, there would be a significant loss of areas of orchard under cultivation. There is understood to be some potential to time the works to coincide with a programmed re-planting of some parts of the orchard and opportunities to use the existing permanent access road to the existing pylon on the site would be explored in order to minimise impacts where possible. Even with mitigation there is potential for significant negative effects on the business.
- 9.151 Construction works associated with the northern alignment in the vicinity of the Copella processing plant would be carefully managed to avoid disruption during construction to ensure a neutral impact.

Underground cable alignment

- 9.152 There are a number of measures that can be put into place to mitigate the impact of temporary construction works on visitors' enjoyment of the area. This may include the programming of construction activities and routing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are disrupted during construction, alternative or diversionary routes would be provided.
- 9.153 Agricultural mitigation measures would include restoration of agricultural land disturbed during construction to productive quality. National Grid will pay appropriate compensation for temporary loss of crops and for permanent easements for its infrastructure.
- 9.154 Construction works in the vicinity of Boxford Fruit Farm would be managed to avoid inconvenience or interruption to the commercial and operational activities and the impact would be neutral

Summary

- 9.155 Both overhead line alignments have the potential to significantly affect the operations of major local employer, Boxford Fruit Farm. A southern alignment would result in a greater loss of productive orchard than a northern alignment. A northern alignment would oversail the operations at Copella and would have

to be carefully managed to avoid any disruption and to ensure a neutral effect. An underground solution would avoid both of these commercial operations and has the potential to benefit the attractiveness of the area, by securing the removal of the 132kV overhead line without it being replaced, and temporary negative effects are capable of mitigation. Both overhead line options have the potential to have minor negative impacts on a number of individual businesses, although the overall impact on tourism activity would be broadly neutral.

Cost

Capital cost

9.156 The estimated capital costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £5.9m
- OHL southern alignment £6m
- Underground cable alignment £70.2m

Lifetime cost

9.157 The estimated Lifetime costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £15m
- OHL southern alignment £15m
- Underground cable alignment £73m

Summary

9.158 In terms of both capital and lifetime costs, an underground option would be considerably more expensive than the overhead options. There would be little difference in capital or lifetime costs of the overhead options.

Interim overhead alignment

9.159 An overhead line on a southern alignment would give rise to a lower negative magnitude of effect (scale of change) on landscape and views than a northern alignment, as this option would more closely parallel the existing 400kV overhead line through the study area and would replace the existing 132kV overhead line to the south.

- 9.160 An overhead alignment to the north or south of the existing 400kV overhead line in Study Area E would have a minor negative effect with regard to heritage assets. The negative effects on the setting of Grade II listed buildings and a Conservation Area in each case would be lessened by the presence of existing mature trees which would limit views to and from the new overhead lines and pylons. In relation to effects on cultural heritage receptors, there would be no difference between these options.
- 9.161 A northern alignment would result in loss of ancient woodland within Broom Hill Wood CWS which would be more significant than woodland losses associated with a southern alignment.
- 9.162 A southern alignment would avoid potential conflicts with operations on the Copella site, a major local employer. For operational and maintenance reasons it would be preferable to avoid the oversailing of commercial premises, which would be associated with a northern alignment. Both overhead alignments would affect the Boxford Fruit Farm orchards to a similar degree.
- 9.163 There are no differences in lifetime cost that would distinguish between the alignments.
- 9.164 Given the lesser effects of the alignment in terms of landscape, visual, ecological and socio-economic factors, the interim overhead alignment in Study Area E would be a southern alignment.

Undergrounding

- 9.165 In line with National Policy Statement EN-5, National Grid has considered the benefits of undergrounding in the context of the landscape in which the proposed connection would be set, together with the additional cost and the environmental and archaeological consequences of undergrounding. Comparisons are drawn between the interim overhead alignment described above and the underground option.

Landscape and visual considerations

- 9.166 Study Area E covers the Box Valley. The River Box is a tributary of the River Stour, which flows approximately 4km to the south. This is a small, intimate and secluded valley with gently sloping sides. The majority of the landscape in Study Area E is designated under the 1949 National Parks and Access to the Countryside Act as part of the Dedham Vale Area of Outstanding Natural Beauty (AONB) and is considered to be of national significance and high value. The

AONB is considered an exceptional example of a lowland river valley which has important connections with the works of Constable. AONBs are designated solely for the purpose of conserving and enhancing their natural beauty through the permanent protection against development that would damage their special qualities.

- 9.167 In recognition of the AONB designation, statutory consultees (including the local planning authorities) and the public have expressed the view that this study area should be prioritised in the consideration of the case for undergrounding.
- 9.168 The predominantly agricultural landscape in Study Area E is broadly intact, apart from the Boxford Fruit Farm and Copella pressing plant development on the western edge of the study area. There are a number of gappy hedgerows or open field boundaries in this study area and woodland blocks and woodland belts remain intact. Overall the landscape condition in Study Area E is moderate.
- 9.169 Study Area E crosses a valley landscape. Valley landscapes generally have less capacity to accommodate an overhead line compared with an open plateau landscape, as the overhead line can appear out of scale with the enclosed landscape. This part of the Box Valley is narrow and well enclosed by gently sloping valley sides, which creates an intimate feel to the landscape. This is accentuated by woodland blocks on the valley sides. The existing overhead lines cross this study area which influences the capacity of the landscape to accommodate a further overhead line. However, given also its statutory designation, the landscape capacity in relation to an additional overhead line is assessed as low.
- 9.170 The beneficial effect on landscape character and visual amenity as a result of the removal of the 132kV overhead line is common to both a southern overhead option and an underground option in Study Area E.
- 9.171 The baseline views in and near Study Area E include the existing 400kV overhead line and a 132kV overhead line and the development associated with Boxford Fruit Farm and the Copella pressing plant. In considering the effect on views, the removal of the 132kV overhead line in Study Area E and the construction of a new 400kV overhead line would generally be consistent with the existing baseline conditions. The scenic value of views in Study Area E is promoted in tourist literature published for the Dedham Vale AONB. However in the part of the AONB crossed by the route corridor views are of less than

national or high importance. Views within Study Area E are therefore generally of moderate importance.

- 9.172 An overhead line option in Study Area E would give rise to a negative change in views from a relatively small number of public and private receptors, although views are of moderate importance. The greatest negative change to views as a result of a new 400kV overhead line would be from high sensitivity receptors that would be closer to the new overhead line than the existing. The greatest effects on views would also be experienced by users of the Suffolk Way, a published long distance walking route, which runs through the Box Valley and crosses beneath the existing overhead lines. In addition the local cycle route, which follows the minor road network and crosses beneath the existing overhead lines east of the Box Valley, and other public footpaths which cross or are close to the corridor also represent visual receptors which are of high sensitivity.
- 9.173 The landscape in Study Area E has a high value and a low capacity to accommodate an additional 400kV overhead line on a southern alignment. The magnitude of effect (scale of change) to the landscape as a result of an additional 400KV overhead line would be no greater than moderate due to the presence of the existing overhead lines in the baseline conditions. Overall a southern overhead alignment would result in a major negative effect on landscape character and this option would not comply with the statutory purpose to conserve and enhance the AONB.
- 9.174 Existing views in the area are generally of moderate importance and there would be views of a new 400kV overhead line from some high sensitivity visual receptors. The magnitude of effect (scale of change) to views as a result of an additional 400KV overhead line would be no greater than moderate due to the presence of the existing overhead lines in the baseline conditions. Overall a southern overhead alignment would result in a moderate negative effect on visual amenity.
- 9.175 An underground option in this study area would avoid the major negative effect on landscape and moderate negative effect on views associated with a southern overhead alignment option.
- 9.176 The scale of effect on landscape and views as a result of undergrounding in Study Area E would be broadly neutral in the long term. There would be a positive effect on landscape character and views, associated with the underground option, over a distance of 3km where the existing 132kV overhead

line would be removed and would not be replaced by a larger 400kV overhead line. Overall, the long term effects on landscape character and visual amenity as a result of an underground cable option would be minor positive. An underground cable option would comply with the statutory purpose to conserve and enhance the AONB.

- 9.177 The overall benefit of undergrounding in Study Area E are the minor positive effects on landscape and views, compared to the major negative effect on landscape and moderate negative effect on views as a result of a southern overhead alignment option.

Undergrounding cost

- 9.178 The estimated capital cost of undergrounding through this section of the route is estimated at £70.2m, compared to a cost of £6m for the interim overhead alignment. The estimated lifetime costs are £73m and £15m respectively.

Environmental and archaeological consequences of undergrounding

- 9.179 The underground option would avoid the potential effects, associated with the interim alignment, on the setting of Polstead Conservation Area and would have a minor beneficial effect on this Conservation Area, linked to the removal of the 132kV overhead line. However these benefits would be limited by topography and mature trees which would reduce the visibility from the Conservation Area.
- 9.180 The underground option would avoid tree loss at Dollops Wood and the woodland in the west, which would be associated with the interim alignment. With mitigation in place such effects would be minor negative.
- 9.181 The removal of the 132kV overhead line may benefit the attractiveness of the area which may have a minor positive effect on economic activity. Importantly, an underground cable solution would avoid the adverse effects that the interim overhead alignment would have on the orchards which underpin the viability of Boxford Fruit Farm, a major employer and contributor to the local economy.
- 9.182 The underground cable option in Study Area E would avoid impacts on the River Box, CWSs and Dollops Wood. It cannot avoid hedgerows and would likely result in losses of up to 65m of habitat at hedgerow crossings. Even with replacement hedgerow planting, impacts on ecology from the underground option in Study Area E would have a moderate negative effect. However, due to the fragmented character of many of the hedgerows in Study Area E this hedgerow loss would have a relatively lower impact than in other study areas.

- 9.183 An underground option would result in extensive ground disturbance which would lead to large negative effects on non-designated buried archaeology. The effects on buried archaeology would be much greater as a result of an underground cable, compared to an overhead alignment. The negative effects would be direct, and lead to total loss or substantial harm in relation to multiple non-designated heritage assets. Mitigation is available for the negative effects through archaeological investigation and recording, although buried archaeology is a finite and non-renewable resource and preservation *in situ* is preferred when possible.
- 9.184 An underground option could also result in negative effects on the historic landscape through the removal of historic hedgerow. Mitigation is available for these effects and if implemented, no long term effects would remain.

Conclusions

- 9.185 The study area lies almost entirely within a landscape designated as an Area of Outstanding Natural Beauty under the 1949 National Parks and Access to the Countryside Act, the primary purpose of which is to conserve and enhance the natural beauty of the landscape. National and local planning policies also seek to protect and enhance the AONB. The Countryside and Rights of Way Act 2000 places a duty on all public bodies and statutory undertakers to have regard to the purposes of AONBs.
- 9.186 The AONB has a rich history and has been the inspiration for many writers and painters, notably Constable. It is recognised for its cultural significance. As such it attracts visitors from home and abroad.
- 9.187 Rule 1 of the Holford Rules, which guide the routeing of new high voltage overhead transmission lines, states that overhead transmission lines should be planned to avoid altogether areas of highest amenity value such as AONBs, even if the total mileage is somewhat increased in consequence. In considering options at the Preferred Route Corridor stage, alternative route corridors avoiding the AONB were considered and rejected. Undergrounding would provide a means of minimising negative effects on the AONB and, by permitting the removal of the 132kV overhead line, would enhance the landscape and views within the AONB consistent with the primary purpose of AONB designation and national and local policies.
- 9.188 The landscape in Study Area E has a low capacity to accommodate overhead electricity lines.

- 9.189 Concerns regarding the negative effects on the landscape qualities of the Dedham Vale AONB have been raised by local planning authorities and other statutory consultees. These concerns were expressed during consultation on the Route Corridor Study including during a workshop on where undergrounding may be considered appropriate as mitigation for the effects of a new overhead line. These concerns have been presented consistently during further engagement to date. These concerns have also been expressed by Thematic Groups and Community Forums and also in many other representations from members of the public.
- 9.190 The issues discussed above mean that the part of the Dedham Vale AONB crossed by the overhead line route corridor may be regarded as a 'particularly sensitive location' in the context of paragraph 2.82 of National Policy Statement for Electricity Networks Infrastructure (EN-5). The assessment has considered whether 'the benefits from the non-overhead line alternative (underground cables) will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable'.
- 9.191 The magnitude of effect (scale of change) to the landscape as a result of an additional 400KV overhead line would be moderate negative, which in combination with landscape of high value results in a major negative effect on landscape overall. This scale of effect would not meet the statutory purpose to conserve and enhance the natural beauty of the AONB. Putting the new line underground would avoid these negative landscape effects and there would be a minor positive effect on the landscape resulting from the removal of the existing 132kV overhead line. The landscape benefits which would accrue from the installation of an underground cable in Study Area E would result in an enhancement of the designated Dedham Vale AONB, consistent with the purposes of designation.
- 9.192 The magnitude of effect (scale of change) to views as a result of an additional 400KV overhead line would be moderate negative. Existing views in the area are of moderate importance and there would be views of a new 400kV overhead line from some high sensitivity visual receptors. Overall effects on views as a result of an overhead line in Study Area E would be moderate negative. Putting the new line underground would avoid these negative visual effects and there would be a minor positive effect on views resulting from the removal of the existing 132kV overhead line.
- 9.193 The extra economic impacts of putting the line underground would involve incurring lifetime costs £58m higher than those of the overhead line equivalent.

- 9.194 The interim overhead alignment would have a major effect on productive orchards at Boxford Fruit Farm, the loss of which could affect the viability of a business important to the local economy. Underground cables would avoid this effect while some minor benefits may accrue from the removal of the 132kV overhead line.
- 9.195 There would be minor negative effects on buried archaeology from an overhead line because of the relatively small area of ground disturbed during pylon construction. A new 400kV overhead line on the southern alignment would have a minor negative effect on cultural heritage because of impacts on limited views to and from Polstead Conservation Area. The effects on buried archaeology of putting the line underground would be moderate negative. It is preferable to leave remains in situ whereas undergrounding would bring a high degree of disturbance where excavations take place and some further potential effects from the use of the haul road. These effects can be mitigated by investigation and recording. There would be a minor positive effect on above ground heritage assets linked to the removal of the 132kV overhead line.
- 9.196 The effects on ecology of a new overhead line would be minor negative. Effects on ecology of putting the line underground would arise because of disturbance to habitats, notably to sections of hedges. No designated sites would be negatively affected by the installation of underground cables. The negative effects can be mitigated by planting and taking measures to reduce fragmentation during the construction period. The long term effects would be moderate negative.
- 9.197 There are no insurmountable technical difficulties associated with the installation of underground cables.
- 9.198 The benefits from the use of underground cables as an alternative to an overhead line in this particularly sensitive location, part of a nationally designated landscape, will clearly outweigh any extra economic, social and environmental impacts and there are no insurmountable technical difficulties.

Study Area conclusion

- 9.199 It is recommended that, for Study Area E, an **underground cable** solution be taken forward to the next stage in the design process. Potential sites for sealing end compounds are addressed in Chapter 12.

10 OPTIONS APPRAISAL STUDY AREA F – LEAVENHEATH/ASSINGTON

Study area boundaries

- 10.1 Study Area F covers a 4.5km length section of the connection with the eastern boundary defined by the AONB boundary on Brick Kiln Hill lane and the western boundary defined by Upper Road (near Dorking Tye).
- 10.2 The village of Leavenheath sits to the south of the existing overhead lines. Leavenheath does not have a village centre, but consists of two main areas of settlement separated by almost 1km and on either side of the A134. The northern part of the village is immediately to the south of the corridor and east of the A134. The southern part of the village is a larger residential area on the western side of the A134 and approximately 1km to the south of the existing overhead lines. Further west, the village of Assington lies immediately north of the existing overhead lines.
- 10.3 The options for Study Area F are shown on Figure 10.

Definition of options

OHL Northern Alignment

- 10.4 In the eastern half of the study area the northern overhead line option would diverge from the existing 400kV overhead line to a maximum distance of approximately 250m to avoid oversailing the listed building at Adam's Well (at this point the northern alignment is just outside the route corridor). Once it crosses High Road, the northern alignment option would more closely parallel the existing 400kV overhead line to the south of Assington. The approximate length of this option would be 4.6km.

OHL Southern Alignment

- 10.5 In the main the southern overhead option would closely parallel the existing 400kV overhead line at an 85m offset throughout this study area. The exception to this is for a short section in the centre of the study area, where the southern alignment would deviate to the south to avoid oversailing 'Hill View'. The approximate length of this option would be 4.6km.

Underground cable alignment

- 10.6 From the AONB boundary at the eastern edge of the study area, the underground option would run to the north of Leavenheath. For the remainder of the study area the underground cable route would run close to and parallel with the existing 400kV overhead line. The approximate length of this option would be 5.1km.
- 10.7 If an underground cable route were to be taken forward in Study Area F and not in the adjacent Study Areas E and G, then at the eastern extent of Study Area F, it is anticipated that the underground cable route could connect to either a northern or southern overhead alignment at a point to the west of Boxford Fruit Farm and east of the A134 (within Study Area F).
- 10.8 At the western extent of Study Area F, it is anticipated that an underground cable route could connect to either a northern or southern overhead alignment in Study Area G in the vicinity of Upper Road. In the case of a northern overhead alignment, this would require a minor diversion of the underground cables route northward.

Other options considered but discounted

- 10.9 Consideration was given to an overhead alignment closely paralleling the existing 400kV overhead line at an 85m offset to the north. This option was discounted as it would have resulted in oversailing property at Adam's Well and Hicks Farm.
- 10.10 The northern overhead alignment does oversail what appear to be rear garden curtilages of a small number of properties on the southern side of Barrack Road to the south east of Assington. However to avoid oversailing would require the deviation of the alignment approximately 1.5km further north to avoid Assington. This degree of deviation from the existing 400kV overhead line was not considered to be appropriate.
- 10.11 Consideration was given to an overhead alignment closely paralleling the existing 400kV overhead line at an 85m offset to the south throughout the study area. This option was discounted as it would have resulted in oversailing property at 'Hill View'.

Environment – Landscape

Baseline conditions

- 10.12 This study area comprises an area of higher ground (interfluvium) between the Box and Stour Valleys. The western half of the study area forms part of the Special Landscape Area (SLA), designated in the Babergh District Plan, which extends north from the Dedham Vale AONB along the River Stour. The SLA is of local value.
- 10.13 There are no regional or national landscape designations within this study area itself. However, at its eastern extent Study Area F adjoins Study Area E, on the Dedham Vale AONB boundary. To the south the Dedham Vale AONB boundary generally lies approximately 2km from the existing overhead lines for the majority of the study area and in the western part of the study area the AONB boundary extends northward to include woodland at Arger Fen and Tiger Hill and at this point is 0.5km from the existing overhead lines.
- 10.14 The Suffolk Landscape Character Assessment characterises this study area as predominantly 'Ancient Rolling Farmlands'. The Ancient Rolling Farmlands landscape character type is described as a rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular sinuous field patterns and ancient and plantation woodlands form a significant feature.
- 10.15 Small areas of 'Rolling Valley Farmlands' associated with small tributary valleys are found at the eastern and western extents of the study area, to the south of the corridor. This landscape character type is described as having gently sloping valley sides within a wider rolling landscape. Woodlands form distinctive features in the land beyond the valley and are often present on the upper slope and framing views out from the valley.
- 10.16 Study Area F is broadly comprised of an unremarkable landscape of arable fields on a plateau of higher ground between the River Box and the Stour. Arable fields have a mixture of open and hedgerow field boundaries, interspersed with some blocks and belts of woodland, including a substantial block of plantation woodland known as Assington Thicks. There are two minor watercourses, with their associated valleys and wooded belts, which cross the corridor in this study area in a north-south direction.
- 10.17 There are isolated residential properties throughout this study area, including farmsteads. The villages of Leavenheath and Assington sit close to this study area. These villages consist of a high proportion of modern houses. The Stour

Valley SLA extends across the western half of this study area. It is not clear why the Stour Valley SLA extends beyond the valley landscape, which is distinctive in its character, and the landscape on the plateau of high ground in Study Area F is comparable throughout.

- 10.18 The predominantly agricultural landscape in Study Area F is broadly intact, although hedgerow loss and gappy hedgerows are relatively frequent. In addition, historic field patterns have been lost with the expansion of fields, particularly in the eastern half of the study area. Woodland blocks and belts remain largely intact in the study area. Overall the landscape condition in Study Area F is moderate.
- 10.19 In terms of the capacity or sensitivity of the landscape in Study Area F, as has been previously noted, the landscape within Study Area F is of local value. Study Area F crosses a plateau landscape between valleys and is broadly comprised of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. In addition, the existing overhead lines crossing the study area and nearby Assington television masts in the western part of the study area mean that the landscape has a greater capacity to accommodate a further overhead line. Overall and in relation to an additional overhead line, the landscape capacity of Study Area F is high.

Assessment of effects

- 10.20 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on the local network of lanes as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land. The network of winding lanes is a component of the landscape character of this study area.
- 10.21 At the study area's eastern boundary with the AONB the presence of the busy A134 and infrastructure at Boxford Fruit Farm, as well as the presence of the existing overhead lines, does much to limit indirect effects of the overhead line options on the AONB to the east. In the western part of Study Area F, where the AONB is approximately 0.5km to the south of the existing overhead lines and on higher ground, a new 400kV overhead line would be visible from parts of the AONB, but the presence of the existing overhead lines mean that views from the AONB would not be dissimilar to existing. At this point where the

AONB boundary is at its closest, mature woodland at Tiger Hill and Arger Fen would also assist in obscuring views and separating the AONB from land to the north. Both overhead line options would have a minor negative indirect effect on the AONB to the south and east of Study Area F.

OHL Northern Alignment

- 10.22 A northern overhead alignment in Study Area F would have a negative effect on the SLA and wider landscape character of the study area, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). A northern overhead alignment option would mean that the smaller 132kV pylons, to the south of the existing 400kV overhead line, would be removed and a new overhead line would be constructed to the north of the existing 400kV overhead line. In the eastern half of the study area this alignment would not closely parallel the existing 400kV overhead line and overall a northern alignment would be considered to introduce a greater scale of change compared to a southern alignment. The northern alignment would closely parallel the existing overhead line within the Stour Valley SLA, minimising the area of the SLA affected by 400kV overhead lines. Overall a northern alignment option would have a greater negative magnitude of effect (scale of change) compared to a southern alignment.
- 10.23 This option could have a negative effect on two existing woodland belts associated with watercourses where they are crossed by the new overhead line. It is likely that additional tree losses would occur as a result of this alignment, such as hedgerow trees. Woodland and hedgerow trees are components of the landscape character of this study area.
- 10.24 An overhead line on a northern alignment in Study Area F would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has high capacity for an additional overhead line. Overall this option would result in a moderate negative effect on landscape prior to mitigation.

OHL Southern Alignment

- 10.25 A southern overhead alignment in Study Area F would have a negative effect on the SLA and wider landscape character of the study area, although the presence of the existing overhead lines in the landscape would limit the negative magnitude of effect (scale of change). Although not closely paralleling the existing 400kV overhead line throughout, a new overhead line would broadly

take the place of the existing 132kV overhead line to the south of the existing 400kV overhead line and this would minimise the extent of the landscape affected by 400kV overhead lines.

- 10.26 This option could have a potential negative effect on existing linear woodland associated with watercourses, as the southern alignment does not follow the exact alignment of the existing 132kV overhead line. It is also likely that some hedgerow tree loss would occur. Woodland and hedgerow trees are components of the landscape character of the study area.
- 10.27 An overhead line on a southern alignment in Study Area F would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has high capacity for an additional overhead line. Overall this option would result in a moderate negative effect on landscape prior to mitigation.
- 10.28 Although a northern and southern overhead alignment in Study Area F would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on landscape character as it would have a marginally less magnitude of effect (scale of change) on the landscape.

Underground cable alignment

- 10.29 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area F.
- 10.30 An underground cable route would have some long term negative effects on the landscape character due to the loss of woodland where the underground cable route crosses woodland belts associated with watercourses to the southeast and southwest of Assington Thicks. There would also be some loss of hedgerow and hedgerow trees within the study area, which would lead to negative effects on landscape character in the study area. An underground cable route in Study Area F would have a moderate negative magnitude of effect (scale of change) on the landscape during construction and low negative magnitude of effect (scale of change) on the landscape in the long term. This scale of change would be experienced by a landscape of local value, which is in a moderate condition and which has high capacity for type of development. This would result in a minor negative long term effect on landscape prior to mitigation as a result of the underground cable option in Study Area F.

- 10.31 There would be a minor positive effect on landscape, associated with the underground option, over a distance of 4.5km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 10.32 The siting of sealing end compounds would be likely to lead to some localised landscape effects. At the western end of Study Area F this would introduce negative local landscape effects in the vicinity of Upper Road. Here, there is little by way of mature vegetation to screen a sealing end compound without locating it closer to the edge of the Stour Valley. However, the presence of existing overhead lines and nearby Assington Masts means that the existing landscape character is considered to have capacity to accommodate a compound.
- 10.33 A sealing end compound, at the eastern extent of Study Area F, would introduce negative local landscape effects at a point to the west of Boxford Fruit Farm and east of the A134. Here, some mature landscape features could assist in accommodating a compound within the landscape. The presence of existing overhead lines in the landscape, infrastructure at Boxford Fruit Farm and the nearby busy A134, mean that the landscape is considered to have capacity to accommodate a compound.
- 10.34 Overall this option would result in a neutral effect on landscape in the long term.

Potential for mitigation

- 10.35 It would be possible to minimise negative effects on the local lane network as a result of the construction of an overhead line or underground cable route through careful planning of access to avoid the need for road improvements, wherever possible. Effects on lanes could also be minimised by utilising existing gaps in hedgerows and existing field accesses as access points onto agricultural land. Modifications to highways would be planned to be reversible (see paragraph 5.40).

OHL Alignments

- 10.36 It is not possible to avoid effects on the Stour Valley Special Landscape Area, wider landscape character or indirect effects on the Dedham Vale AONB.
- 10.37 Mitigation by way of additional woodland and hedgerow planting in the vicinity of a new overhead line, depending on land owners' consent being granted, would be in keeping with the existing landscape character and could assist in lessening potential effects.

Underground cable alignment

- 10.38 There would be some unavoidable loss of woodland, hedgerow and hedgerow trees as a result of an underground cable route through this study area. Loss of some trees and hedgerow through this study area could be minimised through careful routing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.
- 10.39 The negative landscape effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 10.40 Both the new overhead line options would have no greater than a moderate negative magnitude of effect (scale of change) on the landscape, due to the presence of the existing overhead lines in the landscape. An overhead line option to the south of the existing 400kV overhead line would have a lesser magnitude of effect than an overhead line to the north as it would more closely parallel the existing 400kV overhead line. There would be minor negative indirect effects on the AONB to the south and east in the long term. Overall and in the long term, both the overhead line options would lead to a moderate negative effect on the landscape.
- 10.41 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area F.
- 10.42 With mitigation, the magnitude of effect (scale of change) on landscape character as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in

temporary or short term negative effects on landscape. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on landscape, would be negligible and the scale of effects on landscape would be broadly neutral.

- 10.43 There would be a minor positive effect on landscape character where a 4.5km section of existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to be a component in the landscape.
- 10.44 Following the establishment of mitigation measures, the effect of sealing end compounds on landscape character would be limited to localised minor negative effects.
- 10.45 Overall, the long term effects on landscape character in Study Area F as a result of an underground cable option, following the establishment of mitigation measures, would be minor positive.

Environment - Visual Amenity

Baseline conditions

- 10.46 The public views in this study area are experienced by high sensitivity users of public footpaths, cycleways and open space, particularly those which run directly beneath the existing overhead line. There are open views of the existing overhead lines from a local cycle route which runs along the western study area boundary and under the existing overhead lines on Upper Road near Dorking Tye, as well as open views from local cycle routes on lanes within the study area to the south of Assington Thicks. Depending on viewpoint, mature woodland blocks in the landscape, such as Assington Thicks offer partial backgrounding or obscuring of some views.
- 10.47 There is also a mixture of open and filtered views of the existing overhead lines, approximately 1km distant, from parts of the Arger Fen and Spouse's Vale Nature Reserve, including the public footpath at the northern edge of Spouse's Grove and the high point on the lane at the visitor car park. Parts of the Nature Reserve have no views to the north due to the density of mature vegetation. The potential effect on views from the Nature Reserve was raised in representations.

- 10.48 There are distant open and filtered views from the St Edmund Way and Stour Valley Long Distance Paths, which both run broadly parallel but 2km to the south (at their closest) of the existing overhead lines within the western and eastern parts of this study area respectively. These long distance paths lie within the boundary of the Dedham Vale AONB and there are distant views from some other public rights of way in the AONB at this point.
- 10.49 There are a number of open and filtered views south and south eastward to the existing 400kV and 132kV overhead lines experienced by high sensitivity visual receptors at private residential properties in Assington. There are some open and filtered views from properties on the northern edges of the northern and southern parts of Leavenheath of the existing 400kV overhead line, extending from near Assington to Boxford Fruit Farm. The majority of views within the settlements are obscured by intervening built form. There are views from individual properties north and south of the existing overhead lines. To the north views from individual properties extend up to 3km to the north of the existing lines. To the south, land starts to fall away toward the Stour Valley and there are no views beyond 2.5km of the existing lines at this point.
- 10.50 As an interfluvium of higher ground, some distant views are possible of the existing overhead lines in Study Area F from a few viewpoints on higher ground. There are distant views from the higher ground on the western side of the Stour Valley (which includes views from the St Edmund Way and Stour Valley Path long distance paths, which extend as far as Assington Thicks) and distant views from the south of Lavenham. However, the majority of more distant views, including those from within the Dedham Vale AONB to the south, are prevented by intervening vegetation and topography.
- 10.51 Given the scenic qualities of the landscape and the generally commonplace nature of the views, views within Study Area F are of local importance.

Assessment of effects

- 10.52 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on views as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land.
- 10.53 A new overhead line on a northern or southern alignment within Study Area F would have a negative effect on the majority of public and private visual receptors to the immediate north and south of the study area. There would be a mixture of open and filtered views of both overhead line options from the Stour

Valley and St Edmund Way Long Distance Footpaths but these would be at some distance (2km minimum). The existing 400kV and 132kV overhead lines are already present in the majority of these views. The presence of the existing overhead lines would limit the magnitude of effect (scale of change) on views as a result of an additional overhead line.

OHL Northern Alignment

10.54 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be from the public rights of way and local cycle route that would run under the new overhead line. The greatest effect on views would also be experienced from high sensitivity receptors at residential properties to the north of the existing line, particularly those individual properties at Adam's Well, where a northern overhead alignment would introduce a new 400kV overhead line to the north of these properties and the existing 400kV overhead line would remain to the south. Other properties to the north of the existing 400kV overhead line that would be particularly affected are at the southern edge of Assington and individual properties on Marshalls Green Road. Representations have raised concerns as to the potential effects of a new overhead line on properties in Assington.

10.55 The effect on wider views would be relatively minor due to the presence of the existing lines and the distance of the viewer.

10.56 A new overhead line on a northern alignment in Study Area F would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and the views in this study area are generally of local importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.

OHL Southern Alignment

10.57 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be from public rights of way and public open space that would run under the new overhead line and also publicly accessible viewpoints that would be closer to a southern alignment than the existing. This includes parts of the Arger Fen and Spouse's Vale Nature Reserve, although these views would still be at a distance of 0.5km (minimum) and filtered by intervening vegetation in many locations. The greatest effect on views would also be experienced from high sensitivity receptors at residential

properties to the south of the existing 400kV overhead line, particularly 'Hill View' which currently sits immediately south of the existing 132kV overhead line. In order for a southern alignment to avoid oversailing 'Hill View' it would be necessary to adopt a route which means that the existing 400kV overhead line would pass to the north and a new 400kV overhead line would pass to the south. Other individual properties to the south, such as at Chestnut Grove and Hunters Lodge, would have nearer views of a new 400kV overhead line than the existing. In addition, those properties within the northern part of Leavenheath with open or filtered views would also experience a greater change to their view as a result of a southern alignment option.

10.58 The effect on wider views would be relatively minor due to the presence of the existing lines and the distance of the viewer.

10.59 A new overhead line on a southern alignment in Study Area F would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and the views in this study area are generally of local importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.

10.60 Although a northern and southern alignment in Study Area F would both have moderate negative effects, a new overhead line on a southern alignment would have a lower negative effect on views compared with a northern alignment as it would more closely parallel the existing 400kV overhead line and would therefore limit the magnitude of effect on views.

Underground cable alignment

10.61 An underground cable route would not lead to any substantial long term effects on views if disturbance to important features such as woodlands is largely avoided. Some loss of hedgerows and hedgerow trees is likely to occur within the study area, which would have a localised negative effect on views.

10.62 Undergrounding would also result in a positive effect over a section of 4.5km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.

10.63 The positioning of sealing end compounds may lead to some localised visual effects. At the western end of Study Area F this would introduce negative local visual effects in the vicinity of Upper Road. Here, there is little by way of mature vegetation to screen a sealing end compound without locating it closer

to the edge of the Stour Valley. However, vegetation screening to property curtilages and in the wider landscape would help to minimise views.

10.64 A sealing end compound at the eastern extent of Study Area F would introduce negative local visual effects at a point to the west of Boxford Fruit Farm and east of the A134. Here, some mature landscape features to field boundaries and residential curtilages could assist in screening views from nearby visual receptors and the presence of overhead lines in existing views would lessen the scale of change to views.

10.65 Overall, an underground cable route would have a moderate magnitude of effect (scale of change) on views in the temporary and short term and a low magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a number of visual receptors of high sensitivity and the views in this study area are of local importance. This option would result in a moderate negative effect on views in the short term and a minor positive effect on landscape in the long term prior to mitigation.

Potential for mitigation

10.66 For both the overhead and underground alignment options it would be possible to minimise negative effects on views as a result of road improvements to the local lane network through careful planning of access to avoid the need for road improvements, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term negative visual effects would be unavoidable until re-establishment.

OHL Alignments

10.67 Mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line would be in keeping with the existing landscape character and could assist in lessening potential effects on views.

Underground cable alignment

10.68 The visual effects of an underground cable alignment would largely be temporary, although there would be some loss of woodland in this study area. Loss of some hedgerow trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.

10.69 The negative visual effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

10.70 For both overhead line options the magnitude of effect (scale of change) on views would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. An overhead line on a southern alignment would give rise to a lower scale of change on views generally than a northern alignment, as this option would closely parallel the existing 400kV overhead line over a greater distance. Overall and in the long term, both the overhead line options would lead to moderate negative effects on visual amenity.

10.71 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area F.

10.72 With mitigation, the magnitude of effect (scale of change) on visual amenity as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on views. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on views, would be negligible and the scale of effects on visual amenity would be broadly neutral.

10.73 There would be a minor positive effect on views where a 4.5km section of existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to form part of many views.

10.74 Following the establishment of mitigation measures, the effect of sealing end compounds on views would be limited to localised minor negative effects.

10.75 Overall, the long term effects on visual amenity as a result of an underground cable option would be minor positive.

Environment - Cultural Heritage

Baseline conditions

- 10.76 There are two Grade II listed buildings within the route corridor in Study Area F- Pump Farmhouse and Kiln Cottage. Adjacent to the Route Corridor are further Grade II listed buildings at Assington. These include Shamrock Farmhouse, Partridge Row, Coote's Cottage and Mill Farm (all on Barrack's Road, a group of buildings that has been mentioned in Community Forum representations), and Assington House and Dillack's Farm. There are three Grade II listed buildings in the hamlet of Dorking Tye to the south of the Route Corridor.
- 10.77 There are no recorded non-designated heritage assets within the route corridor in Study Area F, although the putative line of a Roman road crosses the study area running north-south. There are two areas of historic woodland immediately adjacent to the route corridor.
- 10.78 A review of aerial photographs and LIDAR data for Study Area F identified a number of former field boundaries, and also some circular features which could relate to buried archaeology.
- 10.79 The historic landscape character of the study area is described as predominantly pre-18th century enclosure. Much of south Suffolk is characterised in this way due to the intact field system.
- 10.80 The underground route crosses two parish boundaries multiple times. These are demarked by intermittent hedgerow, which where present would certainly be 'important' in terms of the Hedgerow Regulations. Other hedgerow will form part of a pattern of pre-18th century enclosure, as described by the Suffolk Historic Landscape Characterisation project, and will therefore also be 'important'.

Assessment of effects

- 10.81 For all of the connection options, improvements to the road network necessary to construction activities could negatively affect 'important' hedgerows and historic lanes. The magnitude of effect would be low on heritage assets of low sensitivity. An overall minor negative effect is therefore predicted.
- 10.82 For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including access tracks). The magnitude of effect would be low/ moderate on heritage

assets of low/ moderate sensitivity. An overall minor negative effect is therefore predicted.

- 10.83 Effects of the overhead line options on the setting of designated heritage assets and an underground cable option on buried archaeology are discussed in more detail below.

OHL Northern Alignment

- 10.84 A northern alignment would bring an overhead line closer to four grade II listed buildings; Pump Farmhouse, Shamrock Farmhouse, Partridge Row, and Coote's Cottage. A northern alignment would have a negative effect on the setting of these designated heritage assets, all of which are of high sensitivity. In the case of Partridge Row and Shamrock Farmhouse, the presence of the existing 400kV overhead line and the screening provided by mature trees that surround the curtilage of these listed buildings lessens the negative effects and the magnitude of effect is low. In the case of Coote's Cottage and Pump Farmhouse, the aspect towards the new overhead lines is more open, but any views would still be filtered by intervening vegetation, and again the magnitude of effect is low.

- 10.85 The overall scale of effect of the northern alignment in Study Area F in relation to heritage assets would be minor negative.

OHL Southern Alignment

- 10.86 A southern alignment has the potential to negatively affect the setting of five Grade II listed buildings; Mill Farmhouse and Kiln Cottage and listed buildings at Dorking Tye. These assets are all of high sensitivity. The existing 132kV overhead line is already present in this area, and the new line would result only in a change in the scale of effect on the setting of designated heritage assets. Negative effects on the setting of listed buildings at Dorking Tye would be further limited given the distance of separation between the southern alignment and these designated heritage assets. Screening is provided by mature trees that surround the curtilage of these listed buildings, which would lessen the negative effects. In light of these factors, the magnitude of effect would be low in each case.

- 10.87 The overall scale of effect of the southern alignment in Study Area F in relation to heritage assets would be minor negative.

Underground cable alignment

- 10.88 An underground option in Study Area F would negatively affect buried archaeological remains. Study Area F has a moderate number of potentially 'important' hedgerows but the potential for the survival of buried archaeology is high. Given the high probability of encountering known and previously unrecorded archaeological remains within an underground cable route, the magnitude of effect of an underground option in Study Area F is predicted to be high, on heritage assets of low, moderate or high sensitivity.
- 10.89 An underground option would also negatively affect the historic landscape, through the removal of historic hedgerows, some of which are 'important' in terms of the Hedgerow Regulations criteria. The magnitude of effect would be low on heritage assets of low sensitivity.
- 10.90 In addition, an underground option in Study Area F would require sealing end compounds. A sealing end compound could have negative effects on buried archaeology, and on views to and from listed buildings, specifically the Grade II listed buildings at Dorking Tye. The magnitude of effect would be low/ moderate on heritage assets of low/moderate, high and very high sensitivity.
- 10.91 It is difficult to determine the scale of effect in relation to buried archaeology. However, given the predicted high magnitude of effect on receptors of low - high sensitivity, as well as the negative effects of sealing end compounds, the overall effect of an underground option on buried archaeological remains would be moderate.

Potential for mitigation

- 10.92 Mitigation of negative effects on buried archaeology and historic landscape features can be achieved. There is less scope to mitigate the negative effects on the setting of designated heritage assets.
- 10.93 For all options, potential effects on historic landscape features could be avoided, or mitigated through archaeological recording, careful reinstatement, and in the case of hedgerow loss, translocation or replanting.
- 10.94 For all options, an extensive programme of archaeological investigation, mitigation and monitoring would be required to mitigate effects on buried archaeology.

Summary

- 10.95 Both overhead alignments would negatively affect the setting of Grade II listed buildings. The magnitude of effect is low in each case, and both alignments have an overall scale of effect that is minor negative with regard to cultural heritage assets.
- 10.96 An overhead alignment to the south of the existing 400kV overhead line would negatively affect a greater number of heritage assets, but due to the distance of separation of the alignment to the listed buildings, existing screening around the listed buildings and presence of the existing 132kV overhead line in the area, the magnitude of effect would be less on the southern alignment, compared to the northern alignment. The designated heritage assets affected by the northern alignment are in closer proximity to that alignment, and although the magnitude of effect would be low, it would be greater than the effect of the southern alignment on the heritage assets affected.
- 10.97 While mitigation of negative effects on buried archaeology and historic landscape features is achievable, preservation in situ is preferred. An underground option would require considerably more mitigation with respect to non-designated heritage assets, and result in direct physical impacts (as opposed to indirect visual impacts) compared to an overhead line. The effects of an underground cable compared to an overhead line connection are very different in relation to heritage assets and difficult to compare. However, given the high probability of direct impacts and significant mitigation requirements in relation to an underground cable compared to an overhead alignment, the scale of effect would be greater for an underground cable option than an overhead alignment.

Environment - Ecology

Baseline conditions

- 10.98 There are no wildlife site designations within Study Area F, although Assington Thicks woodland CWS (valued at the county level) is adjacent to the north boundary and Arger Fen SSSI (valued at the national level) is approximately 0.5km south of the south boundary. There are two Tree Preservation Order designations within the Route Corridor: Chestnut Grove and Ash Ground, these are amenity based designations.

10.99 Two small watercourses run north-south across the study area, along the narrow wooded valleys south of Bush Hill Grove and at Ash Ground. There are no eel or water vole records within this study area or the wider landscape. The closest otter records are associated with the River Box in Study Area E and the River Stour in Study Area G but there is still potential for them to use the watercourses as otter have large home ranges. Both of these landscape features are likely to act as important wildlife corridors providing indirect links between Assington Thicks CWS and Assington Meadow CWS in the north to Arger Fen SSSI in the south. In combination, they are valued at the district level due this functional role and the presence of dormouse, and various bat and reptile species.

10.100 Land within the study area is dominated by arable farmland. Species including badger, brown hare and various reptile species have been recorded within the study area and surrounding land. The intrinsic value of the grasslands is low but associations with valued species would increase their value.

10.101 A few field ponds are found within the study area. There are no records of great crested newt in Study Area F and the ponds are currently valued at less than local level.

10.102 Hedgerow field boundaries are less connected in this area, with fewer species-rich examples. However, the hedges are still likely to have a connective function and could support a range of species including birds, bats, dormice and amphibians. The network of hedgerows is currently valued at the district level, but the value of individual hedgerows will vary depending on composition and association with other species.

Assessment of effects

OHL Alignments

10.103 An overhead option on both a northern and southern alignment in Study Area F would result in permanent tree loss within Ash Ground TPO, and the linear plantation woodland south of Assington. Although tree loss would not be extensive, it would fragment important wildlife corridors across the study area and impact associated species resulting in a moderate negative, long term magnitude of effect.

10.104 The permanent loss of individual hedgerow trees along the route cannot be ruled out with either overhead line option resulting in a low negative, long term magnitude of effect. However, the hedgerow network would be retained. Both

options would avoid impacts on ponds and watercourses. Grasslands and their associated flora and fauna are likely to experience a low negative, temporary magnitude of effect.

10.105 In combination, the low to moderate magnitude of effects on receptors of local to district value would lead to an overall moderate negative effect on ecology in Study Area F as a result of either overhead alignment prior to mitigation.

Underground cable alignment

10.106 The underground option in Study Area F would result in tree losses at Ash Ground TPO and the linear plantation south of Assington. Tree loss would extend up to a 65m swathe and would fragment important wildlife corridors across the study area and impact associated species resulting in a high negative, long term magnitude of effect.

10.107 This option would impact the water quality and bankside vegetation of the small watercourses associated with the wooded areas. In turn this could impact riverine species including otter due to loss of habitat and temporary fragmentation. These impacts would result in a high negative, medium term magnitude of effect.

10.108 There would be losses of up to 65m of habitat at hedgerow crossings, this would impact associated species through habitat loss and fragmentation. These losses would result in a high negative, long term magnitude of effect.

10.109 The underground cable also crosses an area of swamp habitat associated with the woodland south of Assington. Drainage requirements associated with this connection design would result in the loss of swamp habitat within the permanent easement of the cable. This would have a high negative, long term magnitude of effect.

10.110 The location of sealing end compounds is not expected to result in additional effects on ecology.

10.111 In combination, the low to high magnitude of effects on receptors of local to district value in Study Area F would lead to an overall major negative effect on ecology as a result of the underground option prior to mitigation.

Potential for mitigation

10.112 For all options, existing field access points and watercourse crossings would be used for works traffic and standard environmental protection measures

implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities onto retained habitats and implementation of pollution control methods.

10.113 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as dormice, amphibians and reptiles, if present.

OHL Alignments

10.114 Where tree loss is required to achieve electrical safety clearances across the narrow plantation at Ash Ground TPO and the plantation south of Assington, pollarding or coppicing could be used to avoid total loss of habitat. Alternatively, where tree removal is required, hedgerow or low height scrub planting across the easement can be used to maintain habitat connectivity. Replacement woodland planting could be undertaken outside the overhead line easement subject to landowner agreement.

10.115 Artificial trackways could be used to protect ground conditions. Alternatively, turf translocation or re-seeding would be employed where working areas affect important species-rich grassland habitats. This is most likely to be required along the southern alignment, if at all.

Underground cable alignment

10.116 Minimising working widths at woodland crossings would be used to reduce tree loss at Ash Ground and the plantation south of Assington. This approach would also be used at valued hedgerow crossings. Where hedgerows are shown to be important for species such as dormouse, ducting would be used to avoid fragmentation impacts. Temporary fragmentation impacts on bats and dormouse caused by hedgerow removal could be mitigated through the use of aerial bridges (across short distances) or timing the works to avoid sensitive seasons.

10.117 Where tree removal is required, replacement woodland planting would be undertaken outside the permanent easement, subject to landowner agreement. Although varying establishment periods will apply and loss of mature trees cannot be mitigated within a reasonable timeframe.

Summary

10.118 Both overhead line options in Study Area F would result in some plantation woodland loss at Ash Ground and the woodland south of Assington, the latter

supports dormouse and the former has the potential to. Mitigation including wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts) would lessen some impacts on ecology from the overhead line options, reducing the overall impacts to minor negative effects.

10.119 The underground option within Study Area F would result in permanent tree loss at Ash Ground and the plantation woodland south of Assington, it would also result in the permanent loss of swamp habitat and hedgerow losses of up to 65m at each crossing. Adjusting working areas at hedgerows would minimise losses and including hedgerows in road ducting will reduce the time between habitat removal and replacement. Replacement hedgerow planting cannot mitigate for loss of mature hedgerow within a reasonable timeframe. These mitigation methods in combination with wildlife-friendly working methods would lessen overall impacts on ecology from the underground option in Study Area F to a moderate negative effect.

10.120 Either of the overhead alignment options would have the fewest overall ecological effects, resulting in only minor negative effects following mitigation, although a northern overhead alignment would be slightly preferable as it crosses the woodland areas at a narrower point. The underground option would have the most ecological effects, resulting in moderate negative impacts due to tree, hedgerow and swamp habitat losses.

Socio-economic – Economic activity

Baseline conditions

10.121 In Study Area F, the villages of Assington and Nayland contain a number of tourist-related businesses such as pubs, farm shops and self-catering accommodation. Although the village of Nayland is popular with visitors, it is over 4 kms from the route corridor with no views of it. There are a number of businesses which rely on passing trade along the A134, including pubs, bed and breakfast premises and other tourist accommodation. The area also contains the Stoke-by-Nayland Hotel and Golf Course which has an 80 bed hotel and restaurant with two 18 hole Golf Courses and fishing lakes.

10.122 Leavenheath village lies close to the study area, but is a mostly residential community with some bed and breakfast rooms and a public house in the northern part of the village.

10.123 Tiger Hill and Arger Fen are areas of woodland used extensively for informal recreation that are popular with visitors and local residents. The 2009 AONB Visit Survey shows that Arger Fen was identified as a 'hot spot' in the area by 5% of visitors.

10.124 Otherwise farming remains an important source of economic activity.

Assessment of effects

10.125 The construction phase, for all options, would bring short term benefits to the local economy in terms of increased spend by the construction teams and additional income for local suppliers.

OHL Alignments

10.126 Overall the permanent impacts for visitors to and tourist-related businesses in the area would be neutral with some localised negative impacts for particular types of visitors and participants in informal recreational activities.

10.127 There would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. There is likely to be some highly localised minor disruptions to PROWs during construction.

10.128 The line would oversail a public right of way south of Assington. There would be open views for users of the PROW network in many locations. Walkers visiting Arger Fen and Spouse's Vale Nature Reserve have their views of the route corridor screened by woodland in many places, but there would be open views from the car park on the west side of Arger Fen and a mixture of open and filtered views from woodland edges and open areas.

10.129 Eight tourist related businesses would have views of a new overhead line in Study Area F, of which six would have partial views, one would have open and partial views, and one would have open views. In particular, Assington Mill which is a rural skills centre, with its own self-catering accommodation, farm house and camp site, would have open views of either a northern or southern alignment. The other affected businesses comprise a public house, cafes, guest accommodation and Newton Green Golf Course.

10.130 The overhead alignments have the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.

10.131 Overhead line options would not result in views from the Stoke-by-Nayland hotel and/or golf club building due to the tall conifers on the road edge which screen views. There would be a mixture of some open glimpses and filtered views from limited parts of the Stoke-by-Nayland Golf Course on higher ground as a result of the alignment.

10.132 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.

Underground cable alignment

10.133 Overall the permanent impacts for visitors to and tourist-related businesses in the area would be beneficial, linked to the removal of the 132kV overhead line. In particular there would be improvements to views experienced by users of the public rights of way network and visitors to the village of Assington, although the 400kV overhead line would still be present.

10.134 There would be some temporary minor negative impacts during the construction period which may lead to localised impacts for visitors to the area. This may include highly localised disruptions to PROWs during construction. In addition there would be potential during construction for increased HGV traffic on the local road network.

10.135 Depending on the final siting and design of a sealing end compound in the eastern part of this area potentially there could be views from the PROW to the south of Stewards Farm. A sealing end compound in the western part of the area would be seen by PROW users in the vicinity of Workhouse Green, Assington Thicks and Dorking Tye House. In addition the termination pylon would be visible from two tourist-related businesses and from parts of Arger Fen and Spouse's Vale Nature Reserve and also from the western side of the Stour Valley. This would result in minor negative impacts which would be highly localised.

10.136 There is potential for minor localised impacts during construction on agricultural land resulting in partial crop or harvest loss. The option would result in the temporary loss of around 25.4 ha of Grade 2 agricultural land and 7.6 ha of Grade 3 agricultural land.

Potential for mitigation

10.137 For all options there are a number of measures that can be put into place to mitigate the impact of temporary construction works on visitors' enjoyment of

the area. This may include the programming of construction activities and routeing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are disrupted during construction, alternative or diversionary routes would be provided.

10.138 Agricultural mitigation measures would include restoration of agricultural land disturbed during construction to productive quality. National Grid will pay appropriate compensation for temporary loss of crops and other effects on agricultural use and for permanent easements for its infrastructure.

Summary

10.139 The overall effect of the overhead line alignments on economic activity would be broadly neutral as the most attractive areas for tourists are some distance from the route corridor. However, both overhead line options have the potential to have minor negative impacts on a number of individual businesses. An underground solution has the potential to benefit the attractiveness of the area, by securing the removal of the 132kV overhead line, without its replacement, and temporary negative effects are capable of mitigation.

Cost

Capital cost

10.140 The estimated capital costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £8.2m
- OHL southern alignment £8.4m
- Underground cable alignment £111.8m

Lifetime cost

10.141 The estimated Lifetime costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £21m
- OHL southern alignment £22m
- Underground cable alignment £117m

Summary

10.142 In terms of both capital and lifetime costs, an underground option would be considerably more expensive than the overhead options. Both of the overhead options would impose similar capital and lifetime costs.

Interim overhead alignment

10.143 An overhead line option to the south of the existing 400kV overhead line would have a lesser negative magnitude of effect on landscape and views than an overhead line to the north as it would closely parallel the existing 400kV overhead line over a greater distance.

10.144 An overhead alignment to the south of the existing 400kV overhead line could negatively affect a greater number of heritage assets, but due to the distance of separation of the alignment to the listed buildings, existing screening around the listed buildings and presence of the existing 132kV overhead line in the area, the magnitude of effect is less on the southern alignment, compared to the northern alignment.

10.145 Effects on ecology would be similar for both alignments. Although a southern alignment would be likely to have marginally greater tree loss as it crosses the plantation woodland south of Assington at a wider point, overall both options would only result in minor negative effects.

10.146 The southern alignment would be marginally more expensive than the northern alignment. The effect on economic activity from both overhead alignments would be broadly neutral.

10.147 Given that the effects on landscape, visual amenity, and cultural heritage would be greater with a northern alignment, and that the differences in other factors would be marginal, the interim overhead alignment in Study Area F would be a southern alignment.

Undergrounding

10.148 In line with National Policy Statement EN-5, National Grid has considered the benefits of undergrounding in the context of the landscape in which the proposed connection would be set, together with the additional cost and the environmental and archaeological consequences of undergrounding. Comparisons are drawn between the interim overhead alignment described above and the underground option.

Landscape and visual considerations

- 10.149 Study Area F is broadly comprised of an unremarkable landscape of arable fields on a plateau of higher ground between the River Box and the Stour. The western half of Study Area F is designated a Special Landscape Area in Babergh District Local Plan and is acknowledged as a landscape of local value. It is not clear why the Stour Valley SLA extends beyond the valley landscape, which is distinctive in its character, and the landscape on the plateau of high ground in Study Area F is comparable throughout.
- 10.150 There are no national landscape designations within this study area. However, at its eastern extent Study Area F adjoins Study Area E, on the Dedham Vale AONB boundary, and to the south of Study Area F the Dedham Vale AONB boundary lies approximately 0.5km from the existing overhead lines at one point.
- 10.151 The predominantly agricultural landscape in Study Area F is broadly intact, although hedgerow loss and gappy hedgerows are relatively frequent. In addition, historic field patterns have been lost with the expansion of fields, particularly in the eastern half of the study area. Woodland blocks and belts remain largely intact in the study area. Overall the landscape condition in Study Area F is moderate.
- 10.152 Study Area F crosses a plateau landscape between valleys and is broadly comprised of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. In addition, the existing overhead lines crossing the study area and nearby Assington television masts in the western part of the study area means that the landscape has a greater capacity to accommodate a further overhead line. Overall the landscape capacity of Study Area F is high.
- 10.153 The beneficial effect on landscape character and visual amenity as a result of the removal of the 132kV overhead line is common to both a southern overhead alignment option and an underground option in Study Area F.
- 10.154 The baseline views in and near Study Area F include the existing 400kV overhead line and a 132kV overhead line. The removal of the 132kV overhead line within Study Area F and construction of a new 400kV overhead line broadly in close parallel would represent a negative scale of change to these views, but the change would generally be consistent with the existing baseline conditions

- 10.155 The greatest effects on views as a result of a new 400kV overhead line would be experienced by high sensitivity visual receptors that would be closer to the new overhead line than the existing. In Study Area F on a southern alignment, this would include residents within Leavenheath, as well as a small number of individual properties to the south of the existing overhead line, users of the public footpaths which cross and are close to the corridor and the local cycle route which crosses beneath the existing overhead lines south of Assington Thicks. There are no national trails or long distance footpath routes that would be affected by a new 400kV overhead line in Study Area F.
- 10.156 The landscape in Study Area F has a high capacity to accommodate an additional 400kV overhead line on a southern alignment. Although, there would be views of a new 400kV overhead line for a number of high sensitivity visual receptors, existing views in the area are generally of local importance. In addition, the magnitude of effect (scale of change) to the landscape and views as a result of an additional 400KV overhead line would be no greater than moderate negative due to the presence of the existing overhead lines in the baseline conditions. The addition of a new overhead line in Study Area F would have a minor negative indirect effect on the AONB to the east, but this effect is not so great as to affect the statutory purpose to conserve the AONB. Overall, a southern overhead alignment would result in a moderate negative effect on landscape character and visual amenity.
- 10.157 An underground option would avoid the moderate negative effects on landscape and views associated with a southern overhead alignment option in Study Area F.
- 10.158 The scale of effect on landscape and views as a result of undergrounding in Study Area F would be broadly neutral in the long term. There would be a positive effect on the landscape and views, associated with the underground option, over a distance of 4.5km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line. Overall, the long term effects on landscape character and visual amenity as a result of an underground cable option would be minor positive.
- 10.159 The overall benefit of undergrounding in Study Area F are the minor positive effects on landscape and views, compared to the moderate negative effects on landscape and views as a result of a southern overhead alignment.

Undergrounding cost

10.160 The estimated capital cost of undergrounding through this section of the route is estimated at £111.8m, compared to a cost of £8.4m for the interim overhead alignment. The estimated lifetime costs are £117m and £22m respectively.

Environmental and archaeological consequences of undergrounding

10.161 The underground option would avoid effects on the setting of five Grade II listed buildings, which would be associated with the interim alignment. The existing 132kV overhead line is already present in this area, and the new line would result only in a change in the scale of effect on the setting of these designated heritage assets. In addition some screening is already provided by mature trees that surround the curtilage of some of these listed buildings.

10.162 The removal of the 132kV overhead line, associated with an underground option, would benefit the setting of these listed buildings, though the existing 400kV overhead line would remain in the settings.

10.163 The removal of the 132kV overhead line may also benefit the attractiveness of the area which may have a minor positive effect on economic activity.

10.164 The underground cable option within Study Area F would result in permanent tree loss at Ash Ground and the plantation woodland south of Assington, it would also result in the permanent loss of swamp habitat and hedgerow losses of up to 65m at each crossing. Even with replacement hedgerow planting impacts on ecology from the underground option in Study Area F would have a moderate negative effect.

10.165 An underground option would result in extensive ground disturbance which would lead to large negative effects on non-designated buried archaeology. The effects on buried archaeology would be much greater as a result of an underground cable, compared to an overhead alignment. The negative effects would be direct, and lead to total loss or substantial harm in relation to multiple non-designated heritage assets. Mitigation is available for the negative effects through archaeological investigation and recording, although buried archaeology is a finite and non-renewable resource and preservation *in situ* is preferred when possible.

10.166 An underground option could also result in negative effects on the historic landscape through the removal of historic hedgerow. Mitigation is available for these effects and if implemented, no long term effects would remain.

Conclusions

- 10.167 The landscape in Study Area F has a high capacity to accommodate overhead electricity lines and is of local value. It would not qualify as a 'particularly sensitive location' as set out at paragraph 2.82 of National Policy Statement for Electricity Networks Infrastructure (EN-5). The assessment has considered whether 'the benefits from the non-overhead line alternative (underground cables) will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable'.
- 10.168 An overhead line solution would have a moderate negative effect on landscape and views in an area where overhead lines are already present. Putting the new line underground would avoid these negative effects and there would be a minor positive effect on the landscape resulting from the removal of the existing 132kV overhead line, although the existing 400kV overhead line would remain in the landscape and in views.
- 10.169 The extra economic impacts of putting the line underground would involve incurring lifetime costs £95m higher than those of the overhead line equivalent.
- 10.170 The socio-economic effects of an overhead alignment are anticipated to be broadly neutral while, with undergrounding, some minor benefits may accrue from the removal of the existing 132kV overhead line.
- 10.171 There would be minor negative effects on buried archaeology from an overhead line because of the relatively small area of ground disturbed during pylon construction. The interim overhead alignment would have a minor negative effect on cultural heritage because of impacts on the setting of five Grade II listed buildings. These effects would be avoided if the connection used underground cables. The effects on buried archaeology of putting the line underground would be moderate negative. It is preferable to leave remains in situ whereas undergrounding would bring a high degree of disturbance where excavations take place and some further potential effects from the use of the haul road. These effects can be mitigated by investigation and recording.
- 10.172 The effects on ecology of the interim overhead alignment would be minor negative. Effects on ecology of putting the line underground would arise mainly because of losses of trees at Ash Ground and south of Assington (more extensive than would be required for an overhead line) and hedgerows. No designated sites would be adversely affected by the installation of underground cables. The long term effects would be moderate negative.

10.173 There are no insurmountable technical difficulties associated with the installation of underground cables.

10.174 The benefits from the use of underground cables as an alternative to an overhead line in this location, which is assessed as not being particularly sensitive, will not clearly outweigh any extra economic, social and environmental impacts. Undergrounding would not therefore be appropriate in this study area.

Study Area conclusion

10.175 It is recommended that an **overhead** line solution be taken forward for consultation for Study Area F and that the **southern** alignment be identified as the least environmentally constrained alignment. Subject to representations received during consultation, this is the alignment which National Grid should take forward to the next stage in the design process.

11 OPTIONS APPRAISAL STUDY AREA G – STOUR VALLEY

Study area boundaries

- 11.1 This study area covers a section of the connection with the eastern boundary defined by Upper Road near Dorking Tye and the western boundary defined by the existing 400kV overhead line which runs between Twinstead Tee and Braintree.
- 11.2 This study area includes the Stour Valley and its immediate surroundings. The River Stour runs in a north-south direction through the centre of the study area and the Sudbury to Braintree railway, Henny Road and Bures Road run north south along the valley floor. Sudbury is approximately 2.5km to the north of the existing 400kV overhead line on the River Stour and Bures is on the river approximately 3km to the south. The hamlet of Workhouse Green is on the eastern valley side and Lamarsh, Twinstead and Alphamstone to the west.
- 11.3 The options for Study Area G are shown on Figure 11.

Definition of options

OHL Northern Alignment

- 11.4 The northern overhead alignment would closely parallel the existing 400kV overhead line at an 85m offset through this study area to where it would join the Twinstead to Pelham overhead line, one span to the west of the Twinstead Tee. The approximate length of this option would be 4.8km.

OHL Southern Alignment

- 11.5 The southern overhead alignment would diverge away from the existing 400kV overhead line from a point to the west of Upper Road. It would then follow the existing 132kV overhead line route as far as the Twinstead to Braintree overhead line at the 132kV overhead line diamond crossing (pylon 4YLA001), one span south of the Twinstead Tee. This option would allow for the removal of one span of the Twinstead to Braintree overhead line south of Twinstead Tee. The approximate length of this option would be 4.8km.

Underground cable alignment

- 11.6 The underground option would run along the route of the existing 132kV overhead line as far west as the Twinstead to Braintree overhead line at the 132kV overhead line diamond crossing (4YLA001), south of the Twinstead Tee. This option would allow for the removal of one span of the Twinstead to Braintree overhead line south of Twinstead Tee. The approximate length of this option would be 4.8km.
- 11.7 If an underground cable route were to be taken forward in Study Area G and not in the adjacent Study Area F, then at the eastern extent of Study Area G, it is anticipated that an underground cable route could connect to either a northern or southern overhead alignment in Study Area F in the vicinity of Upper Road. In the case of a northern overhead alignment, this would require a minor diversion of the underground cables route northward.
- 11.8 At the western extent of Study Area G, it is anticipated that a sealing end compound would be built in the vicinity of pylon 4YLA001 to allow the connection of the underground cable route to the existing 400kV overhead line running between Twinstead Tee and Braintree.

Other options considered but discounted

- 11.9 Consideration was given to a southern overhead option which followed the existing 132kV overhead line route as far as to the west of Henny Road and from here continued in a south-westerly direction to join the existing 400kV Twinstead to Braintree overhead line 1km to the south of the Twinstead Tee (at pylon 4YLA003). This option would have allowed for the removal of three spans of this overhead line. However, this option was discounted as it would introduce a new overhead line in a landscape that does not contain any high voltage overhead lines at present, whereas the southern alignment taken forward for appraisal would minimise the scale of change on both landscape and visual amenity. It was also considered that access along the route of the existing 132kV overhead line would be less constrained.
- 11.10 Consideration was also given to an underground option which followed the route of the existing 132kV overhead line across the Stour Valley before running south from west of Moat Lane to meet the Twinstead to Braintree overhead line at either pylon 4YLA004 or pylon 4YLA005 to maximise overhead line removal of the Twinstead to Braintree overhead line to the north. This option was

discounted as it would result in negative effects on County Wildlife Sites and woodland to the north of Alphamstone.

Environment – Landscape

Baseline conditions

- 11.11 Study Area G comprises a section of the Stour Valley. This section of the Stour Valley is outside the Dedham Vale AONB, with the closest boundary approximately 1km to the east of Bures. This part of the Stour Valley is a Special Landscape Area (designated in the Babergh District Local Plan) and characterised as the 'A2 - Stour River Valley' Landscape Character Area in Braintree District Council's administrative area. Both the Special Landscape Area and landscape character area are of local value. There are no regional or national landscape designations within this study area. However, representations received during consultation, including those from statutory consultees including the local planning authorities, have confirmed that this landscape has characteristics consistent with the Dedham Vale Area of Outstanding Natural Beauty. Consistent representation has also been made by members of the public that the landscape qualities and cultural associations of the Stour Valley should be protected.
- 11.12 The area is subject to a countryside management project, the Dedham Vale AONB and Stour Valley Project, which also applies to the AONB. In November 2009, the Joint Advisory Committee resolved that the Partnership would 'issue a Statement of Intent to Natural England seeking an extension of the Dedham Vale AONB, including westward toward Sudbury, and to evaluate and provide a substantive case and detail in support of an extension.' This intention has also been incorporated in the Dedham Vale AONB and Stour Valley Management Plan 2010-15. Natural England has acknowledged the Statement of Intent. The potential extension of the Dedham Vale AONB was included in a list of suggestions received by Natural England in answer to a question put to Richard Benyon MP Parliamentary Under Secretary (Fisheries and Natural Environment) Environment, Food and Rural Affairs on 26 January 2012. The area which may be included in a detailed submission to Natural England seeking an extension to the AONB would be determined after study by the Project. The present anticipation is that this would not extend further west than the extent of the Project's geographical scope and it would not extend further north than the southern edge of Sudbury. This is the area which has scenic qualities and cultural associations similar to the land in the Dedham Vale AONB. It includes

- the area around Sudbury, Bures and Stoke-by-Nayland which 'Managing a Masterpiece' (see below) identifies as of particular heritage value.
- 11.13 The Stour Valley is the subject of a further management project ('Managing a Masterpiece') which celebrates and seeks to further the understanding of landscape value and cultural associations throughout the river valley, including the area designated as an AONB and land outside the designation.
- 11.14 It is generally accepted that the artist Gainsborough, who was born in Sudbury, 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, such as church spires. In consultation with Sudbury History Society (via the Landscape and Views Thematic Group) information has been provided on viewpoints used by Gainsborough in his paintings. These include a painting⁴¹ thought to be a view of the church at Great Henny from a viewpoint to the north. This viewpoint looks southward toward the existing overhead lines at Twinstead Tee.
- 11.15 Although Constable mainly painted within the Flatford area within the Dedham Vale, there is evidence that Constable visited the Stour Valley as he painted a view of Daw's Hall near Lamarsh⁴².
- 11.16 Feedback from Twinstead Community Forum also highlighted the connection between the Stour Valley and the painter John Nash. 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 landscape to the north and the local landscape was captured in many of his paintings. The Landscape and Views Thematic Group identified this as an important viewpoint beyond 3km from the existing overhead line.
- 11.17 These factors mean that the landscape is considered to be of much greater than local value.
- 11.18 The Suffolk Landscape Character Assessment characterises the majority of the study area as Rolling Valley Farmlands and Valley Meadowlands. The Valley Farmlands are described as having gently sloping valley sides within a wider rolling landscape. This landscape is comprehensively settled and contains locally distinctive villages often with late medieval cores. Woodland forms a distinctive feature in the land beyond the valley and is often present on the upper slope and framing views out from the valley.

⁴¹ Gainsborough : Wooded Landscape with Herdsmen Seated

⁴² Constable : Lamarsh Hall

- 11.19 The Valley Meadowlands are largely dominated by grazing land with small carr woodlands and willow plantation and occasional areas of fen.
- 11.20 The margins of the study area, at the edges of the valley sides, are characterised by the Suffolk Landscape Character Assessment as Ancient Rolling Farmlands. Ancient Rolling Farmlands are described as being a gently rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular fields and ancient and plantation woodlands form a significant feature.
- 11.21 The Essex County Council Landscape Character Assessment characterises the Stour Valley (west of the River Stour) as the Stour Valley Landscape Character Area. This is described as having a typically wide flat valley floor with floodplain meadows, riverbank willow trees and small wet woodlands. Rolling rounded valley sides contain a complex mosaic of small woods, pasture and arable fields in the east and gentler arable valley sides in the north and west. Church towers, traditional villages, farmsteads, barns and mills are listed as distinctive features, as are the sinuous pattern of lanes and roads.
- 11.22 Study Area G falls with Braintree District Council's 'A2 – Stour River Valley' landscape character area (west of the River Stour) within its Landscape Character Assessment. Main characteristics of this area include gently rounded arable valley sides with valley sides dissected by tributary valleys. There is a sinuous pattern of lanes and roads, which are generally located at the edges of the valley floor and on the valley sides. Several small settlements are located near the top of the slope. The area has a mostly tranquil, secluded character away from settlement. In terms of visual characteristics, it is noted that there are panoramic views of the valley from valley slopes and that churches form landmarks on the valley slopes, such as at Great Henny.
- 11.23 Overall this landscape character area is judged in the landscape character assessment as having a relatively high sensitivity to change. Particular sensitivities are the patchwork of pasture and woodland on the valley sides and meadows on the valley floor, the secluded and relatively tranquil character of the network of lanes and public rights of way. The skylines of the valley slopes are visually sensitive as are views to valley sides from adjacent landscape character areas.
- 11.24 There are a number of Protected Lanes designated by Braintree District Council on the western side of the Stour Valley. These include lanes between Great Henny and Alphamstone within the preferred route corridor. The lanes are

designated for their traditional landscape and nature conservation character and protection extends to their tranquillity as well as their physical appearance.

- 11.25 Study Area G covers the Stour Valley and extends east and west to include high ground at the valley tops. This part of the River Stour runs in a north-south direction before the main valley turns near Bures and runs in a west-east direction through the Dedham Vale, passing Flatford Mill and the area closely associated with Constable. The Stour Valley at Study Area G is a natural extension of the Dedham Vale, sharing the same river. At Study Area G, the Stour Valley is a large pronounced valley with steep valley sides. The valley is a dramatic feature within an otherwise broadly flat and unremarkable landscape. This point has been made in representations from members of Twinstead Community Forum.
- 11.26 The land within and surrounding this study area 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. The quality of this landscape has been highlighted in representations made by both Landscape and Views Thematic Group members and Twinstead Community Forum members. A network of minor lanes cross the valley sides, some of which are designated as Protected Lanes, and are often sunken and flanked by tall hedgerow trees. As well as woodland belts associated with tributary valleys, some blocks of broadleaved woodland are found on the valley sides and plantations of cricket bat willows on the valley floor.
- 11.27 The southern residential edge of Sudbury extends toward the study area from the north as ribbon development along the B1508. Development mainly consists of modern houses and there is a sewage works in the valley. The village of Bures is south of the study area and is an attractive village with narrow winding streets and a mixture of traditional and modern buildings, including St Mary's Church. Other minor settlements in the vicinity of Study Area G, such as Lamarsh, Alphamstone, Twinstead and Great Henny are attractive villages containing a mixture of traditional and modern buildings and with historic churches. Apart from distinct settlements there are other individual residential properties within the landscape, including isolated farmsteads and halls, and houses located on the road network. Babergh

District Council's SLA which covers the eastern part of the Stour Valley extends east of the valley into Study Area F where the boundary cannot be distinguished on the ground. The valley is well pronounced and its landscape distinctive, particularly on its western side. The existing overhead lines and Assington masts to the east already influence the landscape character of this study area.

- 11.28 The predominantly agricultural landscape in Study Area G is broadly intact, although there is some hedgerow loss and gappy hedgerows in the eastern part of the study area in particular. In addition, historic field patterns have been lost with the expansion of fields, particularly in the eastern half of the study area. Woodland blocks and belts remain largely intact in the study area. Overall the landscape condition in Study Area G is moderate.
- 11.29 In terms of the capacity or sensitivity of the landscape in Study Area G, as has been previously noted, the landscape within Study Area G is of much greater than local value. Study Area G crosses a distinct valley landscape. Valley landscapes generally have less capacity to accommodate an overhead line compared with an open plateau landscape, as the overhead line can appear out of scale with the enclosed landscape. This part of the Stour valley is pronounced with steep valley sides creating a high degree of enclosure. The existing overhead lines cross this study area which influences the capacity of the landscape to accommodate a further overhead line. However, the landscape capacity of Study Area G to accommodate an additional overhead line is low.

Assessment of effects

- 11.30 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on the local network of lanes as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land. The network of winding and often sunken lanes is a component of the landscape character of this study area and includes Protected Lanes to the west of the Stour Valley, designated by Braintree District Council and included on the Proposals Map for its Core Strategy.
- 11.31 The majority of the Stour Valley where the preferred route corridor crosses is physically and visually separate from the AONB. The exception to this is at the eastern extent of Study Area G where the AONB is 1km to the southeast at its closest and on higher ground. A new 400kV overhead line would be visible where it crosses high ground to the east of the valley from parts of this western

extent of the AONB, but the presence of the existing overhead lines mean that there would be little discernible difference. Mature woodland at Tiger Hill and Arger Fen would also assist in obscuring views and separating the AONB from land to the northwest. All these factors mean the magnitude of effect (scale of change) is negligible and both overhead line options would have a neutral indirect effect on the AONB to the southeast of Study Area G.

OHL Northern Alignment

- 11.32 A northern overhead alignment in Study Area G would have a negative effect on the SLA and wider landscape character of the study area, although the presence of the existing overhead lines in the landscape would limit the negative magnitude of effect (scale of change). The northern option would take a close parallel alignment to the north of the existing 400kV overhead line (and diverge from the existing 132kV overhead line route). This would decrease the extent of area of the valley landscape affected by overhead lines, however it would bring effects into a new area to the north of the existing overhead lines.
- 11.33 This option could have a potential negative effect on existing willow plantation close to the river. It is likely that additional tree losses would occur as a result of this alignment, such as hedgerow trees. Willow plantation and hedgerow trees are components of the landscape character of this study area.
- 11.34 This option would have minor positive and localised effects in the area to the south of the existing 400kV overhead line as far as the diamond crossing, as the existing 132kV overhead line would be removed.
- 11.35 An overhead line on a northern alignment in Study Area G would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of much greater than local value, has a moderate condition and has low capacity for change. Overall this option would result in a moderate negative effect on landscape prior to mitigation.

OHL Southern Alignment

- 11.36 A southern overhead alignment in Study Area G would have a negative effect on the SLA and wider landscape character of the study area, although the presence of the existing overhead lines in the landscape would limit the magnitude of effect (scale of change). The southern option would diverge from a closely parallel route with the existing 400kV overhead line to follow the existing 132kV overhead line and this would increase the area of the valley landscape affected by 400kV overhead lines when compared with the northern alignment option.

- 11.37 This option would have a minor positive and localised effect where the 400kV circuits (linking Twinstead Tee and Braintree) would be removed between Twinstead Tee and 4YLA001 (at the 132kV diamond crossing).
- 11.38 A southern option would minimise any woodland loss by following the alignment of the existing 132kV overhead line and so utilising existing easements. It is likely that some tree loss would still occur, which would represent a negative effect as woodland and hedgerow trees are components of the landscape character of the study area
- 11.39 An overhead line on a southern alignment in Study Area G would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of much greater than local value, has a moderate condition and has low capacity for an additional overhead line. Overall this option would result in a moderate negative effect on landscape prior to mitigation.
- 11.40 Although a northern and southern overhead alignment in Study Area G would both have moderate negative effects, a new overhead line on a northern alignment would have a lower negative effect on landscape character as it would have a marginally less magnitude of effect (scale of change) on the landscape.

Underground cable alignment

- 11.41 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area G.
- 11.42 An underground cable route would not lead to any substantial long term negative effects on the landscape character if disturbance to woodland is largely avoided through routeing. The use of directional drilling techniques to cross the River Stour and Sudbury to Bures railway line would minimise effects on vegetation. There would be some loss of hedgerow and hedgerow trees within the study area and some disturbance to protected lanes is likely to occur. This would result in some localised negative effects on landscape character. An underground cable route in Study Area G would have a moderate negative magnitude of effect (scale of change) on the landscape during construction and low negative magnitude of effect (scale of change) on the landscape in the long term. This scale of change would be experienced by a landscape of much greater than local value, which is in a moderate condition and which has high capacity. This would result in a minor negative long term effect on landscape prior to mitigation as a result of the underground cable option in Study Area G.

- 11.43 There would be a minor positive effect on landscape, associated with the the underground option, over a section of 5km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line.
- 11.44 The positioning of sealing end compounds is likely to lead to some localised landscape effects. At the eastern extent of Study Area G this would introduce negative local landscape effects in the vicinity of Upper Road. Here, there is little by way of mature vegetation to screen a sealing end compound without locating it closer to the edge of the Stour Valley. However, the presence of existing overhead lines and nearby Assington Masts means that the existing landscape character is considered to have capacity to accommodate a compound.
- 11.45 A sealing end compound at the western extent of Study Area G would introduce negative local landscape effects in the vicinity of pylon 4YLA001 (at the 132kV diamond crossing). Here, mature landscape features and topography would assist in accommodating a sealing end compound within the landscape. The presence of existing overhead lines in the landscape, including the diamond crossing arrangement where the existing 132kV overhead line passes beneath and around 4YLA001, mean that the landscape is considered to have capacity to accommodate a compound. There is potential for negative effects on the protected lane to the immediate east of 4YLA001.
- 11.46 Overall this option would result in a neutral effect on landscape in the long term.

Potential for mitigation

- 11.47 It would be possible to minimise negative effects on the local lane network as a result of the construction of an overhead line or underground cable route through careful planning of access to avoid the need for road improvements, wherever possible. Effects on lanes could also be minimised by utilising existing gaps in hedgerows and existing field accesses as access points onto agricultural land. Modifications to highways would be planned to be reversible (see paragraph 5.66).

OHL Alignments

- 11.48 It is not possible to avoid effects on the Stour Valley. The existing 400kV overhead line and the 132kV overhead line are already present and are

influencing features on the landscape. This would result in a lower magnitude of effect on the landscape than if overhead lines were not already present.

- 11.49 Mitigation by way of additional woodland and hedgerow planting in the vicinity of a new overhead line, depending on land owners' consent being granted, would be in keeping with the existing landscape character and could assist in lessening potential effects.

Underground cable alignment

- 11.50 The River Stour and Sudbury to Bures railway line would be crossed by a trenchless installation technique, such as directional drilling, which would also preserve any associated vegetation.
- 11.51 There would be some unavoidable loss of trees and hedgerow as a result of an underground cable route through this study area, and some disturbance to Protected Lanes. Effects could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows and by returning Protected Lanes to their original condition once construction is complete. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could also assist in lessening potential effects.
- 11.52 The negative landscape effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 11.53 Both the new overhead line options would have no greater than a moderate negative magnitude of effect (scale of change) on the landscape, due to the presence of the existing overhead lines in the landscape. There would be a neutral indirect effect on the AONB to the southeast in the long term. An overhead line option to the north of the existing 400kV overhead line would have a lesser negative magnitude of effect than an overhead line to the south as it would more closely parallel the existing 400kV overhead line. In the long term, the overhead line options would both lead to a moderate negative effect on the landscape. However due to the low capacity to accommodate an additional overhead line, the effects would be much greater than the effects of an area which has a high capacity for an overhead line and is only of local value.

- 11.54 An underground option would avoid the moderate negative effects on landscape associated with an overhead line option in Study Area G.
- 11.55 With mitigation, the magnitude of effect (scale of change) on landscape character as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on landscape. Although some tree losses are likely, which could not be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on landscape, would be negligible and the scale of effects on landscape would be broadly neutral.
- 11.56 There would be a minor positive effect on landscape character, associated with the underground option, where a 5km section of existing 132kV overhead line would be removed, although the existing 400kV overhead line would continue to be a component in the landscape.
- 11.57 Following the establishment of mitigation measures, the effect of sealing end compounds on landscape character would be limited to localised minor negative effects. Overall, the long term effects on landscape character in Study Area G as a result of an underground cable option, following the establishment of mitigation measures would be minor positive.

Environment - Visual Amenity

Baseline conditions

- 11.58 The public views in this study area of the existing overhead lines are experienced by high sensitivity visual receptors using public footpaths, cycleways, the river and public open spaces in and near to the study area, particularly those routes which run directly beneath the existing overhead lines. Consultation feedback has highlighted the importance to tourism of the visual amenity of the Stour Valley, which is promoted alongside the Dedham Vale AONB by the Dedham Vale AONB and Stour Valley Project. To the north of Study Area G is the market town of Sudbury, the birthplace of Gainsborough, which is now the home of Gainsborough's House, a museum and gallery. A number of published cycle and walking routes extend southward from Sudbury into the Stour Valley.
- 11.59 There are open views of the existing overhead lines from the Stour Valley Path (Long Distance Footpath and Regional Route) and St Edmund Way (Long

Distance Footpath) which run on higher ground on the western side of the Stour Valley and to the south of Sudbury before crossing into the valley. Representations have highlighted the Stour Valley Walk as an important footpath route. From the high ground on the western valley side the pylons on the eastern valley side and top are most visible. The prominence of the pylons at the top of the eastern valley side in views from the Stour Valley was highlighted by the Landscape and Views Thematic Group and resulted in the study area boundary between Study Area G and F being moved further to the east. Views of the existing 400kV overhead line from the Long Distance Footpaths on higher ground extend further into Study Area F as far as Assington Thicks, however at over 4km distant, these pylons are not prominent in the view. From the long distance routes on the western valley side the pylons in the valley bottom are backgrounded by landform. When viewed from the long distance footpaths in the valley, the backgrounded pylons are more prominent than in other views, although still less visible than where the 400kV overhead line crosses higher ground.

- 11.60 There are also several other public rights of way in the valley and on the valley sides with a mixture of open and filtered views of the existing overhead lines, as well as other publicly accessible locations such as Loshes Meadow Nature Reserve, which has been specifically highlighted in representations for its local walks, as well as Daw's Hall Nature Reserve, which has filtered views of the existing overhead lines in the valley. There are open views of the existing overhead lines within the valley and on higher ground to the east from local cycle route – Suffolk Cycle Route (Bures Loop A2), which runs between Bures and Sudbury along the western edge of the valley bottom and on the top of the eastern valley side. There are also open views from the roads running south from Sudbury including Henny Road, Bures Road and Upper Road and also open views from the River Stour and the section of railway line between Sudbury and Bures.
- 11.61 Feedback from the Twinstead Community Forum highlighted the importance of views experienced by river users and also the railway line (known as the Gainsborough line). There are river trips run by the Stour River Trust between Sudbury and Henny Street during the weekends between March and October. There are open views of the existing lines from the southern extent of this route. Consultation feedback also highlighted the locally valued viewpoints across the Stour Valley, some of which are visited by tourists.

- 11.62 There are few views of the existing overhead lines from residential receptors of high sensitivity at the southern edge of Sudbury and no views from Bures, although representations have highlighted concern as to the potential effect of a new 400kV connection on views from Bures. There are views from individual properties and hamlets, including Workhouse Green and Lamarsh, which have views along the Stour Valley to the existing overhead lines within the valley, and depending on location of the overhead lines on higher ground to the east or west. This includes views of the existing overhead lines in the valley from The Ryes School in Little Henny, which has been mentioned in representations, but has predominantly filtered views at a distance of approximately 3km toward the eastern side of the Stour valley.
- 11.63 Views within Study Area G are generally of high scenic quality and are not commonplace in the wider landscape. The scenic value of views in Study Area G is promoted in tourist literature covering the Dedham Vale AONB and Stour Valley. Views within Study Area G are therefore generally of moderate importance.

Assessment of effects

- 11.64 The construction of an overhead line or underground cable route in this study area has the potential for negative effects on views as a result of the possible need for road improvements for access, as well as the creation of points of access to cross agricultural land.
- 11.65 A new overhead line on a northern or southern alignment within Study Area G would have a negative effect on the majority of high sensitivity public and private visual receptors within the valley and on the valley sides. The existing 400kV and 132kV overhead lines are already present in these views and in some views backgrounding by the valley sides reduces their visibility. In other views the pylons are more prominent especially where they are on the valley sides and on the higher ground either side. There would be open views of both overhead line options from the Stour Valley and St Edmund Way Long Distance Footpaths which run beneath the existing overhead lines between Great Henny and Lamarsh. There are views to the existing overhead lines in the valley from this footpath route. The presence of the existing overhead lines would limit the negative magnitude of effect (scale of change) on views as a result of an additional overhead line

OHL Northern Alignment

- 11.66 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be public rights of way and private residences to the north of the existing 400kV overhead line including properties at Great Hickbush and Workhouse Green where a new overhead line would be viewed in close proximity. The potential proximity of a northern overhead alignment to Workhouse Green and Great Hickbush has been raised in representations from members of the public.
- 11.67 A new overhead line on a northern alignment in Study Area G would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a relatively high number of visual receptors of high sensitivity and the views in this study area are generally of moderate importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.
- 11.68 This option would have some minor positive and localised effects, to the south of the existing 400kV overhead line, where the existing 132kV overhead line would be removed. Positive effects would be experienced by some receptors on the western side of the Stour Valley, such as to the northern edge of Alphamstone, where residents currently have a view of the 132kV overhead line but not of the existing 400kV overhead line, and would not have views of a 400kV overhead line on a northern alignment.

OHL Southern Alignment

- 11.69 The greatest negative magnitude of effect (scale of change) on views experienced by high sensitivity visual receptors would be from public rights of way and private residences to the south of the existing 132kV overhead line, as the 132kV overhead line would be removed and replaced with the larger 400kV overhead line. This would include properties at Lamarsh (approximately 0.5km distant) and the northern edge of Alphamstone (approximately 1km distant). Specific consultation feedback has raised concerns about potential effects on views from Lamarsh.
- 11.70 A new overhead line on a southern alignment in Study Area G would have a moderate negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a relatively high number of visual receptors of high sensitivity and the views in this study area are generally

of moderate importance. Overall this option would result in a moderate negative effect on views in the long term and prior to mitigation.

- 11.71 Although a northern and southern alignment in Study Area G would both have moderate negative effects and there are some minor positive and localised effects associated with a northern alignment option and the removal of the 132kV overhead line to the south. However, a new overhead line on a southern alignment would have a lower negative effect on views compared with a northern alignment as it would follow the existing alignment of the 132kV overhead line, which would minimise the negative magnitude of change on views in the study area for the most visual receptors.

Underground cable alignment

- 11.72 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area G.
- 11.73 An underground cable route would not lead to any substantial long term effects on views if disturbance to important features such as the River Stour and woodlands are avoided. Some loss of hedgerows and hedgerow trees is likely to occur within the study area, which would have a localised negative effect on views. An underground cable route would have a moderate negative magnitude of effect (scale of change) on views in the temporary and short term and a low negative magnitude of effect (scale of change) on views in the long term. This scale of change would be experienced by a relatively high number of visual receptors of high sensitivity and views in this study area are generally of moderate importance. This would result in a minor negative effect on views without mitigation and in the long term as a result of an underground cable route in Study Area G.
- 11.74 There would be a minor positive effect on views, associated with this option, where 5km of the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line. Visual receptors that would particularly benefit would be those on the western side of the valley, such as properties around Alphamstone, which currently have a view of the 132kV overhead line but no view of the existing 400kV overhead line.
- 11.75 The positioning of sealing end compounds is likely to lead to some localised negative visual effects. At the eastern extent of Study Area G this would introduce negative visual effects in the vicinity of Upper Road. Here, there is little by way of mature vegetation to screen a compound without locating it closer to the edge of the Stour Valley.

- 11.76 A sealing end compound at the western extent of Study Area G would introduce negative local effects on visual amenity in the vicinity of pylon 4YLA001. Here, mature landscape features and topography would assist in screening views from the majority of visual receptors. The presence of overhead lines in existing views would lessen the scale of change to views and there would be a positive effect for some visual receptors as a result of the removal of the 132kV overhead line up to and including the diamond crossing at 4YLA001.
- 11.77 Overall, an underground cable option would result in a neutral effect on views in the long term.

Potential for mitigation

- 11.78 For both the overhead and underground alignment options it would be possible to minimise negative effects on views as a result of road improvements to the local lane network through careful planning of access to avoid the need for road improvements, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term negative visual effects would be unavoidable until re-establishment.

OHL Alignments

- 11.79 Mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line would be in keeping with the existing landscape character and could assist in lessening potential effects on views.

Underground cable alignment

- 11.80 The majority of woodland could be avoided through routeing and the employment of directional drilling would minimise effects on views of the River Stour and vegetation along the Sudbury to Bures railway line. Loss of some trees and hedgerow through this study area could be minimised through careful routeing and the reduction of the working width of the cable swathe at hedgerows. Replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement, could assist in lessening potential effects.
- 11.81 The negative visual effects of sealing end compounds could also be minimised through careful siting and the addition of new hedgerow and woodland planting within the sites.

Summary

- 11.82 For both overhead line options the magnitude of effect (scale of change) on views would be no greater than moderate negative, due to the presence of existing overhead lines in the landscape. A southern overhead line option would give rise to a lower scale of change on views than a northern alignment, which would have particularly negative effects on residential properties and public rights of way in close proximity to Great Hickbush and Workhouse Green. Overall and in the long term, both the overhead line options would lead to moderate negative effects on visual amenity.
- 11.83 An underground option would avoid the moderate negative effects on views associated with an overhead line option in Study Area G.
- 11.84 With mitigation, the magnitude of effect (scale of change) on visual amenity as a result of an underground option would continue to be moderate negative during construction and would be low negative during the reinstatement and re-establishment periods which would follow, resulting in temporary or short term negative effects on views. Although some tree losses are likely, which would be unable to be replaced within the cable swathe, the long term magnitude of effect of an underground cable route on views would be negligible and overall effects on visual amenity would be broadly neutral.
- 11.85 There would be minor positive effects on views to the south where the existing 132kV overhead line would be removed, notably on the western side of the Stour Valley in the vicinity of Alphamstone where topography and vegetation minimise views to the north to the existing 400kV overhead line, although the existing 400kV overhead line would continue to form part of many views.
- 11.86 Following the establishment of mitigation measures, the effect of sealing end compounds on views would be limited to localised minor negative effects.
- 11.87 Overall, the long term effects on visual amenity as a result of an underground cable option would be minor positive.

Environment - Cultural Heritage

Baseline conditions

- 11.88 There are two Grade II* listed buildings and 18 Grade II listed buildings within the route corridor in Study Area G. The Grade II* buildings are Sawyer's Farmhouse and Round Hill House. There are groups of listed buildings at Sparrow's Farm and Great Hickbush, which have been mentioned in

- representations. The listed buildings at Sparrow's Farm, Great Hickbush and Sawyer's Tye all have a relationship with the landscape that surrounds them and their setting therefore includes the farmland surrounding the buildings.
- 11.89 Just outside the study area, there are further Grade II Listed Buildings at Twinstead, Alhamstone, Workhouse Green and Lamarsh, Grade I listed Lamarsh Parish Church, and the Conservation Areas at Bures and Bures Hamlet.
- 11.90 There are 24 non-designated heritage assets within the Route Corridor in Study Area G. These include a number of World War Two pillboxes, as well as a number of areas of cropmark enclosures and find spots. This study area includes some large cropmark complexes that are indicative of prehistoric settlement sites. Although these assets are not designated, further investigation could confirm them to be of equivalent significance to a designated heritage asset.
- 11.91 A review of aerial photographs and LIDAR data for Study Area G identified a number of former field boundaries and areas of ridge and furrow.
- 11.92 The Cultural Heritage Thematic Group has advised that the river valleys have greater potential for the discovery of previously unrecorded buried archaeological remains, compared to other parts of the route corridor.
- 11.93 The historic landscape character of the study area is described as predominantly pre-18th century enclosure in the Suffolk and Lower Stour Valley Character Area. Much of south Suffolk and this part of Essex is characterised in this way due to the intact field system.
- 11.94 The underground route would cross three parish boundaries in Study Area G (multiple times). These are demarked by hedgerow, and would certainly be 'important' in terms of the Hedgerow Regulations. Other hedgerows form part of a pattern of pre-18th century enclosure, as described by the Suffolk and Braintree Historic Landscape Characterisation projects, and will therefore also be 'important'.
- 11.95 The Stour Valley's cultural associations with Gainsborough are dealt with in the landscape appraisal for Study Area G.

Assessment of effects

- 11.96 For all of the connection options, improvements to the road network necessary to construction activities could negatively affect 'important' hedgerows and historic lanes. The magnitude of effect would be low on heritage assets of low sensitivity. An overall minor negative effect is therefore predicted.

- 11.97 For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including access tracks). The magnitude of effect would be low/ moderate on heritage assets of low/ moderate sensitivity. An overall minor negative effect is therefore predicted.
- 11.98 Effects of the overhead line options on the setting of designated heritage assets and an underground cable option on buried archaeology are discussed in more detail below.
- 11.99 There are listed buildings on Henny Road, Lamarsh, that overlook the Stour Valley and although neither overhead alignment would be in the setting of these listed buildings both alignments would affect views from them. Four Grade II listed buildings and one Grade II* building would be negatively affected by both of the overhead alignments. The magnitude of effect on these listed buildings would be minor, and the overall scale of effect would be minor negative.

OHL Northern Alignment

- 11.100 An overhead option to the north of the existing 400kV overhead line in Study Area G has the potential to negatively affect the setting of three Grade II listed buildings at Great Hickbush. A northern alignment would introduce a line to the north of the group of listed buildings, in addition to the existing 400kV overhead line which lies immediately to the south of them. The northern alignment would also affect the setting of Sawyer's Farmhouse, which is Grade II* listed and Grade II listed buildings at Workhouse Green (Stakers, Burnthouse Farmhouse, the Village Hall, Spout Farmhouse, The Harwell and Pump Cottage). The northern alignment therefore has a negative effect on nine designated heritage assets of high sensitivity and one designated heritage asset of very high sensitivity. The presence of the existing 400kV overhead line would lessen the magnitude of the effect, other than at Great Hickbush due to the separation of the alignment to the north and south of these listed buildings. In the case of Sawyer's Farmhouse and Stakers, screening provided by mature trees that bound the curtilage to the listed buildings would lessen the negative effects and the magnitude of effect in each case would be low. Burnthouse Farmhouse, the Village Hall at Workhouse Green, Spout Farmhouse, The Harwell and Pump Cottage, as well as the three listed buildings at Great Hickbush, are not well screened from the northern alignment. In these cases the magnitude of effect would be moderate.

11.101 The overall scale of effect of a northern overhead alignment in Study Area G would be moderate negative.

OHL Southern Alignment

11.102 An overhead option to the south of the existing 400kV overhead line in Study Area G would negatively affect the setting of Grade II listed buildings at Sparrow's Farm, as well as views to and from Grade II listed Lamarsh Hall and Barn. The southern alignment would therefore have a negative effect on five heritage assets of high sensitivity. The existing 132kV overhead line is already present in this area, which would result in a lower magnitude of effect on the setting of heritage assets than if overhead lines were not already present. Sparrow's Farm has screening provided by mature trees that bound the curtilage to the listed buildings, which would lessen the negative effects and the magnitude of effect. In the case of Lamarsh Hall and Barn, the distance of separation between the listed buildings and southern alignment would lessen the magnitude of effect. In each case the magnitude of effect is low.

11.103 The overall scale of effect of a southern overhead alignment in Study Area G would be minor negative.

Underground cable alignment

11.104 An underground option in Study Area G would negatively affect buried archaeological remains. Study Area G has a moderate number of potentially 'important' hedgerows but the potential for the survival of buried archaeology is high. The Cultural Heritage Thematic Group has advised that the river valleys have a higher potential for the discovery of previously unrecorded archaeology than elsewhere in the Route Corridor. Given the high probability of encountering known and previously unrecorded archaeological remains within an underground cable route, the magnitude of effect of an underground option in Study Area G is predicted to be high, on heritage assets of low, moderate or high sensitivity.

11.105 An underground option would also negatively affect the historic landscape, through the removal of historic hedgerows, some of which are 'important' in terms of the Hedgerow Regulations criteria. The magnitude of effect would be low on heritage assets of low sensitivity.

11.106 In addition, an underground option in Study Area G would require sealing end compounds. A sealing end compound could have negative effects on buried archaeology and on the setting of listed buildings at Sparrow's Farm.

11.107 It is difficult to determine the scale of effect in relation to buried archaeology. However, given the predicted high magnitude of effect on receptors of low - high sensitivity, as well as the negative effects of sealing end compounds, the overall effect of an underground option on buried archaeological remains would be moderate negative.

Potential for mitigation

11.108 Mitigation of negative effects on buried archaeology and historic landscape features can be achieved. There is less scope to mitigate the negative effects on the setting of designated heritage assets.

11.109 For all options, potential effects on historic landscape features could be avoided, or mitigated through archaeological recording, careful reinstatement, and in the case of hedgerow loss, translocation or replanting.

11.110 For all options, an extensive programme of archaeological investigation, mitigation and monitoring would be required to mitigate effects on buried archaeology.

Summary

11.111 An overhead alignment to the north of the existing 400kV overhead line in Study Area G would have a moderate negative effect on heritage assets of high and very high sensitivity. In common with the southern alignment, the northern alignment has further minor negative effects on heritage assets of high and very high sensitivity. An overhead alignment to the south of the existing 400kV in Study Area G would have a minor effect in heritage assets of high sensitivity, as well as the minor negative effects common with the northern alignment. The southern alignment would affect fewer heritage assets compared to the northern alignment.

11.112 While mitigation of negative effects on buried archaeology and historic landscape features is achievable, preservation *in situ* is preferred. An underground option would require considerably more mitigation with respect to non-designated heritage assets, and result in direct physical impacts (as opposed to indirect visual impacts) compared to an overhead line. The effects of an underground cable and an overhead line connection are very different in relation to heritage assets and difficult to compare. However, given the high probability of direct impacts and significant mitigation requirements in relation to an underground cable compared to an overhead alignment, the scale of

effect would be greater for an underground cable option than an overhead line on a southern alignment.

Environment - Ecology

Baseline conditions

11.113 There are eight county/local wildlife sites within Study Area G, valued at the county level:

- Appletree Wood/Meadow CWS listed for its ancient woodland, species-rich meadow and associated butterfly community;
- Daws Hall LWS which contains a mix of grassland, marsh and aquatic habitats and has multiple TPO trees;
- Loshes Meadow Complex LWS (also an Essex Wildlife Trust reserve) which comprises grassland, woodland, new plantation, hedgerows and marsh and supports a variety of flowering plants and breeding birds, butterflies and reptiles;
- Twinstead Marsh LWS and Ansell's Grove/Ash Ground LWS both support a range of wet woodland and grassland habitat types and open water;
- Alphamstone Meadows LWS comprises a mix of wet and dry grassland habitats;
- Alphamstone Complex LWS comprises a mix of dry grassland in an old gravel pit, scrub, wet alder woodland and swamp; and
- Moat Farm/Burnt House Marsh LWS is a wooded stream with a mix of wet and dry grassland habitats.

11.114 The area west of the River Stour contains a number of Protected Lanes, a Braintree District designation that includes the road and associated roadside habitat features. These features are valued at the district level.

11.115 The study area is divided by the River Stour which the Environment Agency has highlighted as a European eel migratory route and it also has records of otter. The river is currently valued at the district level.

11.116 The study area is characterised by large arable fields east of the River Stour, while west of the river the fields are smaller and are dominated by improved and semi-improved pasture, some of which are species-rich. The small watercourses and changing topography in the west of the study area give rise to a mosaic of wet and dry woodland and grassland habitats and there are some

small areas of neutral species-rich grassland. A small area of floodplain grazing marsh (as listed on the habitat inventory) is recorded on the banks of the River Stour north of Daws Hall, but elsewhere within the route corridor the banks of the River Stour are a mixed of managed arable and pasture land. In the main, the interesting grassland habitats fall within wildlife site designations and their value is considered as part of those county valued sites.

11.117 The area is interspersed with blocks of woodland (many covered by Local Wildlife Site designations) and there are records of dormice, bats, reptiles and badgers which will be reliant on the mix of habitats found in this area. Many of the interesting woodland habitats fall within wildlife site designations and their value is considered as part of those county valued sites. Small areas of woodland outside of these areas are valued at the local level.

11.118 There are a number of waterbodies in the study area which may support great crested newt. The network of ponds is currently valued at the local level.

11.119 There are a large number of hedgerows within the study area and many are species-rich. The network of hedgerows is currently valued at the district level, but the value of individual hedgerows will vary depending on composition and association with other species.

Assessment of effects

OHL Northern Alignment

11.120 The northern alignment in Study Area G would pass the edge of Appletree Wood/Meadow LWS and Twinstead Marsh LWS. Although the alignment would avoid the LWSs there is potential for some perimeter tree limb removal to achieve electrical safety clearances. This would result in a low negative, long term magnitude of effect.

11.121 The northern alignment would cross one Protected Lane which may require some hedgerow tree loss resulting in a low negative, long term magnitude of effect.

11.122 Young plantation habitats at Daws Hall and Twinstead Marsh would also be crossed by the alignment. While this may not require tree removal initially, the long term management required to achieve electrical safety clearances along the easement would prevent the young trees from maturing. This would result in a moderate negative, long term magnitude of effect.

11.123 The permanent loss of individual hedgerow trees along the route cannot be ruled out, resulting in a low negative, long term magnitude of effect. However, the hedgerow network would be retained. This option would avoid impacts on ponds and watercourses. Grasslands and their associated flora and fauna are likely to experience only a low negative, temporary magnitude of effect.

11.124 In combination the low to moderate magnitude of effects on receptors of local to county value would lead to an overall moderate negative effect on ecology in Study Area G as a result of the northern overhead alignment prior to mitigation.

OHL Southern Alignment

11.125 The southern alignment in Study Area G would avoid all wildlife sites but would cross two Protected Lanes which may require some hedgerow tree loss resulting in a low negative, long term magnitude of effect.

11.126 The alignment would cross the edge of two small woodland areas, one is young plantation and both are already subject to habitat management along the easement of the 132kV overhead line. Tree loss would be minimal and no fragmentation impacts are predicted, resulting in a low negative, long term magnitude of effect.

11.127 The permanent loss of individual hedgerow trees along the route cannot be ruled out, resulting in a low negative, long term magnitude of effect. However, the hedgerow network would be retained. This option would avoid impacts on ponds and watercourses. Grasslands and their associated flora and fauna are likely to experience only a low negative, temporary magnitude of effect.

11.128 In combination, the low magnitude of effects on receptors of local to district value would lead to an overall minor negative effect on ecology in Study Area G as a result of the southern overhead alignment prior to mitigation.

Underground cable alignment

11.129 The cable route underground option in Study Area G would avoid all wildlife sites and avoid impacts on the River Stour through the use of HDD.

11.130 Ducting would be used to cross two Protected Lanes and this would result in a high negative, long term magnitude of effect.

11.131 The underground route would require tree loss where it crosses the edge of one narrow area of young plantation. This would have a moderate, negative, long term magnitude of effect.

11.132 There would be losses of up to 65m of habitat at hedgerow crossings, this would impact associated species through habitat loss and fragmentation. These losses would result in a high negative, long term magnitude of effect.

11.133 A sealing end compound in the west of Study Area G would be located just south of the Twinstead Tee within semi-improved pasture fields which have the potential to be species-rich. This could have a moderate negative, long term magnitude of effect on grasslands. Permanent access to the compound would be provided across the semi-improved pasture field from the Protected Lane to the east, which has the potential to result in negative impacts to the hedgerow and verge of the Protected Lane in order to achieve access but is not expected to increase the magnitude of effect already described for these features.

11.134 In combination, the low to high magnitude of effects on receptors of local to district value would lead to an overall major negative effect on ecology in Study Area G as a result of the underground option prior to mitigation.

11.135 In addition to impacts on Protected Lanes from alignment crossings, all three options have the potential to cause further loss or degradation of these features to facilitate works access into the area.

Potential for mitigation

11.136 For all options, existing field access points and watercourse crossings would be used for works traffic and standard environmental protection measures would be implemented, including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities onto retained habitats and implementation of pollution control methods.

11.137 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as dormice, amphibians and reptiles, if present.

OHL Northern Alignment

11.138 Replacement tree planting (subject to landowner agreement) would mitigate the loss of young plantation at Daws Hall and Twinstead Marsh and access routes that avoid the need to widen Protected Lanes or reinstatement of verge habitats would reduce impacts from this option.

11.139 Artificial trackways could be used to protect ground conditions. Alternatively, turf translocation or re-seeding would be employed where working areas affect important species-rich grassland habitats.

OHL Southern Alignment

11.140 Replacement tree planting (subject to landowner agreement) would mitigate the small loss of young plantation in the east of the study area and access routes that avoid the need to widen Protected Lanes or reinstatement of verge habitats would reduce impacts from this option.

11.141 Artificial trackways could be used to protect ground conditions. Alternatively, turf translocation or re-seeding would be employed where working areas affect important species-rich grassland habitats.

Underground cable alignment

11.142 HDD would avoid impacts on the River Stour and ducting at the road crossings could incorporate the roadside hedgerows and thereby reduce fragmentation impacts by shortening the timeframe between hedgerow removal and reinstatement. Temporary fragmentation impacts on bats and dormouse caused by hedgerow removal could be mitigated through the use of aerial bridges (across short distances) or timing the works to avoid sensitive seasons.

11.143 Working areas would be minimised when crossing valued habitat features to avoid or reduce impacts, habitats within the permanent easement would be reinstated on completion of works (with the exception of trees), although varying establishment periods will apply and loss of mature trees cannot be mitigated within a reasonable timeframe.

Summary

11.144 Both overhead alignment options within Study Area G would result in some tree loss to achieve electrical safety clearances. Mitigation, including wildlife-friendly working methods and scrub planting within the permanent easement (to minimise fragmentation impacts), would lessen some impacts on ecology from this option, bringing the overall impacts from either overhead line option to only a minor negative effect.

11.145 The underground option within Study Area G would result permanent tree loss across a linear area of woodland and hedgerow losses at each crossing. Adjusting working areas at hedgerows would minimise losses and including hedgerows in road ducting would reduce the time between habitat removal and replacement. Replacement hedgerow planting cannot mitigate for loss of mature hedgerow within a reasonable timeframe. These mitigation methods, in combination with wildlife-friendly working methods would lessen overall impacts

on ecology from the underground option in Study Area G to a moderate negative effect.

11.146 Either of the overhead alignment options would result in only minor negative effects following mitigation. A southern overhead alignment would cross fewer plantation areas and, unlike the northern option, it would not run adjacent to wildlife sites. The underground option would have the most ecological effects, resulting in moderate negative impacts due to tree and hedgerow habitat losses.

Socio-economic – Economic activity

Baseline conditions

11.147 The whole of the Stour Valley is an attractive area for tourism. In that part of the Stour Valley close to the route corridor, tourist interest is centred around Sudbury. Sudbury is an attractive market town popular with visitors as evidenced by the number of businesses supported by tourism, including cafés, pubs, restaurants, bed and breakfast premises, hotels, camping facilities, caravan parks and cycle and boat hire facilities. The Stour Valley offers cycle trails and water based activities focussed on the river. Sudbury also acts as a local employment centre reflecting its function as a market town serving its rural hinterland.

11.148 Loshes Meadow Nature Reserve in Twinstead, the Cornard Mere Nature Reserve and Great Cornard County Park near Sudbury are areas of informal recreation that are popular with visitors and local residents. The Daws Hall Centre for Environmental Education is located close to Lamarsh. The Stour Valley Path and St Edmund Way also run through the area and are currently oversailed by the existing 400kV and 132kV overhead lines.

11.149 In the villages of Lamarsh and Bures there are a number of pubs and restaurants. However, the village of Bures has no views of the route corridor.

Assessment of effects

11.150 The construction phase, for all options, would bring short term benefits to the local economy in terms of increased spend by the construction teams and additional income for local suppliers.

OHL Northern Alignment

- 11.151 Sudbury is the major centre for tourist activity in the area, but the concentration of tourist-related businesses is within the town centre with no views of the route corridor. Elsewhere, there is the potential for some highly localised negative impacts for some visitors, recreational users and businesses.
- 11.152 There would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. Given the density of the PROW network there is likely to be some highly localised minor disruptions to PROWs during construction.
- 11.153 The line would oversail a number of public rights of way including the Stour Valley Path and St Edmund Way. There would be open views for users of the PROW network in many locations, including users of the Stour Valley Path and St Edmund Way and cyclists on the Sudbury to Bures Circular Cycle Route.
- 11.154 Two tourist related businesses (public houses) would have open views of a new overhead line in Study Area G.
- 11.155 The alignments has the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.
- 11.156 Visitors to the Loshes Meadow Nature Reserve, used for informal recreation, would have views of the alignment. Visitors to Clay Hill Nature Reserve would have open views of the alignment from higher ground within the woodland and filtered views from elsewhere in the reserve. Visitors to the Daws Hall Centre for Environmental Education would have filtered views of the alignment from both the building and within the grounds. Visitors on river trips from Sudbury to Henny Street would also have views of the alignment. Although on the outskirts of Sudbury, visitors to the Great Cornard Country Park would have views of the alignment from the paths on the edge of Kedington Hill on the west side of the Stour Valley.
- 11.157 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.

OHL Southern Alignment

11.158 There would be some minor negative impacts during the construction period which may lead to localised impacts for visitors to the area. Given the density of the PROW network there are likely to be some highly localised minor disruptions to PROWs during construction.

11.159 The line would oversail a number of public rights of way including the Stour Valley Path and St Edmund Way. There would be open views for users of the PROW network in many locations, including users of the Stour Valley Path and cyclists on the Sudbury to Bures Circular Cycle Route.

11.160 As with the northern alignment, there would be two tourist related businesses that would both have open views of the alignment.

11.161 The alignments has the potential to have minor negative impacts on these businesses due to the landscape and visual impacts of an additional 400kV overhead line, taking account of the removal of the existing 132kV overhead line.

11.162 Visitors to the Loshes Meadow Nature Reserve, used for informal recreation, would have filtered views of the alignment. Visitors to the Daws Hall Centre for Environmental Education would have filtered views of the route corridor from both the building and within the grounds.

11.163 There is potential for highly localised temporary impacts on some agricultural operations during construction but neither these nor the location of permanent structures would compromise the operation of individual farming units.

Underground cable alignment

11.164 Overall the permanent impacts for visitors to and tourist-related businesses in the area would be beneficial, linked to the removal of the 132kV overhead line. In particular there would be improvements to views of users of the public rights of way network, including the long distance paths, and for cyclists on the Sudbury to Bures Circular Cycle Route.

11.165 There would be some minor negative impacts during the construction period which may lead to localised negative impacts for visitors to the area. Given the density of the PROW network and in particular the Stour Valley Path and St Edmund Way which run underneath existing power lines there is likely to be some highly localised disruptions to PROWs during construction. In addition there would be potential during construction for increased HGV traffic on the

local road network which could impact on cyclists using the Sudbury to Bures Circular Cycle Route.

11.166A sealing end compound in the eastern part of the area could be seen by PROW users in the vicinity of Workhouse Green, Assington Thicks and Dorking Tye House. In addition the termination pylon would be visible from two tourist-related businesses and from parts of Arger Fen and Spouse's Vale Nature Reserve and the western side of the Stour Valley. Filtered views of a sealing end compound in the western part of the areas are likely from the PROW to the east of Twinstead and visitors to Loshes Meadow Nature Reserve. Views of termination pylons are expected to occur from parts of Loshes Meadow Nature Reserve and, for PROW users to the east of Twinstead. Some parts of Clay Hill are expected to have a view over intervening vegetation in places, however the current pylon is already visible. Overall this would result in minor negative impacts which would be highly localised.

11.167There is potential for minor localised impacts during construction on agricultural land resulting in partial crop or harvest loss. The option would result in the temporary loss of around 9.3 ha of Grade 2 agricultural land and 12.5 ha of Grade 3 agricultural land.

Potential for mitigation

11.168For all options there are a number of measures that can be put into place to mitigate the impact of temporary construction works on visitors' enjoyment of the area. This may include the programming of construction activities and routing construction traffic to minimise effects on visitors to the area and disruption to local businesses, including agricultural operations. Where Public Rights of Way are disrupted during construction, alternative or diversionary routes would be provided.

11.169Agricultural mitigation measures would include restoration of agricultural land disturbed during construction to productive quality. National Grid will pay appropriate compensation for temporary loss of crops and other effects on agricultural use and for permanent easements for its infrastructure.

Summary

11.170By securing the removal of the 132kV overhead line, an underground solution has the potential to benefit the attractiveness of the area, which is a particular focus for tourism activity. Temporary negative effects are capable of mitigation. An additional overhead line associated with both the northern and

southern alignments would affect the views experienced by both residents and visitors, although the scale of change to landscape and views would be less than for a completely new overhead line given that it would replace an existing 132kV overhead line crossing the area. The effects of overhead line alignments on economic activity would be broadly neutral.

Cost

Capital cost

11.171 The estimated capital costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £8.7m
- OHL southern alignment £8.7m
- Underground cable alignment £105.6m

Lifetime cost

11.172 The estimated Lifetime costs, based on the assumptions referred to in Chapter 5 are as follows:

- OHL northern alignment £22m
- OHL southern alignment £22m
- Underground cable alignment £110m

Summary

11.173 In terms of both capital and lifetime costs, an underground option would be considerably more expensive than the overhead options. Both of the overhead options would impose similar capital and lifetime costs.

Interim overhead alignment

11.174 An overhead line option to the north of the existing 400kV overhead line would have a lesser negative magnitude of effect on landscape than an overhead line to the south as it would more closely parallel the existing 400kV overhead line, minimising the extent of the Stour Valley affected by 400kV overhead lines.

11.175 Overall a southern overhead line option would give rise to less negative effects on views than a northern alignment, even though there are some minor positive localised effects associated with a northern alignment option and the removal of the 132kV overhead line to the south. This is because a northern overhead

alignment option would have particularly negative effects on residential properties and public rights of way in close proximity to Great Hickbush and Workhouse Green, whereas a southern overhead alignment option in this study area would follow the existing alignment of the 132kV overhead line, which would minimise the negative magnitude of change on views in the study area for most visual receptors.

11.176 An overhead alignment to the north of the existing 400kV overhead line in Study Area G would have a moderate negative effect on heritage assets of high and very high sensitivity. In common with the southern alignment, the northern alignment would have further minor negative effects on heritage assets of high and very high sensitivity. An overhead alignment to the south of the existing 400kV in Study Area G would have a minor effect in heritage assets of high sensitivity, as well as the minor negative effects common with the northern alignment. The southern alignment would affect fewer heritage assets compared to the northern alignment.

11.177 A southern alignment would avoid all wildlife sites and would have less of an effect on plantation woodland than would a northern alignment.

11.178 While the effects of both alignments on economic activity would be broadly neutral, a northern alignment would have a greater effect on views from the north, which could affect visitors using the navigable section of the River Stour and the nature reserves at Loshes Meadow and Clay Hill.

11.179 There are no differences in cost that would distinguish between the alignments.

11.180 Although a northern alignment would have less of an effect on the landscape, the greater effects on visual amenity and heritage (particularly in the Great Hickbush and Workhouse Green areas), ecology and economic activity mean that the interim overhead alignment in Study Area G would be a southern alignment.

Undergrounding

11.181 In line with National Policy Statement EN-5, National Grid has considered the benefits of undergrounding in the context of the landscape in which the proposed connection would be set, together with the additional cost and the environmental and archaeological consequences of undergrounding. Comparisons are drawn between the interim overhead alignment described above and the underground option.

Landscape and visual considerations

- 11.182 In Study Area G, the Stour Valley is a large pronounced valley with steep valley sides. The valley is a dramatic feature within an otherwise broadly flat and unremarkable landscape. Study Area G east of the River Stour is designated a Special Landscape Area in Babergh District Local Plan and the value of the landscape west of River Stour is highlighted in Braintree District Council's 'A2 - Stour River Valley' landscape character area. Both the Special Landscape Area and landscape character area are of local value and the Braintree landscape character area is characterised as having a relatively high sensitivity to change.
- 11.183 There are no national landscape designations within this study area. However, representations received during consultation, including those from statutory consultees and the local planning authorities, have confirmed that this landscape has characteristics complementary to the Dedham Vale to the southeast. This is recognised by the fact that the Dedham Vale AONB and Stour Valley Project is a countryside management project which also applies both to the AONB and the Stour Valley and there is little distinction made between its activities in the AONB and the other parts of the Stour Valley. These activities include countryside management projects with landowner's permission; encouraging landowners to manage their land sympathetically to the value of the AONB; promoting appropriate enjoyment of the AONB and Stour Valley; and securing grant funding for these and related activities.
- 11.184 In November 2009, the Joint Advisory Committee resolved that the Partnership would 'issue a Statement of Intent to Natural England seeking an extension of the Dedham Vale AONB, including westward toward Sudbury, and to evaluate and provide a substantive case and detail in support of an extension.' This intention has also been incorporated in the Dedham Vale AONB and Stour Valley Management Plan 2010-15. Natural England has acknowledged the Statement of Intent. The potential extension of the Dedham Vale AONB was included in a list of suggestions received by Natural England in answer to a question put to Richard Benyon MP Parliamentary Under Secretary (Fisheries and Natural Environment) Environment, Food and Rural Affairs on 26 January 2012. The area which may be included in a detailed submission to Natural England seeking an extension to the AONB would be determined after study by the Project. The present anticipation is that this would not extend further west than the extent of the Project's geographical scope and it would not extend further north than the southern edge of Sudbury. This is the area which has scenic qualities and cultural associations similar to the land in the Dedham Vale AONB. It includes

the area around Sudbury, Bures and Stoke-by-Nayland which 'Managing a Masterpiece' (see below) identifies as of particular heritage value.

11.185 The Stour Valley is also subject of a further management project ('Managing a Masterpiece') which celebrates and seeks to further the understanding of landscape value and cultural associations throughout the river valley, including the area designated AONB and land outside the designation. This part of the Stour Valley has strong cultural associations with the internationally regarded artist Thomas Gainsborough. Although there is limited evidence that specific views of the Stour Valley were painted by Gainsborough, it is widely acknowledged that he was inspired by the views of the Stour Valley and that many similar picturesque views can be seen today. Although Constable mainly painted within the Flatford area within the Dedham Vale, there is also evidence that Constable visited the Stour Valley as he painted a view of Daw's Hall near Lamarsh (in a painting titled 'Lamarsh Hall'). There are also connections with John Nash, an official war artist who lived in Wormingford in the latter part of his life and took inspiration from the nearby landscape.

11.186 Study Area G covers the Stour Valley and extends east and west to include high ground at the tops of the valley sides. The part of the Stour Valley through which the overhead line route corridor passes is a distinctive high quality landscape. This part of the River Stour runs in a north-south direction before the main valley turns near Bures and runs in a west-east direction through the Dedham Vale, passing Flatford Mill and the area closely associated with Constable. The Stour Valley at Study Area G is a natural extension of the Dedham Vale, sharing the same river. This part of the Stour Valley contains the characteristics of an English lowland river landscape which are highly valued in the Dedham Vale AONB and are depicted in both Gainsborough and Constable's paintings, such as the meandering River Stour, riverside willows, grazing and water meadows, historic villages with imposing church towers and scattered woodlands. The landscape character of the western side of the Stour Valley is made up of an intricate pattern of secluded tributary valleys. There are a number of sunken lanes within this landscape, some of which are locally designated as Protected Lanes by Braintree District Council for their traditional landscape and nature conservation character. Protection extends to their tranquillity as well as their physical appearance.

11.187 The factors described above mean that, while not statutorily designated, the landscape is generally recognised as being of much greater than local value.

- 11.188 The predominantly agricultural landscape in Study Area G is broadly intact, although there is some hedgerow loss and gappy hedgerows in the eastern part of the study area in particular. In addition, historic field patterns have been lost with the expansion of fields, particularly in the eastern half of the study area. Woodland blocks and belts remain largely intact in the study area. Overall the landscape condition in Study Area G is moderate.
- 11.189 Study Area G crosses a valley landscape. Valley landscapes generally have less capacity to accommodate an overhead line compared with an open plateau landscape, as the overhead line can appear out of scale with the enclosed landscape. This part of the Stour valley is pronounced with steep valley sides creating a high degree of enclosure. The existing overhead lines cross this study area which influences the capacity of the landscape to accommodate a further overhead line. Overall, the landscape capacity of Study Area G is assessed as low.
- 11.190 The beneficial effect on landscape character and visual amenity as a result of the removal of the 132kV overhead line is common to both a southern overhead alignment option in Study Area G.
- 11.191 The baseline views within Study Area G include the existing 400kV overhead line and a 132kV overhead line. The removal of the 132kV overhead line within Study Area G and construction of a new 400kV overhead line on a southern alignment would represent a change to these views, but the change would generally be consistent with the existing baseline conditions. As well as the existing overhead lines, the Assington masts to the east form part of baseline views from many locations.
- 11.192 Representations have highlighted the importance of tourism in the Stour Valley, which is promoted alongside the Dedham Vale AONB by the Dedham Vale AONB and Stour Valley Project. To the north of Study Area G is the market town of Sudbury, the birthplace of Gainsborough, which is now the home of Gainsborough's House, a museum and gallery. A number of published cycle and walking routes extend southward from Sudbury into that part of the Stour Valley, drawing visitors into Study Area G. Views within Study Area G are generally of high scenic quality and are not commonplace in the wider landscape. The scenic value of views in Study Area G is promoted in tourist literature covering the Dedham Vale AONB and Stour Valley. Views within Study Area G are therefore generally of moderate importance.

- 11.193 The greatest effects on views as a result of a new 400kV overhead line on a southern alignment would be from high sensitivity receptors that would be closer to the new overhead line than the existing 400kV overhead line. In Study Area G this would include parts of the Stour Valley Way and St Edmund Way long distance paths and residents at the northern edge of Lamarsh, as well as individual properties within the Stour Valley. Views of a new 400kV overhead line on the valley sides within Study Area G would be particularly prominent from both visual receptors in the valley and from higher ground. Within the Stour Valley bottom views of a new 400kV overhead line would be limited to receptors within the valley, whose views of pylons are often backgrounded reducing their visual prominence.
- 11.194 The landscape in Study Area G has a low capacity to accommodate an additional 400kV overhead line on a southern alignment. In addition, existing views in the area are generally of moderate importance and there would be views of a new 400kV overhead line from a particularly high number of visual receptors of high sensitivity. The magnitude of effect (scale of change) to the landscape and views as a result of an additional 400kV overhead line would be no greater than moderate due to the presence of the existing overhead lines in the baseline conditions. An additional overhead line in Study Area G would have a negative effect on the setting of the AONB to the east, but the degree of effect is not so great as to affect the statutory purpose to conserve and enhance the 'special qualities' of the AONB. Overall, a southern overhead alignment would result in a moderate negative effect on landscape character and visual amenity.
- 11.195 An underground cable option would avoid the moderate negative effects on landscape and views associated with a southern overhead alignment option in Study Area G.
- 11.196 The scale of effect on landscape and views as a result of undergrounding in Study Area G would be broadly neutral in the long term. There would also be a positive effect on landscape and views, associated with the underground option over a distance of 5km where the existing 132kV overhead line would be removed and would not be replaced by a larger 400kV overhead line. The greatest benefit to views would be experienced by high sensitivity receptors on the western side of the Stour Valley where the existing 132kV overhead line is currently visible but the 400kV overhead line is not, such as at the northern edge of Alphamstone. Overall, the long term effects on landscape character

and visual amenity as a result of an underground cable option would be minor positive.

11.197 The overall benefit of undergrounding in Study Area G are the minor positive effects on landscape and views, compared to the moderate negative effects on landscape and views as a result of a southern overhead alignment option.

Undergrounding cost

11.198 The estimated capital cost of undergrounding through this section of the route is estimated at £105.6m, compared to a cost of £8.7m for the interim overhead alignment. The estimated lifetime costs are £110m and £22m respectively.

Environmental and archaeological consequences of undergrounding

11.199 The removal of the 132kV overhead line, associated with the underground option, may benefit the attractiveness of the area which is a particular focus for tourism and recreation activities.

11.200 The underground option within Study Area G would avoid all wildlife sites but would result in two crossings of Protected Lanes, permanent tree loss across a linear area of woodland and hedgerow losses of up to 65m at each crossing. Even with replacement hedgerow planting and reinstatement of road verges, impacts on ecology from the underground option in Study Area G would have a moderate negative effect.

11.201 An underground option would result in extensive ground disturbance which would lead to large negative effects on non-designated buried archaeology. The effects on buried archaeology would be much greater as a result of an underground cable, compared to an overhead alignment. The negative effects would be direct, and lead to total loss or substantial harm in relation to multiple non-designated heritage assets. Mitigation is available for the negative effects through archaeological investigation and recording, although buried archaeology is a finite and non-renewable resource and preservation *in situ* is preferred when possible.

11.202 An underground option could also result in negative effects on the historic landscape through the removal of historic hedgerow. Mitigation is available for these effects and if implemented, no long term effects would remain

Conclusions

11.203 The part of the Stour Valley through which the overhead line route corridor passes is a distinctive high quality landscape. It shares similar physical

characteristics to areas of Dedham Vale Area of Outstanding Natural Beauty which are acknowledged as of great value. These include a wide and pronounced river valley with farming patterns and land use which are consistent with those of the '*epitome of the farmed English countryside*' for which the Dedham Vale AONB is recognised.

11.204 The Stour Valley is associated with Constable and Gainsborough, with tourism related to Gainsborough being promoted particularly from Sudbury to the north of the overhead line route corridor where there is the Gainsborough's House attraction. Although there is limited evidence that specific views of the Stour Valley were painted by Gainsborough, it is widely acknowledged that he was inspired by the views of the Stour Valley and that many similar picturesque views can be seen today. The association with Gainsborough means that this part of the Stour Valley has national cultural significance.

11.205 The Stour Valley is managed by the Dedham Vale AONB and Stour Valley Project and there is little distinction made between its activities in the AONB and the other parts of the Stour Valley. These activities include countryside management projects with landowner's permission; encouraging landowners to manage their land sympathetically to the value of the AONB; promoting appropriate enjoyment of the AONB and Stour Valley; and securing grant funding for these and related activities.

11.206 In November 2009, the Project's Joint Advisory Committee resolved that the Partnership would 'issue a Statement of Intent to Natural England seeking an extension of the Dedham Vale AONB, including westward toward Sudbury, and to evaluate and provide a substantive case and detail in support of an extension.' This intention has been incorporated in the Dedham Vale AONB and Stour Valley Management Plan 2010-2015. The potential extension of the Dedham Vale AONB has been acknowledged by Natural England as one of a number of suggestions that have been put to it.

11.207 Concerns regarding the negative effects on the landscape qualities of the part of the Stour Valley which would be crossed by the overhead line have been raised by local planning authorities and other statutory consultees. These concerns were expressed during consultation on the Route Corridor Study, including during a workshop on where undergrounding may be considered appropriate as mitigation for the effects of a new overhead line. These concerns have been presented consistently during further engagement to date. These concerns have also been expressed by Thematic Groups and Community Forums and also in many other representations from members of the public.

- 11.208 The issues discussed above mean that the part of the Stour Valley crossed by the overhead line route corridor may be regarded as a 'particularly sensitive location' in the context of paragraph 2.82 of National Policy Statement for Electricity Networks Infrastructure (EN-5) and that in determining whether an application for a new overhead line is acceptable, the successor to the IPC will need to consider whether *'the benefits from the non-overhead line alternative (underground cables) will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable'*.
- 11.209 The proposed overhead line would give rise to a moderate negative magnitude of effect (scale of change) on a landscape of low capacity to accommodate this type of effect. This would result in a moderate negative effect on a landscape which is of much greater than local importance. Putting the new line underground would avoid this negative effect and there would be a minor positive effect resulting from the removal of the existing 132kV overhead line.
- 11.210 Overall a new overhead line on the southern alignment would give rise to a moderate negative effect on views of a relatively high number of receptors of high sensitivity. These effects would be avoided if underground cables are used and there would be a minor positive effect on views resulting from the removal of the existing 132kV overhead line.
- 11.211 The extra economic impacts of putting the line underground are lifetime costs of £88m more than the overhead line equivalent.
- 11.212 The socio-economic impacts of the new overhead line are anticipated to be neutral and this assessment also applies to underground cables.
- 11.213 There would be minor negative effects on buried archaeology from an overhead line because of the relatively small area of ground disturbed during pylon construction. A new 400kV overhead line on the southern alignment would have a minor negative effect on cultural heritage because of impacts on the setting of heritage assets. The effects on buried archaeology of putting the line underground would be moderate negative. It is preferable to leave remains in situ whereas undergrounding would bring a high degree of disturbance where excavations take place and some further potential effects from the use of the haul road. These effects can be mitigated by investigation and recording. There would be a minor positive effect on above ground heritage assets from the removal of the 132kV overhead line.
- 11.214 The effects on ecology of the interim overhead alignment would be minor negative. Effects on ecology of putting the line underground would arise

because of disturbance to habitats, notably to sections of hedges. No designated sites would be adversely affected by installation of underground cables. The negative effects can be mitigated to an extent by planting and taking measures to reduce fragmentation during the construction period. The overall effects would be moderate negative.

11.215 There are no insurmountable technical difficulties associated with installation of underground cables.

11.216 The benefits from the use of underground cables as an alternative to an overhead line in this particularly sensitive location will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable.

Study Area conclusion

11.217 It is recommended that, for Study Area G, an **underground cable** solution be taken forward to the next stage in the design process. Potential sites for sealing end compounds are addressed in Chapter 12.

12 CONNECTION REVIEW

Conclusions by study area

- 12.1 Having considered the main issues for each study area, and taken consultation responses to date into account, this report concludes that there is a case for undergrounding certain sections of the connection. Where undergrounding is not considered to be appropriate, National Grid would be prepared to build overhead lines on any of the interim alignments identified in this report, provided that a feasible connection can be assembled (see paragraph 4.9). Comments on the findings of the appraisal and, in particular, on options for the Hintlesham area (Corridors 2A and 2B) will be sought before finalising an interim alignment for the whole connection.
- 12.2 In summary, the appraisal recommends that the following options for the connection should be taken forward:
- Study Area AB – Hintlesham – the Corridor 2B southern alignment – this would involve running a new overhead line alignment from Bramford substation to the south of the existing line, linking to it to the north east of Hintlesham Wood in order to use its alignment to pass through the woodland, then running to the south of the existing line. In order to permit this, the existing 400kV overhead line would be routed onto a new alignment north of Ramsey Wood, rejoining the existing line near Clay Lane;
 - Study Area C - Brett Valley - a new overhead line alignment to the south of the existing line;
 - Study Area D – Polstead - a new overhead line alignment to the south of the existing line;
 - Study Area E – Dedham Vale AONB – an underground cable section from Heath Road, Polstead Heath to Leavenheath (4.2km);
 - Study Area F – Leavenheath/Assington - a new overhead line alignment to the south of the existing line;
 - Study Area G – Stour Valley - an underground cable section from west of Dorking Tye to the Bramford-Braintree-Rayleigh overhead line south of Twinstead Tee (3.8km).
- 12.3 This connection arrangement is shown on Figure 12. The connection would involve about 21km of overhead line and 8km of underground cable.

- 12.4 Should responses to this report present additional information which would support different conclusions for one or more of the study areas, then further consideration would need to be given to the assembly of a feasible connection.
- 12.5 For the purposes of this report however it is appropriate to test how a feasible connection may be assembled based on the recommendations in paragraph 12.2 above.

Assembling a feasible connection

- 12.6 The interconnection between the overhead line and the underground sections will be achieved at sealing end compounds. Investigations have been undertaken to determine whether there are potentially suitable locations for such compounds at either end of each of the underground sections which could be developed without incurring unacceptable environmental effects.
- 12.7 Earlier in this report it was suggested that for Study Area E (Dedham Vale AONB) potential locations for sealing end compounds could be to the south-east of Sprott's Farm and to the west of Boxford Fruit Farm and east of the A134. For Study Area G (the Stour Valley), potential locations were identified in the vicinity of Upper Road and adjacent to Pylon 4YLA001 on the Bramford-Braintree-Rayleigh overhead line.
- 12.8 In assembling a feasible connection, further consideration was given to these broad locations and to local environmental constraints in order to identify appropriate locations for sealing end compounds and thus the extent of underground sections. A description of the form of sealing end compounds is provided in paragraphs 4.23 et seq.

Interim locations for sealing end compounds

- 12.9 Interim locations for sealing end compounds have been considered in relation to potential effects on landscape, visual amenity, biodiversity and cultural heritage. These are particularly relevant issues to be considered in relation to the localised effects of a sealing end compound.
- 12.10 In Study Area E (Dedham Vale AONB) potential compound locations were identified at the eastern end of the cable route to the south east of Sprott's Farm and east of the AONB boundary (Location 4 on Figure 12), and at the western end of the route, to the immediate west of Boxford Fruit Farm (Location 3 on Figure 12).
- 12.11 At the eastern end of this section of underground cable route, Location 4 to the south east of Sprott's Farm and west of Heath Road provides an opportunity to

- screen the compound next to the adjacent Dollops Wood, supplemented by additional planting. This location falls within an undesignated landscape. A compound at this location would have a minor negative effect on landscape character and visual receptors in the long term, following establishment of supplementary planting and given the wider benefit of undergrounding to the west. This includes consideration of the indirect effect on the AONB to the west which would be separated from the sealing end compound to an extent by the woodland at the AONB boundary.
- 12.12 Views from the nearest residential visual receptors are already limited by vegetation screening and there would be no views of the compound from Polstead village. There would be near and open views from the public footpath network and Heath Road, although supplementary planting would help to screen views of the sealing end compound over time. Even after the establishment of supplementary planting, a termination pylon would continue to be visible in the wider area but this would be viewed in the context of the existing 400kV overhead line.
- 12.13 A compound at this location would have a minor negative effect on biodiversity in the short term, as there would be permanent loss of arable habitat, which is already widespread, and the potential for a small loss of hedgerow where a permanent access road would connect with Heath Road (although this could be avoided by utilising an existing gap in a hedgerow). Some negative effects could occur as a result of disturbance or displacement impacts on breeding birds, but these would be temporary.
- 12.14 There would be a minor effect on buried archaeology as a result of the construction of the sealing end compound. The settings of Sprott's Farmhouse and Polstead Conservation Area are already influenced by the presence of overhead lines and there are intervening mature trees that would limit views toward a compound from these locations.
- 12.15 At the western end of this section of the route, the area is generally open. A sealing end compound location to the west of Boxford Fruit Farm was primarily dictated by the western extent of the fruit farm as this offers separation from the AONB to the east and there is an opportunity to locate a sealing end compound adjacent to existing tree planting along the boundary to the orchard.
- 12.16 This sealing end compound location falls within an undesignated landscape. A compound at this location would have a minor negative effect on landscape character and visual receptors in the long term, following establishment of

- supplementary planting and given the wider benefit of undergrounding to the east. This includes consideration of the indirect effect on the AONB to the east which would be separated from the sealing end compound by the intervening fruit farm.
- 12.17 There would be near public views of a compound at this location from a short section of the B1068 and public rights of way to the south. There would be near private views of a compound from properties on the B1068 at the northeastern edge of Leavenheath. A number of these views would be filtered and partly obscured by intervening built form or mature vegetation to curtilages. Supplementary planting would help to screen views of the sealing end compound over time. Even after the establishment of supplementary planting, a termination pylon would continue to be visible in the wider area but this would be viewed in the context of the existing 400kV overhead line.
- 12.18 A compound at this location would have a minor negative effect on biodiversity in the short term, as there would be permanent loss of arable habitat, which is already widespread, and the potential for a small loss of hedgerow where a permanent access road connects with the wider road network (although this could be avoided by utilising an existing gap in a hedgerow). Some negative effects as a result of disturbance or displacement impacts on breeding birds are likely to occur during the construction phase, but these would be temporary.
- 12.19 There would be a minor effect on buried archaeology as a result of the construction of the compound. The location would not fall within the setting of any listed buildings.
- 12.20 In Study Area G (Stour Valley) sealing end compound locations were identified at the eastern end of the cable route, to the south of Sawyer's Farm and west of Upper Road has been appraised (Location 2 on Figure 12), and at the western end, adjacent to pylon 4YLA001 on the Bramford-Braintree-Rayleigh overhead line (Location 1 on Figure 12).
- 12.21 At the eastern end of this section of underground cable route, the proposed location to the south of Sawyer's Farm and west of Upper Road falls within the Special Landscape Area designated by Babergh District Council. The area in the vicinity of Upper Road is generally flat and open and there are limited opportunities for screening a compound. However this location takes advantage of a natural depression on the edge of the Stour Valley and the presence in the existing landscape of tall hedgerow, hedgerow trees and a parcel of woodland to the immediate south. Prior to the establishment of mitigation there would be

additional negative effects as a result of the requirement for a permanent access road to this location. A termination pylon at this elevated location is also likely to have a negative effect on the Stour Valley. A sealing end compound at this location would have a minor negative effect on landscape character in the long term, following establishment of supplementary planting and given the wider benefit of undergrounding to the west. This includes consideration of the indirect effect on the AONB approximately 2km to the southeast which is buffered by intervening woodland.

- 12.22 In the long term, a compound at this location would have a minor negative effect on nearby visual receptors, following the establishment of supplementary planting and given the wider benefit of undergrounding to the west. There would be filtered public views of the compound and open views of a termination pylon at this location from the public footpath near Workhouse Green and the public footpath to the southeast which connects with Upper Road. There would also be heavily filtered views of the compound and open views of the termination pylon from parts of Upper Road. The nearest private viewpoint would be from Sawyer's Farm (less than 0.5km distant), which would have filtered views of the compound and open views of a termination pylon. There are also likely to be views from some residential properties to the south and east of Workhouse Green, with views of the compound filtered by vegetation in gardens and with open views of part of the termination pylon. Other views, including views from the western side of the Stour Valley would be more distant, with the compound largely obscured. Even after the establishment of supplementary planting, a termination pylon would continue to be visible in the wider area, but this would be viewed in the context of the existing 400kV overhead line and the Assington masts.
- 12.23 There would be a minor negative effect on biodiversity in the short term, as there would be permanent loss of arable habitat, which is already widespread, and the potential for loss of hedgerow where a permanent access road is needed (although effects could be avoided by utilising an existing gap in a hedgerow). Some negative effects as a result of disturbance or displacement impacts on breeding birds are likely to occur during the construction phase, but these would be temporary.
- 12.24 There would be a minor effect on buried archaeology as a result of the construction of the compound. The location would fall within the setting of the listed building at Sawyer's Farm and would have negative effects which cannot be mitigated entirely. However, this setting is already influenced by the

presence of overhead lines and the magnitude of effect on this listed building would be minor.

- 12.25 At the western end of this section of underground cable route, the proposed sealing end compound at Location 1 would be positioned within a natural valley feature which has existing mature hedgerow and woodland screening. This is the current location of the diamond crossing, where the existing 132kV overhead line splits in order to cross beneath the 400kV Twinstead Tee to Braintree overhead line. This crossing would be removed as part of the connection proposal. This location does not fall within a designated landscape, but Braintree District Council highlights the sensitivity of this landscape as part of the Stour River Valley landscape character area. A compound at this location would have a minor negative effect on landscape character and visual receptors in the long term, following establishment of supplementary planting and given the wider benefit of undergrounding to the east. This includes consideration of the negative effects on the protected lane to the east of the sealing end compound location as a result of the construction of a permanent access road connecting to it, although it may be possible to minimise these effects by utilising an existing gap in a hedgerow.
- 12.26 There would be near public views of a compound at this location from parts of the nearby Protected Lanes and these views would be largely filtered by hedgerow vegetation. There would be filtered views toward the compound from the public rights of way to the north and west and from the parts of Loshes Meadow Nature Reserve. There would be near private views of a compound from Sparrow's Farm with open views from windows on the southern gable end. More distant and filtered views are possible from Loshhouse Farm and properties on the lane to the south (Lorkin's Lane). Supplementary planting would help to screen views of the compound over time from these locations. Even after the establishment of supplementary planting, a termination pylon would continue to be visible in the wider area but this pylon would replace the existing pylon at 4YLA001, which would minimise the magnitude of effect (scale of change) to views. In addition, these visual receptors would benefit from the positive effects associated with the removal of the 132kV overhead line up to and including the diamond crossing.
- 12.27 A compound at this location would have a minor negative effect on biodiversity in the short term. There would be permanent loss of pasture field (which may be species-rich), although the resultant loss of foraging habitat for birds, bats, badger, brown hare and nesting habitat for birds is unlikely to be significant,

given the availability of similar habitat to the north. Furthermore, if necessary there is potential to preserve areas of greatest botanical interest. There is also the potential for effects on the nature conservation interest features of the Protected Lane where a permanent access road would connect with it (although this could be avoided by utilising an existing access from the lane). Some negative effects as a result of disturbance/displacement impacts on breeding birds are likely to occur during the construction phase, but these would be temporary.

- 12.28 There would be a minor effect on buried archaeology as a result of the construction of the sealing end compound. 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 Grade II listed and is in the same field as the interim sealing end compound. These settings are already influenced by the presence of overhead lines and effects could be reduced following the establishment of supplementary planting around the compound. The negative effects of the construction of a compound would also be offset by the removal of the existing 132kV overhead line up to and including the diamond crossing.

Future studies and assessment

- 12.29 The sealing end compound sites identified above have interim status and are not to be regarded as fixed. The choice of sealing end compound locations and their detailed design will be informed by the results of further technical studies, detailed environmental surveys, discussions with landowners and in the light of representations received.

Costs and benefits compared to a full OHL solution

- 12.30 The capital cost of the connection solution set out in paragraph 12.2 above is estimated to be £207.7m and lifetime cost is estimated to be £266m. A fully overhead solution adopting an alignment to the south of the existing 400kV overhead line, and including the diversion of the existing 400kV overhead line to the north of Ramsey Wood at Hintlesham, is estimated to cost £51.3m (lifetime cost £132m). The additional capital cost for including the underground sections would therefore be in the region of £156.4m and the additional lifetime cost £134m.
- 12.31 In adopting the partly underground connection solution set out in paragraph 12.2 above, the following benefits should accrue:

- a reduction in the number of overhead lines crossing the Dedham Vale AONB by securing the removal of the 132kV overhead line;
- enhancing the landscape quality and visual amenity of the Dedham Vale AONB in accordance with national and local policies;
- avoiding adverse effects on the operations of Boxford Fruit Farms, a major local employer;
- a reduction in the number of overhead lines crossing the Stour Valley by securing the removal of the 132kV overhead line;
- enhancing the landscape quality and visual amenity of the Stour Valley in accordance with local policies reflecting its landscape value and cultural associations;
- enhancing the attractiveness of the Dedham Vale and Stour Valley areas where tourism is important to the local economy.

12.32 Although there would be minor negative indirect effects on the AONB as a result of the interim overhead alignment and cable sealing end compounds in Study Areas D and F, overall by undergrounding through Study Area E, the natural beauty of the AONB would be enhanced.

13 NEXT STEPS

- 13.1 As part of the overall Stage 2 Consultation programme there will be opportunities for all interested parties to comment on the emerging connection design. Representations will be invited on the findings of this Connection Options Report. During this consultation period there will be further meetings of the Community Forums and Thematic Groups. Following the consultation period, the conclusions of the report will be reassessed as appropriate in the light of representations received. A statement will be published to confirm any areas where it is proposed to use underground cables and also to confirm the preferred alignment for the overhead line sections.
- 13.2 An exception to this is the section of the route around Hintlesham in Study Area AB. Consistent with a previous commitment, specific consultation is to be undertaken on options for Study Area AB before deciding which alignment to take forward. Following a review of representations received, the route for this part of the connection will be confirmed. This will complete the definition of an interim alignment for the whole connection.
- 13.3 In addition, a separate consultation exercise will be undertaken to address alternative locations for a new substation to the west of Twinstead. The potential locations for this substation all lie outside the study areas for the options appraisal considered in the present report. They will be subject to a separate options appraisal exercise.
- 13.4 A consultation feedback report will be produced which will identify the relevant issues raised during the consultations and the responses to these issues.
- 13.5 Outputs from the Stage 2 Consultations will help to inform the development of a detailed connection design, based on the interim alignment, which will also be influenced by technical considerations, environmental and geo-technical surveys and discussions with affected landowners and occupiers.
- 13.6 During Stage 3 of the process, the detailed connection design will be subject to environmental impact assessment (EIA) and further public consultation. The Community Forums and Thematic Groups will continue to meet as appropriate throughout the project development period.
- 13.7 The project is subject to a continuous process of backcheck and review in the pre-application stages to ensure that when new information comes forward (be it related to policy, technological developments, environmental or other

factors), this is communicated to the project team and its effect on the robustness of decision making evaluated.

- 13.8 It is anticipated that National Grid's public consultation on the detailed connection design will be undertaken in late 2012. The proposal will then be finalised and it is anticipated that a submission will be made to the Planning Inspectorate in 2013, seeking consent for the connection and associated development. Timescales and activities may be subject to alteration as the project progresses.

ABBREVIATIONS

AC	Alternating Current
AONB	Area of Outstanding Natural Beauty
CPRE	Council for the Protection of Rural England
CWS	County Wildlife Site
DCO	Development Consent Order
DPD	Development Plan Document
EIA	Environmental Impact Assessment
ERM	Environment Resources Management
GCN	Great Crested Newt
GIL	Gas Insulated Line
Ha	Hectare
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HVDC	High Voltage Direct Current
ICNIRP	International Commission on Non-Ionising Radiation Protection
IET	Institution of Engineering and Technology
IPC	Infrastructure Planning Commission
Km	Kilometre
kV	Kilovolt
LDF	Local Development Framework
LIDAR	Light Detection and Ranging
LNR	Local Nature Reserve
LWS	Local Wildlife Site
m	metre/million
MVA	Mega Volt Ampere
NCR	National Cycle Route
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OHL	Overhead Line
PILs	Persons with an Interest in Land
PINS	Planning Inspectorate
PROW	Public Right of Way
RSPB	Royal Society for the Protection of Birds
SLA	Special Landscape Area
SSSI	Site of Special Scientific Interest
TEP	The Environment Partnership
TPO	Tree Preservation Order
UKPN	United Kingdom Power Networks
XLPE	Cross Linked Polyethylene
ZVI	Zone of Visual Influence

APPENDIX A

Preliminary Options Appraisal of Potential Overhead Alignments on Corridor 2B at Hintlesham Woods SSSI

Appendix A – Preliminary Options Appraisal of Potential Overhead Alignments on Corridor 2B at Hintlesham Woods SSSI

- A-1. This Appendix presents a preliminary options appraisal of the anticipated effects of a new 400kV overhead line on Corridor 2B in the vicinity of Hintlesham Woods Site of Special Scientific Interest (SSSI). Hintlesham Woods SSSI comprises two contiguous woodlands: Hintlesham Wood and Ramsey Wood; and a further woodland separate from these called Wolves Wood. The existing 400kV overhead line from Bramford substation passes through the woodland comprising Hintlesham Wood and Ramsey Wood before continuing to Twinstead Tee and then beyond to Braintree and Rayleigh to the south and to Pelham to the west. In the appraisal presented in this Appendix, phrases 'the SSSI'; 'the woods' and 'Hintlesham Woods' refer to the contiguous Hintlesham and Ramsey Woods.
- A-2. This appraisal has been carried out in order to decide which potential overhead line alignment in Corridor 2B is least environmentally constrained and which should therefore be taken forward to the options appraisal of Study Area AB contained in the Connection Options Report.
- A-3. The range of issues considered in comparison of options is set out in the Connection Options Report. The following environmental issues are not material differentiators between potential alignments in Corridor 2B:
- Air quality
 - Noise and vibration
 - Soils and geology
 - Water
 - Resources and waste
 - Greenhouse gases and energy efficiency
 - Climate change adaptation

- A-4. It is also considered that in relation to potential overhead alignments in Corridor 2B, Socio-economic, Technical, Safety and Cost criteria are not material differentiators.
- A-5. This appraisal includes consideration of the potential effects of a new 400kV overhead line on landscape, views, ecology, and cultural heritage.

Issues Raised in Representations

- A-6. During its consultation on the Route Corridor Study (Stage 1 consultation) National Grid did not expressly invite statements of preference between Corridor 2A and Corridor 2B in Corridor 2. Notwithstanding, Suffolk County Council's representation on the Route Corridor Study included a specific statement that it sought National Grid to adopt option Corridor 2B if it continued to propose an overhead line. Few other representations volunteered a preference between Corridor 2A and Corridor 2B at that stage.
- A-7. The Stage 2 Consultation process commenced at the same time as the studies to consider whether it would be appropriate to underground sections of the proposed connection and also options in the Hintlesham area. Further information on the approach to Stage 2 consultation to date is provided in Chapter 2 of the Connection Options Report. While the Stage 2 Consultation will extend up to the announcement of a preferred connection alignment, feedback from the early stage of the consultation has informed the options appraisal. Recent representations raised by Community Forums, Thematic Groups and other bodies and individuals are identified in this interim options appraisal where relevant.
- A-8. The final meeting notes providing a formal record of all issues raised from the Thematic Group Meetings and Community Forums can be found on the Project website (<http://www.bramford-twinstead.co.uk/meetings-community-forums.aspx>). Furthermore, plans capturing the outputs from the Community Forum workshops held in November 2011, at which members were asked to identify what they considered to be of particular importance or of value in their local area, are shown on the project website alongside the environmental baseline information to support the Connection Options Report. This information can be found at: <http://www.bramford-twinstead.co.uk/library-stage-2.aspx>.

Definition of Options

- A-9. There are a wide range of potential overhead alignments which could be considered in Corridor 2B and Chapter 4 of the Connection Options Report provides further information on the principles adopted in defining overhead alignment options. When National Grid announced that Corridor 2 was its preferred route corridor for an overhead line for part or all of the connection between Bramford and Twinstead, this was based on its view, strongly expressed in representations made during consultation on the route corridors, that building a new overhead line as close as reasonably possible to the existing 400kV line would result in the smallest amount of change and the lowest levels of environmental effects. Synchronising the positions of pylons on the new line to be in an equivalent position to the pylons on the existing line is likely to be preferable in visual terms to the new line having pylons in different positions, although it is acknowledged that this may not always be possible.
- A-10. Chapter 4 of the Connection Options Report explains that for the purposes of the options appraisal it is assumed that the distance between the centre lines of existing and proposed overhead lines should generally be at least 85m.
- A-11. This preliminary options appraisal considers options for a new overhead line in Corridor 2B in the vicinity of Hintlesham Woods that address the principles adopted in Chapter 4 of the Connection Options Report and which also consider options in relation to features of known environmental sensitivity. It is not possible to apply the principles outlined in Chapter 4 equally in every situation and professional judgement has been applied where principles are found to conflict. The options appraised in Appendix A are shown in Figure A at the rear of the Connection Options Report. These are described below in order from north to south.

OP2 – NL (north of Ramsey Wood)

- A-12. This overhead alignment option runs around the northern edge of Ramsey Wood, continuing southward to re-join a paralleled alignment with the existing 400kV overhead line to the south of Bushey Cooper's Farm. One pylon shown on this option sits just outside the route corridor identified in the Route Corridor Study.

OP1 – NL (a) (northern parallel through wood with pylons outside)

- A-13. This overhead alignment option parallels the existing 400kV overhead line to the north through the woods. In this option pylon positions have been adjusted to allow a span through the woods that would avoid the need to place a pylon (and access route and construction area) in the woods. This would result in the need for one additional pylon to allow for the shorter span lengths to either side. This additional pylon would be required to the north of the woods.
- A-14. Southwest of the woods a closely paralleled alignment to the north of the existing 400kV overhead line would not be possible without oversailing residential property at Primrose Farm and so the alignment deviates northward away from the existing 400kV overhead line to avoid these properties before re-joining a closely paralleled alignment to the south of Bushey Cooper's Farm.

OP1 – NL (b) (northern parallel through wood with pylons inside)

- A-15. This overhead alignment option parallels the existing 400kV overhead line to the north through the woods. In this option pylon positions are synchronised to match those of the existing overhead line, so one pylon and associated access would be needed within the woods.
- A-16. Southwest of the woods this option follows the deviation described above for OP1 – NL (a) to avoid oversailing residential property at Primrose Farm.

OP1 – SL (a) (southern parallel through wood with pylons outside)

- A-17. This overhead alignment option parallels the existing 400kV overhead line to the south through the woods. In this option pylon positions have been adjusted to allow a span through the woods that would avoid the need to place a pylon (and access route) within the woods. This would result in the need for one additional pylon to allow for the shorter span lengths to either side. This additional pylon would be required to the north of the woods.

OP1 – SL (b) (southern parallel through wood with pylons inside)

A-18. This overhead alignment option parallels the existing 400kV overhead line to the south through the woods. In this option pylon positions are synchronised to match those of the existing overhead line, so one pylon and associated access would be needed in the woods.

OP2 – SL (southern route through wood at shortest crossing)

A-19. This overhead alignment option deviates south from the existing 400kV overhead line to take the shortest available route to cross the woods before re-joining a southern and closely paralleled alignment to the southwest of the woods. This option does not require any pylons to be constructed in the woods. This option partly sits outside the route corridor identified in the Route Corridor Study.

A-20. The above options do not necessarily prejudice a northern or southern alignment elsewhere within Study Area AB or in other parts of the route between Bramford and Twinstead. It would be possible to achieve any of the above options with either a northern or southern paralleled alignment to the northeast or southwest of the woods as the change in angle in the existing 400kV overhead line would allow for the existing and new lines to be 'swapped' so that part of a new line can be strung on the pylons of the existing 400kV line through the woodland.

Determining the Scale of Effects

A-21. Chapter 5 of the Connection Options Report provides an outline methodology for the appraisal of landscape, visual amenity, cultural heritage and ecology, which has also been adopted in this preliminary options appraisal.

A-22. In reporting the effects associated with an option, a scale has been used which differentiates between positive and negative effects and, in each case, the degree of effect. For negative effects, the following scale has generally been used as a guide:

- Major negative effects could arise as a result of a major scale of change to receptors, or effects on receptors of national and/or international importance, for which reliable and effective mitigation cannot be guaranteed;

- Moderate negative effects could arise as a result of a moderate scale of change to receptors, or effects on receptors of regional importance. Potential negative effects remain for some sensitive receptors despite mitigation;
- Minor negative effects could arise as a result of a minor scale of change to receptors or effects on receptors of local importance. Potential negative effects remain for some sensitive receptors despite mitigation.

A-23. The assessment of effects on the appraisal topics considers the above scale of effects prior to mitigation. Mitigation measures are then described and the effects are reassessed in the summary taking mitigation into account.

Environment - Landscape

Baseline Conditions

- A-24. The eastern part of Corridor 2B, up to and including Hintlesham Woods forms part of the Special Landscape Area (SLA) which extends from Belstead Brook in the east (designated in the Babergh District Local Plan). The landscape to the west of Hintlesham Woods is not designated. The landscape in the vicinity of Hintlesham Woods is of local value.
- A-25. There are no regional or national landscape designations within Study Area AB and the setting of the Dedham Vale AONB, which at its closest lies some 2km to the southwest of the study area, is not affected by the existing overhead lines within this study area.
- A-26. The Suffolk Landscape Character Assessment characterises this area as Ancient Plateau Claylands. The Ancient Plateau Claylands landscape character type is found outside of the river valleys and is described as being a gently rolling plateau dissected by small streams and rivers. It is largely in arable use with irregular fields and ancient and plantation woodlands form significant features.
- A-27. Hintlesham Hall and Park sits approximately 1.0km to the east of Hintlesham Woods and occupies the area between Corridor 2A and 2B. Consultation and reference to historic maps have confirmed that a vista from the Hall was incorporated into Hintlesham Woods in the past, comprising a cleared avenue through the woodland through which a view was available from the Hall, framed by the remaining woodland adjacent. This avenue has not been maintained and is no longer apparent on site. The Royal Society for the Protection of Birds (RSPB) which manages Hintlesham Woods has confirmed that it is undertaking works to coppice and remove some trees from this former vista avenue. However, this work is being undertaken in a gradual and careful basis to manage habitat rather than as part of any proposal to re-open the vista with a view to recreating its former function or appearance.
- A-28. There is no registered Park and Garden associated with the Hall, but it is of historic value (see the Cultural Heritage options appraisal which follows). It has some characteristics of the Estate Claylands Landscape Character type. However

these characteristics are not dominant and, as described above, the land falls in the Ancient Plateau Claylands.

- A-29. The landscape immediately surrounding Hintlesham Woods consists of a broadly flat and unremarkable arable landscape with large geometric fields with some hedgerow field boundaries. The arable landscape is interspersed with large broadleaved woodland blocks and overall the landscape has a large and open feel. The presence of the busy A1071 and the existing 400kV overhead line as it deviates to run through the narrow point between Ramsey and Hintlesham Woods already influence the local landscape character. North and south of the woods there are residential properties located on the A1071, Pond Hall Road/Duke Street respectively. There are a few isolated farmsteads and residential properties in farmland between these two east-west roads, which are accessed via farm tracks. The boundary to the locally designated Special Landscape Area is not distinguishable in the landscape on the ground.
- A-30. The predominantly agricultural landscape in the vicinity of Hintlesham Woods is broadly intact, although hedgerow loss and gappy hedgerows are found. In addition, historic field patterns have been lost in some parts of the study area with the expansion of fields, such as land to the north and east of Hintlesham Woods. Modern ribbon-style development along main roads also encroaches on the character of the rural landscape. Overall the landscape condition in the vicinity of Hintlesham Woods is moderate.
- A-31. The landscape in the vicinity of Hintlesham Woods is of local value and consists of large arable fields interspersed with woodland blocks. A large-scale and open landscape of this type has greater capacity to accommodate an overhead line than a smaller scale landscape or valley landscape. In addition, the presence of mature woodland and the existing 400kV overhead line means that the landscape has capacity to accommodate a further overhead line. Overall and in relation to an additional overhead line, the capacity of the landscape in the vicinity of Hintlesham Woods is high.

Assessment of Effects

- A-32. A new 400kV overhead line in Corridor 2B using any alignment option would have a negative effect on the Special Landscape Area and Ancient Plateau Claylands landscape character area, which are of local value. However the magnitude of

effect (scale of change) to this landscape as a result of any of the options is limited due to the presence of the existing 400kV overhead line and mature woodland.

OP2-NL (north of Ramsey Wood)

A-33. A new 400kV overhead line on option OP2-NL would introduce the greatest magnitude of effect (scale of change) of the options considered as this option is most removed from the closest parallel of the existing 400kV overhead line through Hintlesham Woods SSSI and this option would require an additional angle pylon. This would extend the negative effect of overhead lines on this landscape to include the area to the north and west of the woods.

A-34. This option would not result in any loss of woodland, which is an important component of the local landscape.

A-35. A new overhead line on alignment OP2-NL would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has a high capacity for an overhead line. Overall, this option would result in a moderate negative effect on the landscape in the vicinity of Hintlesham Woods prior to mitigation.

OP1-NL(a) and OP1-NL(b) (northern parallel through the wood with pylons outside or inside)

A-36. A new 400kV overhead line on option OP1-NL(a) or OP1-NL(b) would introduce a lesser magnitude of effect (scale of change) compared to options OP2-NL and OP2-SL, as the OP1-NL options closely parallel the existing 400kV overhead line through the woodland. This would minimise the extent that the 400kV overhead lines have a negative effect on the landscape.

A-37. A new 400kV overhead line on option OP1-NL(a) or OP1-NL(b) would introduce a greater magnitude of effect (scale of change) compared to options OP1-SL(a) and (b), as the OP1-NL options would be required to deviate from a closely paralleled route south of the woodlands to avoid oversailing properties at Primrose Farm and Hadleigh Bee Farm. This would extend the negative effect of overhead lines on this landscape and its Special Landscape Area designation.

- A-38. The minor loss of woodland as a result of either OP1-NL options would represent a negative effect on landscape, however although an important component of the local landscape character, this effect is considered of lesser significance to landscape effects compared with the advantages of closely paralleling the existing 400kV overhead line.
- A-39. There would be some difference in landscape effects between OP1-NL(a) and OP1-NL(b). OP1-NL(b) would introduce a lesser magnitude of effect (scale of change) than OP1-NL(a) as pylons would be better accommodated within the landscape in the woodland and pylons would be synchronised with the existing 400kV overhead line. Although OP1-NL(b) would require less woodland loss, synchronicity with the existing 400kV overhead line would be lost and an additional pylon would be required to the north of the woods.
- A-40. A new overhead line on either alignment OP1-NL(a) or OP1-NL(b) would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has a high capacity for an overhead line. Overall, option OP1-NL(a) or OP1-NL(b) would result in a moderate negative effect on the landscape in the vicinity of Hintlesham Woods prior to mitigation.

OP1-SL(a) and OP1-SL (b) (southern parallel through the wood with pylons outside or inside)

- A-41. A new 400kV overhead line on option OP1-SL(a) or OP1-SL(b) would introduce the least negative magnitude of effect (scale of change) of the options considered, as the OP1-SL options closely parallel the existing 400kV overhead line through the woodland and also south of the woodland. This would minimise the extent that the 400kV overhead lines have a negative effect on the landscape (which is of local importance).
- A-42. The minor loss of woodland as a result of either OP1-SL options would represent a negative effect on landscape, however, although an important component of the local landscape character, this effect is considered of lower importance to landscape effects compared with the advantages of closely paralleling the existing 400kV overhead line.

- A-43. There would be some difference in landscape effects between OP1-SL(a) and OP1-SL(b). OP1-SL(b) would introduce a lesser magnitude of effect (scale of change) than OP1-SL(a) as pylons would be accommodated better within the landscape in the woodland and pylons would be synchronised with the existing 400kV overhead line. Although OP1-NL(b) would require less woodland loss, synchronicity with the existing 400kV overhead line would be lost and an additional pylon would be required to the north of the woods.
- A-44. A new overhead line on either alignment OP1-SL(a) or OP1-SL(b) would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has a high capacity for an overhead line. Overall, option OP1-SL(a) or OP1-SL(b) would result in a moderate negative effect on the landscape in the vicinity of Hintlesham Woods prior to mitigation.

OP2-SL (southern route through the wood at shortest crossing)

- A-45. A new 400kV overhead line on option OP2-SL would introduce a greater magnitude of effect (scale of change) than the OP1-NL and OP1-SL options, as this option does not closely parallel the existing 400kV overhead line through Hintlesham Woods SSSI and would require additional angle/deviation pylons. This will extend the effect of overhead lines on this landscape including the Special Landscape Area designation.
- A-46. The minor loss of woodland as a result of either OP1-SL options would represent a negative effect on landscape, however, although an important component of the local landscape character, this effect is considered of less significance to landscape effects compared with the advantages of minimising the deviation from the existing 400kV overhead line that would be required to avoid the woodland altogether.
- A-47. A new overhead line on alignment OP2-SL would have a moderate negative magnitude of effect (scale of change) on the landscape, which is of local value, has a moderate condition and has a high capacity for an overhead line. Overall, option OP2-SL would result in a moderate negative effect on the landscape in the vicinity of Hintlesham Woods prior to mitigation.

Potential for Mitigation

- A-48. It is not possible to avoid effects on the landscape as a result of a new 400kV overhead line. However mitigation in the form of additional woodland and hedgerow planting in the vicinity of a new overhead line would be in keeping with the existing landscape character and could assist in reducing potential effects in some locations, particularly by screening the lower parts of pylons.
- A-49. Although there is potential for mitigating the effects of an overhead line connection on landscape by way of planting this would be subject to the agreement of landowners and would need to be carefully managed and monitored to ensure successful establishment. Given the lack of certainty that such measures will be feasible in every instance, the assessment of effects on landscape has been judged without these mitigation measures in place.

Summary

- A-50. Following mitigation, for all of the overhead line options the magnitude of effect (scale of change) would be no greater than moderate negative, due to the presence of the existing overhead line and mature woodland in the landscape. In addition, the landscape is of local importance and moderate condition and has a high capacity to accommodate an additional overhead line. Overall, it is therefore concluded that all the overhead line options would result in moderate long-term negative effects on landscape.
- A-51. Although all options would have a moderate negative magnitude of effect (scale of change) and overall a moderate negative effect on landscape, the magnitude of effect would vary slightly between the options. The options in order of magnitude of effect, starting with the lowest are:
- OP1-SL(b) (southern parallel through wood with pylons inside);
 - OP1-SL(a) (southern parallel through wood with pylons outside);
 - OP1-NL(b) (northern parallel through wood with pylons inside);
 - OP1-NL(a) (northern parallel through wood with pylons outside);

- OP2-SL (southern route through wood at shortest crossing); and
- OP2-NL (north of Ramsey Wood).

Environment - Visual Amenity

Baseline Conditions

- A-52. The landscape surrounding Hintlesham Woods is part of a broadly flat open plateau, interrupted by woodland blocks and with some localised screening offered by tree belts, hedgerow trees and taller hedgerows. The size of the existing 400kV overhead line means that Hintlesham Woods does not screen views of the existing overhead line entirely, although depending on viewpoint the lower half of the pylon within the woods or pylons on the far side of the woods are obscured and the lower half of pylons on the near side of the woods are backgrounded in views from the surrounding area.
- A-53. High sensitivity visual receptors at publicly accessible locations that would be affected by a new 400kV overhead line on Corridor 2B at this point are the public views from public footpaths and roads within the corridor and within 1km of the corridor in particular, although more distant views are possible. There is a single public footpath which runs through Hintlesham Woods (Ramsey Wood), which allows predominantly filtered views of the existing 400kV overhead line. There are existing open views of the 400kV overhead line from public footpaths north of Hintlesham woods and south of the A1071. Open views of the existing 400kV overhead line also extend to public footpaths north of the A1071. There are also open views from public footpaths to the east and south of the woods, between Duke Street/Pond Hall Road and the woods, and also further south between this road and Woodlands Road. To the west of the woods there is a single footpath 1km distant from the edge of the corridor which runs through Valley Farm and has a mixture of open and filtered views of the existing 400kV overhead line crossing the woods.
- A-54. High sensitivity visual receptors from private viewpoints include residents in closest proximity, within the corridor and within 1 km of the corridor in particular, although more distant views are possible. In the north, the nearest residences with views of the existing 400kV overhead line are the residential properties at College Farm, which currently have open views of the line approximately 0.2km to the north on its approach to the woods, as well as views approximately 0.8km to the southwest where the line crosses the woods. College farmhouse runs a Bed and Breakfast and guests are also high sensitivity visual receptors. There is a children's clothing shop near to College Farmhouse and workers and visitors to

it are of lower sensitivity. College Farm Woods, which it is understood from consultation feedback is used as an outdoor teaching resource for local primary schools, is approximately 0.1km to the south of the existing line at this point.

- A-55. Also to the north of Hintlesham Woods are high sensitivity receptors at residential properties on the A1071, which include Park Farm, 'Kingsfield', Park Farm Cottages, Claremont Cottages, Norman Farm, Norman House and The Old Hall House. Some of these residential properties are also used as business premises whose workers and customers are of lower sensitivity. These properties all have views of the A1071 and to the south of the existing 400kV overhead line on its approach to and crossing the woods. Park Farm and 'Kingsfield' have the closest views of the existing line (0.1km to the south) on its approach to Hintlesham Woods, with views 1km to the southwest where the line crosses the woodland. Views of the existing line from all of these properties include an element of backgrounding, where the lower half of pylons on the near side of the woods are backgrounded by the woods, and an element of screening, where the lower half of the pylon within the woods or pylons on the far side of the woods are obscured from view. There are also views of this part of the existing 400kV overhead line from properties north of the A1071, but as well as being more distant, these tend to be more filtered by intervening built form and vegetation.
- A-56. Hintlesham Hall Hotel is approximately 1km to the northeast of Hintlesham Woods and guests at the hotel are high sensitivity receptors. Views from the front facing windows and driveway approach to the Hall include a partially obscured view of the existing 400kV overhead line where it crosses the woods (any nearer views of the 400kV overhead line are obscured by intervening vegetation).
- A-57. In the east, the nearest views of the existing 400kV overhead line in the vicinity of Hintlesham Woods from high sensitivity visual receptors at residences are from rear-facing windows of properties on the northwestern side of Duke Street. These views are at a distance of approximately 1.2km and many of the views from these properties include an element of backgrounding, where the lower half or so of pylons on the near side of the woods are backgrounded by the woods, and an element of screening, where the lower half or so of pylons on the far side of the woods are obscured from view.

- A-58. In the south, the nearest high sensitivity visual receptors at residences with views of the existing 400kV overhead line, running through and southward from the woods, are those on Pond Hall Road. These include Wood Farm, Bungalow Farm, 'Bradfields', 'Ingle Nook' (and the nearby 'Boundary Garage', which is of low sensitivity), Primrose Farm and Bushey Cooper's Farm. Distances between these visual receptors and the existing 400kV overhead line varies. Primrose Farm is less than 1km from the existing 400kV overhead line where it crosses Pond Hall Road and has views toward the existing overhead line where it crosses the woods (1km distant). The views of the existing overhead line from many of these properties include an element of backgrounding, where the lower half of pylons on the near side of the woods are backgrounded by the woods, and an element of screening, where the lower half of pylons on the far side of the woods are obscured from view. There are also views of this part of the existing 400kV overhead line from properties south of Pond Hall Road, but as well as being more distant, these tend to be more filtered by intervening built form and vegetation.
- A-59. To the west, the nearest high sensitivity visual receptors at residences with views of the existing 400kV overhead line running through the woods are Ram's Farm approximately 0.2km north of Ramsey Wood and 0.7km from the existing line to the southeast; Ramsey Farm approximately 0.3km west of Ramsey Wood and 0.8km from the existing line to the west; and Hill Farm, which has views of both the existing 400kV overhead line to the east where it crosses the woods (approximately 0.9km distant), as well as closer views of the same line where it runs south of Pond Hall Road (approximately 0.3km distant). Views of the existing line from all of these properties includes an element of backgrounding, where the lower half of pylons on the near side of the woods are backgrounded by the woods, and an element of screening, where the lower half of pylons on the far side of the woods are obscured from view. Beyond these closest properties, individual properties at Valley Farm and Cobbold's Farm currently have views of this part of the existing line approximately 2.0km distant.
- A-60. There are open views for low sensitivity road users on the A1071 which runs approximately 0.5km to the north of Hintlesham Woods. This is a busy traffic route where travellers are likely to be less interested in the view. There is also a mixture of filtered and open views for low sensitivity road users on Pond Hall Road, which runs approximately 0.5km to the south and is a quieter secondary route between Hadleigh and Hintlesham.

A-61. Given the scenic qualities of the landscape in the vicinity of Hintlesham Woods and the commonplace nature of the views, views in this area are generally of low importance.

Assessment of Effects

OP2 – NL (north of Ramsey Wood)

A-62. The greatest magnitude of effect (scale of change) to views as a result of this option would be from visual receptors that would be closer to the new 400kV overhead line than the existing and would have near views.

A-63. This would include high sensitivity visual receptors using the public rights of way network to the north of Ramsey Wood, including the public footpath which runs around the northern edge of Ramsey Wood and over which the new 400kV line would pass. There are few views of the existing 400kV overhead line from this location because of the screening effect of Ramsey Wood. Views from the public footpaths west of Ramsey Wood, near Cobbold's Farm and Valley Farm would also have closer views of a 400kV overhead line than at present, however this would be at a distance of approximately 1.0km.

A-64. The high sensitivity visual receptors at residential properties that would experience the greatest change to views as a result of this option would be 'The Old Hall House' (approximately 0.2km distant), Ram's Farm (approximately 0.1km distant) and Ramsey Farm (approximately 0.2km distant). Although the new pylons would be partly backgrounded by the woods in these views.

A-65. Other residences whose views would be particularly affected are Bushey Cooper's Farm, which currently has views of the existing 400kV overhead line 0.1km to the south, but would have additional views of a new line to the west (at approximately 0.2km). As well as having a view of the existing overhead line to the south, residences at Pheasant House and Hadleigh Bee Farm would also be likely to have views of the new 400kV overhead line running south from the western edge of Ramsey Wood. The residence at Hill Farm would also have a view of the new 400kV overhead line 0.3km to the east as well as already having views of the 400kV overhead line 0.4km to the south. The present view from these properties of the existing 400kV overhead line to the south would be added to by the new line, which could be aligned to the north or south of the existing

line. A northern alignment would result in a greater scale of change on views from these particular properties.

- A-66. Other high sensitivity visual receptors would experience a change to their view as a result of a new 400kV overhead line on alignment option OP2-NL but these would be at a greater distance and in some cases where there are closer views of the existing 400kV overhead line. These receptors include views from the residential properties on the A1071 to the north of the woods and Hintlesham Hall hotel. This option would add additional pylons to the view from Hintlesham Hall, but these would be at a greater distance than the existing and would be partly obscured by the woods.
- A-67. Overall this option would result in the greatest change to views as the new 400kV overhead line would deviate from paralleling the route of the existing, resulting in a greater magnitude of effect (scale of change). There are few receptors that would experience a change to their near views because of the general absence of public footpaths, lanes and properties west of Ramsey Wood. These receptors identified above would experience a high negative magnitude of effect (scale of change) to their views as their near views do not currently contain an overhead line. Concern about the potential change to views from properties to the north of Hintlesham Woods has been expressed in feedback from consultation.
- A-68. A new overhead line on alignment OP2-NL would have a moderate negative magnitude of effect (scale of change) on the majority of visual receptors and a high negative magnitude of effect on a few visual receptors. This scale of change would be experienced by a number of visual receptors of high sensitivity. Views in the vicinity of Hintlesham Woods are of local importance. Overall option OP2-NL would result in a moderate negative effect on views in the vicinity of Hintlesham Woods prior to mitigation.

OP1-NL(a) and OP1-NL(b) (northern parallel through the wood with pylons outside or inside)

- A-69. The greatest magnitude of effect (scale of change) on views as a result of these options would be from visual receptors that would be closer to the new 400kV overhead line than the existing and would have near views.

- A-70. This would include high sensitivity visual receptors using the public rights of way network to the north of Hintlesham Woods, including the public footpath which runs between College Farm and the woods, over which the new line would cross. Users of public footpaths connecting from the A1071 southward would also have closer views of a 400kV overhead line than at present. Users of the public footpath through Ramsey Wood would have near views of the new 400kV overhead line as it would pass over this footpath, but these views would be filtered by the surrounding trees. There are already near views of the existing 400kV overhead line from parts of all these public footpaths.
- A-71. To the north of the woods the high sensitivity visual receptors at residential properties that would experience the greatest change to views as a result of this option would be 'The Old Hall House' (approximately 0.4km distant), Norman House/Norman's Farm and Claremont Cottages (approximately 0.4km distant) and Ram's Farm (approximately 0.6km distant). The new pylons would be partly backgrounded and partly obscured by the woods in these views.
- A-72. To the south, high sensitivity visual receptors at residential properties that would experience the greatest change to views as a result of this option would be from Primrose Farm (approximately 0.1km), Hadleigh Bee Farm (less than 0.1km) and Pheasant House (approximately 0.1km). As well as having a view of the existing overhead line to the south (distances ranging from 0 to 0.1km), residences at Primrose Farm, Hadleigh Bee Farm and Pheasant House would have views of the new 400kV overhead line immediately to the north of their properties.
- A-73. Other high sensitivity visual receptors at residences whose views would be particularly affected are properties at College Farm. Depending on its alignment, these properties could have a nearer view of the new 400kV overhead line to the north (0.1km distant) as well as view to the west of these OP1-NL options at a distance of approximately 0.4km, which would be visible beyond the existing 400kV overhead line (at approximately 0.3km distant).
- A-74. Other high sensitivity visual receptors at residences whose views would be particularly affected are Bushey Cooper's Farm, who currently have views of the existing 400kV overhead line 0.1km to the south, but would have additional views of a new line to the east (at approximately 0.2km). The residence at Hill Farm would also have a view of the new 400kV overhead line 0.5km to the east as well

as already having views of the 400kV overhead line 0.4km to the south. As well as these properties having a view of the existing 400kV overhead line to the south, this view would be added to by the new line, which could be aligned to the north or south of the existing. A northern alignment would result in a greater scale of change again on views from these particular properties.

- A-75. Other high sensitivity visual receptors would experience a change to their view as a result of a new 400kV overhead line on alignment option OP1-NL but these would be at a greater distance and in some cases with nearer views of the existing 400kV overhead line. These receptors include views from residential properties, to the north of the woods on the A1071 and east of Claremont Cottages, and Hintlesham Hall Hotel. The visual effect on the properties Park Farm Cottages, Kingsfield and Park Farm on the A1071 depends on whether a northern or southern alignment is considered for the new 400kV overhead line as it approaches Hintlesham Woods. A northern alignment would bring a new 400kV overhead line closer to these properties as opposed to a southern alignment. The deviation of this alignment option through the woods would be visible at a distance of 0.5km (minimum) and would be visible beyond the existing 400kV overhead line.
- A-76. The OP1-NL options would add new pylons to the view from Hintlesham Hall, but these would be at a greater distance than the existing and would be partly obscured by the woods.
- A-77. To the south and east, there would be views of the new 400kV overhead line crossing the woods from the residential properties to the northern and southern ends of Duke Street (the intervening woodland would obscure the majority of views of this option from the middle part of Duke Street). There would also be views from more distant receptors on Pond Hall Road, such as Wood Farm (0.9km distant). Some of the new pylons would be partially backgrounded and partly screened by the woods.
- A-78. To the west, there would be views of the new 400kV overhead line crossing the woods from the residential properties at Ramsey Farm. These are at a distance of approximately 0.7km with some partial backgrounding and partial screening by the woods.

A-79. Overall these options would result in a lesser magnitude of effect (scale of change) on views compared to Option OP2-NL as the new 400kV overhead line would broadly parallel the existing throughout the vicinity of Hintlesham Woods. However, compared to OP2-NL it would cause a similar scale of change as both deviate from an entirely paralleled route and although OP1-NL options parallel the existing line through the woods there would be particular negative effects on properties at Primrose Farm, Hadleigh Bee Farm and Pheasant House. OP1-NL(a) would result in a greater magnitude of effect (scale of change) on views, compared to option OP1-NL(b), because of an increase in the number of pylons that would be visible outside the woods and the lack of synchronicity of the pylons of the new 400kV line compared to the existing 400kV line.

A-80. A new overhead line on either alignment OP1-NL(a) or OP1-NL(b) would have a moderate negative magnitude of effect (scale of change) on the majority of visual receptors. This scale of change would be experienced by a number of visual receptors of high sensitivity. Views in the vicinity of Hintlesham Woods are of local importance. Overall either option OP1-NL(a) or OP1-NL(b) would result in a moderate negative effect on views in the vicinity of Hintlesham Woods prior to mitigation.

OP1-SL(a) and OP1-SL(b) (southern parallel through the wood with pylons outside or inside)

A-81. The greatest magnitude of effect (scale of change) on views as a result of these options would be from visual receptors that would be closer to the new 400kV overhead line than the existing and would have near views.

A-82. This would include high sensitivity visual receptors using the public rights of way network to the north of Hintlesham Woods, including the public footpath which runs between College Farm and Hintlesham Woods, which the new 400kV line would pass over. The public footpath which runs from the northern edge of Hintlesham Woods toward Duke Street crossing agricultural fields would also have nearer views of the new 400kV line because it would pass over this footpath. Further east, views of the new 400kV overhead line crossing Hintlesham Woods would be partly obscured by intervening woodland. Intervening woodland would also obscure the majority of views from the public footpath which runs around the northern edge of Hintlesham Woods. Users of the public footpath south of Hintlesham Woods would have near views of the new 400kV overhead line as it

would pass over this footpath. There are already near views of the existing 400kV overhead line from parts of all these public footpaths.

- A-83. High sensitivity visual receptors at residential properties that would experience the greatest change to views as a result of this option would include residential properties to the north of the woods at College Farm and College Farm Cottages (approximately 0.1km distant), which would have nearer views of the a new 400kV overhead line to the west than at present and would also have the added impact of views of the new overhead line to the north (either on a northern or southern alignment). This overhead option would also result in the greatest change to views from high sensitivity visual receptors at residential properties on Pond Hall Road to the south of the woods which would have nearer views of a new 400kV overhead line than existing. These receptors include 'Inglenook' (approximately 0.1km distant), 'Bradfields' (approximately 0.25km distant) and Bungalow Farm (approximately 0.35km distant). Views of the new pylons within and to either side of Hintlesham Woods from these locations would include an element of backgrounding, where the lower half of pylons on the near side of the woods would be backgrounded by the woods, and an element of screening, where the lower half of pylons either within or on the far side of the woods would be obscured from view.
- A-84. Other high sensitivity visual receptors at residences whose views would be particularly affected because of proximity to the new 400kV overhead line are the properties at Primrose Farm/Hadleigh Bee Farm and Pheasant House that currently have near views of the existing 400kV overhead line and although the new overhead line would not sit any closer than this, views of the new line would be between approximately 0.1 to 0.2km distant.
- A-85. Other high sensitivity visual receptors would experience a change to their view as a result of a new 400kV overhead line on alignment option OP1-SL, but these would be at a greater distance and in some cases with nearer views of the existing 400kV overhead line. To the north and east these receptors include views from the residential properties on the A1071 to the north of the woods and Hintlesham Hall Hotel.
- A-86. The visual effect on properties on the A1071, to the north of the woods, namely 'The Old Hall', Norman House, Norman's Farm, Claremont Cottages, Park Farm

Cottages, Kingsfield and Park Farm depends on whether a northern or southern alignment is considered for the new 400kV overhead line as it approaches Hintlesham Woods. A northern alignment would bring a new 400kV overhead line closer to these properties as opposed to a southern alignment. The deviation of this alignment option through the woods would be visible at a distance of 0.5km (minimum) and would be visible beyond the existing alignment.

- A-87. This option would result in additional pylons appearing in the view from Hintlesham Hall where the new 400kV overhead line crosses the woods. These new pylons would be approximately 0.1km closer to the hall than the existing, but would still be viewed at a distance of more than 1.0km and would continue to be partly obscured by the woods.
- A-88. To the south and east, there would be views of the new 400kV overhead line crossing the woods from the residential properties to the northern and southern ends of Duke Street (the intervening woodland would obscure the majority of views of this option from the middle part of Duke Street). There would also be views from more distant receptors on Pond Hall Road, such as Wood Farm (0.7km distant). Some of the new pylons would be partially backgrounded and partially screened by the woods.
- A-89. To the west, there would be views of the new 400kV overhead line crossing the woods from the residential properties at Ram's Farm, Ramsey Farm and Hill Farm. These are at a distance of approximately 0.7 to 1.0km with nearer views of the existing 400kV overhead line and some partial backgrounding and some partial screening by the woods.
- A-90. Overall these options would result in a lesser magnitude of effect (scale of change) on views compared to all other options as the new 400kV overhead line would parallel the existing throughout the vicinity of Hintlesham Woods. OP1-SL(a) would result in a greater degree of change to views, compared to option OP1-SL(b), because of an increase in the number of pylons that would be visible outside the woods and the lack of synchronicity.
- A-91. A new overhead line on either alignment OP1-SL(a) or OP1-SL(b) would have a moderate negative magnitude of effect (scale of change) on the majority of visual receptors. This scale of change would be experienced by a number of visual

receptors of high sensitivity. Views in the vicinity of Hintlesham Woods are of local importance. Overall either option OP1-SL(a) or OP1-SL(b) would result in a moderate negative effect on views in the vicinity of Hintlesham Woods prior to mitigation.

OP2 – SL (southern route through wood at shortest crossing)

- A-92. The greatest magnitude of effect (scale of change) to views as a result of this option would be from visual receptors that would be closer to the new 400kV overhead line than the existing and would have near views.
- A-93. This would include high sensitivity visual receptors using the public rights of way network to the north of Hintlesham Woods, including the public footpath which runs between College Farm and Ramsey Wood and over which the new 400kV overhead line would pass. The public footpath which runs from the northern edge of Hintlesham Woods toward Duke Street crossing agricultural fields could also have nearer views of the new 400kV line where it would be crossed by the new line. Further east, views of the new 400kV overhead line crossing Hintlesham Woods would be partly obscured by intervening woodland. Intervening woodland would also obscure the majority of views from the public footpath which runs around the northern edge of Hintlesham Woods. Users of the public footpath south of Hintlesham Woods would have near views of the new 400kV overhead line as it would pass over this footpath. There are already near views of the existing 400kV overhead line from parts of all these public footpaths.
- A-94. The high sensitivity visual receptors at residential properties that would experience the greatest change to views as a result of this option would include residential properties to the north of the woods at College Farm and College Farm Cottages (approximately 0.1km distant), which would have nearer views of the new 400kV overhead line to the west than at present and would also have the added impact of views of the new overhead line to the north (either on a northern or southern alignment). This overhead option would also result in the greatest change to views from properties on Pond Hall Road to the south of the woods which would have nearer views of a new 400kV overhead line than are presently available of the existing 400kV overhead line. These receptors include 'Inglenook' (approximately 0.1km distant), 'Bradfields' (approximately 0.25km distant) and Bungalow Farm (approximately 0.35km distant). Views of the new

pylons to either side of Hintlesham Little Wood from these locations would be partly backgrounded and partly screened by woodland.

- A-95. Other high sensitivity visual receptors at residences whose views would be particularly affected because of proximity to the new 400kV overhead line are properties on Pond Hall Road (to the south of the woods), at Primrose Farm/Hadleigh Bee Farm and Pheasant House. Views of the new line would be close (approximately 0.1 to 0.2km distant) although the new overhead line would not sit any closer than the existing 400kV overhead line which features in views.
- A-96. Other high sensitivity visual receptors would experience a change to their view as a result of a new 400kV overhead line on alignment option OP2-NL but these would be at a greater distance and in some cases with nearer views of the existing 400kV overhead line. To the north and east these receptors include views from the residential properties on the A1071 to the north of the woods and Hintlesham Hall Hotel.
- A-97. The visual effect on residents at properties on the A1071, to the north of the woods, namely 'The Old Hall', Norman House, Norman's Farm, Claremont Cottages, Park Farm Cottages, Kingsfield and Park Farm depends on whether a northern or southern alignment is considered for the new 400kV overhead line as it approaches Hintlesham Woods. A northern alignment would bring a new 400kV overhead line closer to these properties as opposed to a southern alignment. The deviation of this alignment option through the woods would be visible at a distance of 0.5km (minimum) and would be visible beyond the existing 400kV overhead line.
- A-98. This option would result in additional pylons appearing in the view from Hintlesham Hall where the new 400kV overhead line crosses the woods. These new pylons would be approximately 0.3km closer to the Hall than the existing, but would still be viewed at a distance of more than 1.0km and would continue to be partly obscured by the woods.
- A-99. To the south and east, there would be views of the new 400kV overhead line crossing the woods from the residential properties to the northern and southern ends of Duke Street (the intervening woodland would obscure the majority of views of this option from the middle part of Duke Street). There would also be

views from more distant receptors on Pond Hall Road, such as Wood Farm (0.7km distant). Some of the new pylons would be partially backgrounded and partially screened by the woods.

A-100. To the west, there would be views of the new 400kV overhead line crossing the woods from the residential properties at Ram's Farm, Ramsey Farm and Hill Farm. These are at a distance of approximately 0.7 to 1.0km with nearer views of the existing 400kV overhead line and some partial backgrounding and partial screening by the woods.

A-101. Overall this option would result in the greater magnitude of effect (scale of change) to views compared to options OP1-NL and OP1-SL as the new 400kV overhead line would deviate from paralleling the route of the existing, resulting in a greater scale of change. Although this option would result in a greater number of visual receptors with closer views of a new 400kV overhead line compared to option OP2-NL, the greater degree of deviation presented by OP2-NL would result in a greater change to views compared to this option.

A-102. A new overhead line alignment on OP2-SL would have a moderate negative magnitude of effect (scale of change) on the majority of visual receptors. This scale of change would be experienced by a number of visual receptors of high sensitivity. Views in the vicinity of Hintlesham Woods are of local importance. Overall option OP2-SL would result in a moderate negative effect on views in the vicinity of Hintlesham Woods prior to mitigation.

Potential for Mitigation

A-103. In the design of overhead line connections it can be assumed that pylon positions will seek to minimise overall the visual effects. This has been taken into account in the assessment of effects, as part of 'in-built mitigation', rather than as an additional mitigation measure.

A-104. It is not possible to mitigate entirely the visual effects of a new 400kV overhead line. However, with each of the options mitigation by way of additional hedgerow and woodland planting in the vicinity of a new overhead line would be in keeping with the existing landscape character and could assist in lessening potential effects on views in some locations.

A-105. Although there is potential for mitigating the effects of an overhead line connection on views by way of planting, this would be subject to the agreement of landowners and would need to be carefully managed and monitored to ensure successful establishment. Given the lack of certainty that such measures will be feasible in every instance, the assessment of effects on landscape has been judged without these mitigation measures in place.

Summary

A-106. Following mitigation, for all of the overhead line options the magnitude of effect (scale of change) experienced by high sensitivity visual receptors would generally be no greater than moderate negative, due to the presence of the existing overhead line and mature woodland in the landscape. The greatest adverse effects would be experienced by receptors in several properties, public rights of way and views from roads in closest proximity. The majority of the receptors that could be affected have the existing 400kV overhead line in their views, although those properties on the western edge of Ramsey Wood currently view the existing 400kV overhead line at a distance of approximately 0.8km and option OP2-NL could bring a new overhead line much closer. Views in the vicinity of Hintlesham Woods are generally of local importance. Overall all the overhead line options would result in moderate long-term negative effects on views.

A-107. Although all options would have a moderate negative magnitude of effect (scale of change) and overall a moderate negative effect on views, the magnitude of effect would vary slightly between the options. The options in order of magnitude of effect, starting with the lowest are:

- OP1-SL(b) (southern parallel through wood with pylons inside);
- OP1-SL(a) (southern parallel through wood with pylons outside);
- OP1-NL(b) (northern parallel through wood with pylons inside), OP1-NL(a) (northern parallel through wood with pylons outside) and OP2-SL (southern route through wood at shortest crossing) are all broadly equal; and
- OP2-NL (north of Ramsey Wood).

Environment - Cultural Heritage

Baseline Conditions

A-108. There are a number of listed buildings within the vicinity of Hintlesham Woods.

A-109. Specifically, the buildings which require assessment as a result of the potential effects of routeing around Hintlesham Woods are:

- Hintlesham Hall (Grade I) Listed Building, associated Grade II* listed service ranges and non-registered parkland;
- College Farmhouse, a Grade II Listed Building;
- Norman's Farmhouse, a Grade II Listed Building;
- Old Hall House, a Grade II Listed Building; and
- Wood Farmhouse, a Grade II Listed Building.

A-110. Hintlesham Hall is a country house (now hotel) dating originally to the late 16th century. It was altered in the 1680s by Henry Timperley and remodelled circa 1725-40 by Richard Powys. The Hall is listed grade I as a building of very high sensitivity.

A-111. Ordnance Survey mapping of 1883 - 1905 shows the extent of Hintlesham Park, including a tree-lined avenue that starts at the front of the Hall, crossing the park, the Ipswich Road and continuing across fields in a south-west direction, before a break of one field and then a cleared avenue extends the line between Hintlesham Little Wood and Hintlesham Great Wood. This deliberate vista from the front of the house is likely to be contemporary to the 18th century remodelling.

A-112. The primary interest and reason for designation of Hintlesham Hall is the architectural and historical value of the Hall and other buildings associated with the Hall, which form a group. The park is not mentioned in the list description, and is not registered. The former park does, however, illustrate the setting of Hintlesham Hall. The setting includes the former avenue that extends beyond the

limits of the park, and therefore includes Hintlesham Little and Great Woods. This description of the setting of the Hall is based on the former extent of Hintlesham Park, rather than as it presently survives.

A-113. College Farmhouse, Norman's Farmhouse and Wood Farmhouse are all heritage assets of high sensitivity. The listed buildings have well defined curtilages, although as farms, the agricultural landscape surrounding these buildings provides context and setting to these buildings. Old Hall House is known as Hintlesham Old Hall on historic mapping and can therefore be associated with the broader landscape and so again the surrounding agricultural landscape provides context and setting for this listed building.

A-114. There are a number of non-designated heritage assets in the area. These include three finds spots (two relate to medieval material and one to a possibly Bronze Age find) and two areas of historic woodland. One of these historic woodlands is the area of Ramsey Wood, Hintlesham Little Wood and Hintlesham Great Wood, which form a contiguous block of woodland. The area recorded by the HER is larger than the SSSI or Ancient Woodland, and includes the former extent of the wood. However, the boundary used by the SSSI includes all of the extant historic woodland, a boundary that has not significantly altered in extent from the first edition OS dated 1886, although the open avenue through the wood, associated with Hintlesham Hall, has been replanted.

A-115. The block of woodland including Ramsey Wood, Hintlesham Little Wood and Hintlesham Great Wood has no statutory or non-statutory designation. It is recorded as a non-designated heritage asset, and is of low (local) heritage sensitivity. The archaeological interest in the woodland relates to the earthwork remains of wood banks (former demarcation of land holding, and / or differing management regimes within and surrounding the woodland) and the possibility of associated buried remains that can provide dating evidence for the development of the woodland and its use. In historic landscape terms the interest is in the extent and character of the woodland, which provides information about historic land use, development and management.

Assessment of Effects

A-116. For all overhead line options, there is some potential for negative effects on buried archaeology at pylon locations and ancillary work locations (including

access tracks). The magnitude of effect would be low/ moderate on heritage assets of low/ moderate sensitivity. An overall minor negative effect is therefore predicted.

A-117. Negative effects on historic landscape features and buried archaeology will be direct, physical impacts. Negative effects on listed buildings will be indirect, visual impacts relating to the setting of listed buildings.

OP2 – NL (north of Ramsey Wood)

A-118. A new overhead line to the north of the wood would introduce up to 3 new pylons into views to and from Old Hall House. Filtered views of pylons are also likely from Norman's Farmhouse. In both cases the screening provided by mature trees that bound the curtilage to the listed buildings lessens the negative effects. In both cases the magnitude of effect is low. When compared to alternative options, this alignment avoids the loss of any trees within the historic woodland, which avoids a negative effect. The overall scale of effect of the route north of Ramsey Wood in relation to heritage assets is minor negative.

OP1 – NL (a) (northern parallel through wood with pylons outside)

A-119. A new overhead line through the woods would result in loss of trees in a historic woodland. Ramsey Wood is understood to be the oldest part of the historic woodland. Pylons outside of the wood are likely to be visible from listed buildings including Old Hall House and Norman's Farmhouse. As described above, the magnitude of effect on Old Hall House and Norman's Farmhouse is lessened by the presence of existing mature trees that screen these listed buildings. For the heritage assets affected, the magnitude of effect is low. The overall scale of effect of this option in relation to heritage assets is minor negative.

OP1 – NL (b) (northern parallel through wood with pylons inside)

A-120. A new overhead line through the woods with a pylon built in the woods would result in a greater loss of trees in a historic woodland. In this case Ramsey Wood is understood to be the oldest part of the historic woodland. However, pylons within the woods would (when compared to the other options) reduce the visual impact on the setting of listed buildings, specifically Old Hall House, referred to

above. For the heritage asset affected, the magnitude of effect is low. The overall scale of effect of this option in relation to heritage assets is minor negative.

OP1 – SL (a) (southern parallel through wood with pylons outside)

A-121. A new overhead line through the woods would result in the loss of trees in historic woodland. Although Hintlesham Wood is not believed to be as old as Ramsey Wood it is still historic and furthermore associated with the designed landscape surrounding the Grade I listed Hintlesham Hall. Pylons outside of the wood are likely to be visible from listed buildings, which are Old Hall House, Norman's Farmhouse, College Farmhouse and Wood Farmhouse. As described above, the magnitude of effect on Old Hall House and Norman's Farmhouse is lessened by the presence of existing mature trees that screen these listed buildings. College Farmhouse and Wood Farmhouse are not surrounded by mature trees. However, the presence of the existing 400kV overhead line results in a lower magnitude of change on the setting of these heritage assets than if the overhead line was not already present. The effect on the setting of Hintlesham Hall is negligible, given the distance of separation between the Hall and this option. Also, only a small part of the setting of the Hall, which has since changed, is negatively affected. For the heritage assets affected, the magnitude of effect is low (with the exception of the setting of Hintlesham Hall, where the magnitude of effect is negligible). The overall scale of effect of this option in relation to heritage assets is minor negative.

OP1 – SL (b) (southern parallel through wood with pylons inside)

A-122. A new overhead line through the woods with a pylon built in the woods would result in a greater loss of trees in historic woodland. Although Hintlesham Wood is not as old as Ramsey Wood it is still historic and is associated with the designed landscape surrounding the Grade I listed Hintlesham Hall. This alignment crosses the former avenue associated with vistas from the Hall. However, pylons within the wood would (when compared to the other options) reduce the visual impact on the setting of listed buildings, specifically Old Hall House, Norman's Farmhouse and College Farmhouse. The effect on the setting of Hintlesham Hall is negligible, given the distance of separation from the Hall and that only a small and changed part of the setting is negatively affected. For the other heritage assets affected, the magnitude of effect is low. The overall scale of effect of this option in relation to heritage assets is minor negative.

OP2 – SL (southern route through wood at shortest crossing)

A-123. A new overhead line through the wood would result in the loss of trees in historic woodland. Although Hintlesham Wood is not as old as Ramsey Wood it is still historic and furthermore associated with the designed landscape surrounding the Grade I listed Hintlesham Hall. It is also noted that this alignment crosses the former avenue associated with vistas from the Hall. Further, pylons outside of the woods are likely to be visible from Wood Farmhouse listed building. The effect on the setting of Hintlesham Hall is negligible, given the distance of separation from the Hall and that only a small and changed part of the setting is negatively affected. In the case of Wood Farmhouse, the presence of the existing 400kV overhead line limits the magnitude of effect of a new 400kV overhead line. For the heritage assets affected, the magnitude of effect is low. The overall scale of effect of this option in relation to heritage assets is minor negative.

Potential for Mitigation

A-124. With each of the options, mitigation in the form of planting in the vicinity of a new overhead line would be in keeping with the existing landscape character and could assist in reducing potential effects on the setting of listed buildings. The ability to implement this mitigation, and effectiveness of it, cannot be guaranteed and it has not been taken into account in assessing the overall effects recorded in the summary.

A-125. Removal of trees in the wood to accommodate the new line could not be mitigated during the lifetime of the line.

A-126. Impacts on buried archaeology are not expected to be significant in relation to an overhead alignment and could be mitigated a programme of archaeological investigation and recording.

Summary

A-127. All of the overhead line options would have minor negative effects on heritage assets. It may be possible to further reduce the effects on the setting of listed buildings most likely to be adversely affected (Norman's Farmhouse, College Farm, Wood Farmhouse and Old Hall House). In the case of the southern alignments, mitigation of effects on the avenue that formerly traversed

Hintlesham Wood (part of the setting of Hintlesham Hall) may not be possible. Similarly the loss of trees within the woodland cannot be mitigated.

A-128. The overall effects are summarised as:

- OP2–NL (north of Ramsey Wood): Negatively affects the setting of two heritage assets of high sensitivity. The affects are indirect and the magnitude of effect is low.
- OP1–NL(a) (northern parallel through wood with pylons outside): Negatively affects the setting of two heritage assets of high sensitivity, and one asset of low sensitivity. The effects on the receptors of high sensitivity are indirect and the magnitude of effect is low. The effect on the receptor of low sensitivity is direct, and the magnitude of effect is low.
- OP1–NL(b) (northern parallel through wood with pylons inside): Negatively affects one heritage asset of low sensitivity. The affect is direct, and the magnitude of effect is low.
- OP1–SL(a) (southern parallel through wood with pylons outside): Negatively affects the setting of four receptors of high sensitivity and one of very high sensitivity, and one receptor of low sensitivity. The effects in relation to the receptors of high and very high sensitivity are indirect and the magnitude of effect is low/ negligible. The effect in relation to the receptor of low sensitivity is direct, and the magnitude of effect is low.
- OP1–SL(b) (southern parallel through wood with pylons inside): Negatively affects the setting of one receptor of very high sensitivity and one of low sensitivity. The effect in relation to former is indirect and the magnitude of effect is negligible. The effect in relation to the latter is direct and the magnitude of effect is low.
- OP2–SL (southern route through wood at shortest crossing): Negatively affects the setting of one receptor of high sensitivity and one of very high sensitivity, and one of low sensitivity. The effect in relation to the receptors of high and very high sensitivity is indirect and the magnitude of

effect is low/ negligible. The effect in relation to the receptor of low sensitivity is direct and the magnitude of effect is low.

A-129. Although all options would have a minor negative magnitude of effect (scale of change) and overall a minor negative effect on cultural heritage, the magnitude of effect would vary slightly between the options. The options in order of magnitude of effect, starting with the lowest are:

- OP2-NL (north of Ramsey Wood);
- OP1-NL(b) (northern parallel through wood with pylons inside);
- OP1-SL(b) (southern parallel through wood with pylons inside);
- OP2-SL (southern route through wood at shortest crossing);
- OP1-NL(a) (northern parallel through wood with pylons outside); and
- OP1-SL(a) (southern parallel through wood with pylons outside).

Environment - Ecology

Baseline Conditions

A-130. Hintlesham Woods is a Site of Special Scientific Interest (SSSI), this is a national wildlife designation¹ and it covers the woodland habitats and breeding bird assemblage. It includes Wolves Wood, Keeble's Grove, Ramsey Wood (and adjoining secondary woodland in the southwest) and Hintlesham Great Wood. The latter two fall within the route corridor and are connected by secondary woodland dating to the 16th and 19th centuries and are otherwise surrounded by arable farmland. The Wolves Wood and Keeble's Grove units of the SSSI are north of the Route Corridor, either side of the A1071.

A-131. The existing 400kV overhead line runs along the west edge of Hintlesham Great Wood and within the secondary woodland adjoining Ramsey Wood. Woodland habitat under the existing overhead line has been removed and the land is currently managed to prevent re-establishment of woodland habitat. The SSSI is also a Royal Society for the Protection of Birds (RSPB) Reserve.

A-132. Conservation objectives for the SSSI² include:

- No loss of ancient semi-natural stands.
- At least current area of recent semi-natural stands maintained, although their location may alter.
- No loss of ancient woodland.
- Maintain the area of habitats that are used by the breeding bird assemblage within acceptable limits, losses of 5% or more of any relevant habitat type are unacceptable.
- Maintain bird assemblage diversity. If the total score of the breeding bird assemblage falls by the equivalent of 25% or more in points then the assemblage is in unfavourable condition. The species present at

¹ Designated under the Wildlife & Countryside Act 1981 (as amended by the CROW Act 2000)

² Conservation Objectives: Hintlesham Woods, Format Version 1.5 (16th August 2007) English Nature

designation and each monitoring event do not need to be the same as this is a score-based assessment only.

A-133. The most recent condition assessment of the SSSI records the Ramsey Wood and Hintlesham Great Wood units as *Unfavourable Recovering*.

A-134. Some organisations have a duty under Section 28G of the Countryside and Rights of Way (CROW) Act (2000), in exercising their functions (so far as their exercise is likely to affect the special interest of a SSSI), '*to take reasonable steps, consistent with the proper exercise of the authority's functions, to further the conservation and enhancement of the ... features by reason of which the site is of special scientific interest*'. This applies to National Grid as a statutory undertaker and will extend to PINS when coming to a decision on National Grid's future application for the Bramford to Twinstead Tee connection.

A-135. Further protection of Ramsey Wood and Hintlesham Great Wood is provided by virtue of their status as ancient woodland. A range of legislation and policy documents consider the value of such habitats and this is summarised in Natural England's 2011 revision of their Standing Advice for Ancient Woodland³.

A-136. Ancient woodland in England is defined as an area that has been wooded continuously since at least 1600 AD. Continuous cover allows for temporary or permanent open spaces within the woodland, but an area is classed as recent woodland if it has been open habitat (grassland, arable, heath etc.) for a long phase within the last 400 years.

A-137. Although not a special feature of the designation, the woods are likely to support bat populations and may also support dormouse populations. Both are legally protected species.

A-138. Land outside the SSSI designation is predominantly arable agricultural land with associated hedgerows or lines of scattered trees along field boundaries.

³ Standing Advice for Ancient Woodland Ver2, Feb 2011, StAdv/AW/SE23_02_11, Natural England

Assessment of Effects

A-139. The main receptor of potential effects on ecology is the Hintlesham Woods SSSI and the following assessment considers the potential for direct and indirect effects to occur on the SSSI.

OP2 – NL (north of Ramsey Wood)

A-140. Option OP2-NL (north of Ramsey Wood) avoids the SSSI designation and therefore avoids direct loss of SSSI habitats. However, there is still some potential for impacts to occur during the construction phase. Construction traffic and pylon foundation works outside the SSSI boundary could result in soil compaction or root severance that could affect trees within the SSSI resulting in a moderate negative, medium to long-term magnitude of effect.

A-141. Where tree canopies overhang the SSSI boundaries, some tree limb removal may be required to achieve electrical safety clearances resulting in a low negative, long-term magnitude of effect.

A-142. Works activities may cause disturbance to the breeding bird assemblage within the SSSI resulting in a moderate negative, short-term magnitude of effect.

A-143. There are several hedgerows and mature tree lines outside the SSSI boundary but that run between the Ramsey Wood and Keeble's Grove units of the SSSI providing varying degrees of connectivity between the SSSI woodland parcels. Where the overhead line crosses these features some tree removal would likely be required to achieve electrical safety clearances. This tree loss may weaken the connective function of these features resulting in a moderate negative, long-term magnitude of effect.

A-144. There are no impacts predicted to arise on the breeding bird assemblage within the SSSI as a result of a new overhead line outside the northern edge of Ramsey Wood. The woodland birds are predominately passerines which are agile species and therefore are not generally susceptible to collision with overhead lines.

A-145. Immediately surrounding the northern edge of Ramsey Wood is a strip of grassland that is not in active agricultural management. This feature is likely to act as a buffer between activities (such as ploughing, seeding and use of

fertilizers and pesticides) associated with farming the adjacent arable field. This feature may also be used by birds (particularly woodland edge species) breeding within the SSSI. Loss of this feature to construction working areas will likely result in a medium negative, long-term magnitude of effects.

A-146. In combination and without mitigation, these low to moderate magnitudes of effect on the nationally valued SSSI and on habitats that may have functional role in connecting or buffering units of the SSSI, result in an overall moderate negative scale of effect from option OP2-NL (north of Ramsey Wood).

OP1-NL (a) and (b), OP1SL (a) and (b) and OP2 – SL (all options through SSSI)

A-147. The remaining five options all involve crossing the SSSI designation and resultant loss of woodland habitats. Impacts resulting from the remaining options are similar and are summarised in Table A.1 below.

Option	SSSI Ancient Woodland Loss	Other SSSI Woodland Loss	Total SSSI woodland loss
OP1 – NL (a) (northern parallel through wood with pylons outside)	0.29ha	0.81ha	1.10ha
OP1 – NL (b) (northern parallel through wood with pylons inside)	0.34ha	0.89ha	1.23ha
OP1 – SL (a) (southern parallel through wood with pylons outside)	0.98ha	0.31ha	1.29ha
OP1 – SL (b) (southern parallel through wood with pylons inside)	1.07ha	0.35ha	1.42ha
OP2 – SL (southern route through wood at shortest crossing)	0.81ha	0.22ha	1.03ha

Table A.1: Predicted SSSI habitat loss resulting from new overhead line alignments through the SSSI

A-148. In general, alignments north of the existing 400kV line will result in less ancient woodland loss than alignments south of the existing overhead line.

A-149. Total woodland loss for options that cross the woodland is lowest for options OP2-SL and OP1-NL (a). Woodland loss is greatest for option OP1-SL (b) which would also result in the greatest loss of ancient woodland habitat.

A-150. All of the five options that cross the SSSI would fail to meet the SSSI conservation objective of no loss of ancient woodland and therefore result in a high negative, long-term magnitude of effect.

A-151. It is unlikely that the habitat losses resulting from crossing the SSSI would be sufficient to result in failure to meet the conservation objection of preventing the breeding bird assemblage score from dropping by 25% or more. This is because the SSSI assemblage score does not require population sizes of individual species to be maintained, nor does it require the range of species present within the assemblage to remain constant. The creation of additional woodland edge habitats can be beneficial for a number of bird species and so the score would not necessarily be lower or, if lower, would not necessarily be by 25% or more. While impacts will vary between species and some birds may benefit from tree removal (depending on future management of the habitat), on balance this loss of habitat is likely to have a low to moderate negative, long-term magnitude of effect on the breeding bird assemblage.

A-152. There is potential for the construction phase to impact the breeding bird population through destruction of nests, eggs or young birds and also through displacement of breeding territories through disturbance factors. This is likely to result in a moderate negative, medium-term magnitude of effect.

A-153. In addition to the special interest features of the SSSI, woodland loss is likely to impact on roosting bats through loss of roosting habitat (mature and veteran tree removal). Woodland loss may also impact on dormouse populations (if present) through loss of habitat and fragmentation impacts (because this species is less willing to cross open habitats). This is likely to result in a high negative, long-term magnitude of effect.

A-154. In combination and without mitigation, these low to high magnitudes of effect on the nationally valued SSSI will result in an overall major negative scale of effect for all five alignment options that cross Hintlesham Woods SSSI.

Potential for Mitigation

A-155. Impacts of option OP2-NL on SSSI woodland including soil compaction and root severance can be avoided through use of appropriate root protection zones and tree limb removal can be reduced or removed through careful siting of pylons.

A-156. Impacts of option OP2-NL on the breeding bird assemblage can be avoided by timing disturbing works to avoid the most sensitive seasons.

A-157. Fragmentation impacts of option OP2-NL can be reduced by using existing access tracks for works vehicles and by pollarding or coppicing (rather than removing) hedgerow trees that lie between the Ramsey Wood and Keeble's Grove units of the SSSI. Where tree or hedge removal is required, replacement hedge planting would be undertaken on completion of works to mitigate impacts in the long-term. Minimising working periods, timing works to avoid sensitive seasons and using aerial bridges (across short distances) could reduce fragmentation effects during the construction phase.

A-158. Impacts of option OP2-NL on the farmland field margins that could function as a buffer protecting the SSSI would be mitigated either by avoiding the habitat or by replacing the habitat on completion of works.

A-159. The loss of ancient woodland or mature woodland resulting from the five options that cross the SSSI cannot be mitigated. Provision of new habitats or attempts to translocate parts of the woodland features would provide varying levels of compensation for the woodland loss. JNCC states that translocation of habitats is not an acceptable alternative to in situ conservation, with specific reference to both ancient habitats and habitats within SSSIs⁴. Furthermore, new planting outside the permanent easement would be subject to landowner agreement.

A-160. Impacts on the breeding bird assemblage resulting from the construction phase of the five options that cross the SSSI can be reduced by avoiding vegetation

⁴ A Habitats Translocation Policy for Britain, JNCC, 2003

clearance during the bird breeding season and by timing works that may cause disturbance to avoid the most sensitive seasons.

A-161. Impacts on the breeding bird assemblage resulting from woodland required for the five options that cross the SSSI can be reduced by actively managing the land beneath the new overhead line to provide a mix of grassland and scrub habitats suitable for the bird assemblage within the SSSI. This approach would also avoid or substantially reduce the effect of woodland removal on movement of less mobile species including dormouse. It can also provide alternative foraging and shelter habitats for dormouse if present.

A-162. Impacts on roosting bats can be minimised through timing of works to avoid any roost destruction when bats are most vulnerable (when raising young or in hibernation). Effects can also be reduced through provision of alternative roosting habitat, including installation of trees felled within retained woodland as standing dead wood or installation of purpose-built roost habitats.

Summary

A-163. Option OP2-NL (north of Ramsey Wood) avoids substantial impacts on the SSSI Mitigation including wildlife-friendly working methods and planting within the permanent easement (to minimise fragmentation impacts) will reduce impacts from this option to a minor negative effect.

A-164. All five options that cross the SSSI will result in loss of ancient and secondary woodland habitats. Based on the area of ancient woodland affected by each option and incorporating the total area of woodland loss, the following list ranks the options through the SSSI in order of lowest to highest impact:

- OP1-NL(a) (northern parallel through wood with pylons outside);
- OP1-NL(b) (northern parallel through wood with pylons inside);
- OP2-SL (southern route through wood at shortest crossing);
- OP1-SL(a) (southern parallel through wood with pylons outside); and
- OP1-SL(b) (southern parallel through wood with pylons inside).

A-165. Wildlife-friendly working methods and non-woodland habitat creation within the permanent easement will reduce some impacts from habitat fragmentation and loss. However, impacts of ancient and mature woodland loss cannot be mitigated. Despite mitigation all five options through the SSSI will result in a major negative effect.

A-166. Option OP2-NL (north of Ramsey Wood) will have the fewest ecological effects on the SSSI. Major negative effects will remain from all 5 options that cross the SSSI through the permanent loss of mature and ancient woodland habitat. This comprises a resource which cannot be replaced and would be contrary to one of the conservation objectives of the SSSI.

Overall Conclusion

- A-167. There is a clear preference for option OP2-NL with regard to potential effects on ecology. All other options would cause the loss of ancient woodland which would be directly contrary to one of the conservation objectives of the Site of Special Scientific Interest and would result in a major negative effect. It is not possible to mitigate this effect and option OP2-NL is the only option in Corridor 2B which can avoid this effect arising. Very strong concern has been expressed regarding these potential effects on ecology by members of the Biodiversity Thematic Group who provide advice and information to National Grid, with avoidance of effects on the SSSI being regarded as a priority.
- A-168. The loss of ancient woodland contrary is to the conservation objective for the designated site and would not be consistent with the obligation on National Grid 'to take reasonable steps, consistent with the proper exercise of the authority's functions, to further the conservation and enhancement of the ... features by reason of which the site is of special scientific interest' where an otherwise acceptable alternative exists.
- A-169. OP2-NL would have least negative effect with regard to cultural heritage because it would avoid adverse effects on the historic woodland and would not give rise to any greater levels of effects on other cultural heritage assets than would arise from other options. There has been no particularly strong advice regarding the preference for any of the Corridor 2B overhead line options from the Cultural Heritage Thematic Group.
- A-170. OP2-NL is ranked as having the greatest effect on landscape character and also on visual amenity. This is because it would be the greatest departure from the route of the existing overhead line route in Corridor 2B and so would give rise to the largest scale of change of the options considered, although the presence of existing mature woodland would help to lessen the scale of change to landscape and views. Notwithstanding, the effects that would arise are deemed moderate adverse for all of the options.
- A-171. Taking account of the issue of potential effects on landscape, visual amenity, ecology and cultural heritage, the least environmentally constrained overhead line option in Corridor 2B is OP2-NL. This option allows for an overhead line further west, beyond Study Area AB, to be either north or south of the existing 400kV

overhead line and so does not constrain the assessment of options in other study areas.

A-172.OP2-NL has been taken forward as the least environmentally constrained overhead line route in Corridor 2B to be assessed against an overhead line route in Corridor 2A and against an underground cable route in Study Area AB.

APPENDIX B

Calculation of Capital and Lifetime Costs

Appendix B – Comparison of Capital and Lifetime Costs

- B-1 As part of the economic assessment of Strategic Options, National Grid makes comparative assessments of the lifetime costs associated with each technology option that is considered to be feasible.
- B-2 This section provides an overview of the methods that National Grid uses to estimate lifetime costs as part the economic appraisal of a Strategic Option. It also provides a summary of generic capital cost information for transmission system circuits for each technology option included in The Review of Strategic Options Report (June 2011)¹ and an overview of the method that National Grid uses to assess the Net Present Value (“NPV”) of costs that are expected to be incurred during the lifetime of new transmission assets.
- B-3 The IET, PB/CCI Report² presents cost information in size of transmission circuit capacity categories for each circuit design that was considered as part of the independent study. To aid comparison between the cost data presented in the IET PB/CCI Report and that used by National Grid for appraisal of Strategic Options, this Appendix includes cost estimates using National Grid cost data for circuit designs that are equivalent to those considered as part of the independent study. Examples in this Appendix are presented using the category size labels of “Lo”, “Med” and “Hi” used in the IET PB/CCI Report.

Lifetime Costs for Transmission

- B-4 For each technology option appraised within a Strategic Option, National Grid estimates total lifetime costs for the new transmission assets. The total lifetime cost estimate consists of the sum of the estimates of the:
- initial capital cost of developing, procuring, installing and commissioning the new transmission assets, and

¹ <http://www.nationalgrid.com/NR/rdonlyres/F50A1521-D755-4116-A787-E623F77D196E/47714/BTReviewofStrategicOptionsReportJune2011.pdf>

² “Electricity Transmission Costing Study – An Independent Report Endorsed by the Institution of Engineering & Technology” by Parsons Brinckerhoff in association with Cable Consulting International. Page 10 refers to Double circuit capacities.
<http://www.theiet.org/factfiles/transmission-report.cfm>

- net present value ("NPV") of costs that are expected to be incurred during the lifetime of these new transmission assets.

Capital Cost Estimates

- B-5 At the initial appraisal stage, National Grid prepares indicative estimates of the capital costs. These indicative estimates are based on the high level scope of works defined for each Strategic Option in respect of each technology option that is considered to be feasible. As these estimates are prepared before detailed design work has been carried out, National Grid takes account of equivalent assumptions for each option.
- B-6 This section considers the capital costs in two parts, firstly the AC technology costs are discussed, followed by HVDC technologies. Each of these technologies is described in The Review of Strategic Options Report (June 2011) in more detail.

AC Technology Capital Cost Estimates

- B-7 Table B.1 shows the category sizes that are relevant for AC technology circuit designs:

Category	Design	Rating
Lo	Two AC circuits of 1,595 MVA	3,190 MVA
Med	Two AC circuits of 3,190 MVA	6,380 MVA
Hi	Two AC circuits of 3,465 MVA	6,930 MVA

Table B.1 – AC Technology Circuit Designs

- B-8 Table B.2 provides a summary of technology configuration and capital cost information (in financial year 2010/11 prices) for each of the AC technology options that National Grid considers as part of an appraisal of Strategic Options.

IET, PB/CCI Report short- form label	Circuit Ratings by Voltage		Technology Configuration			Capital Costs		
	275kV AC Technologies	400kV AC Technologies	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)
	Total rating for two Circuits (2 x rating of each circuit)	Total rating for two Circuits (2 x rating of each circuit)	No. of Conductors Sets "bundles" on each arm/circuit of a pylon	No. of Cables per phase	No of direct buried GIL tubes per phase	Cost for a "double" two circuit pylon route (Cost per circuit, of a double circuit pylon route)	Cost for a two circuit AC cable route (Cost per circuit, of a two circuit AC cable route)	Cost for a two circuit GIL route (Cost per circuit, of a two circuit GIL route)
Lo	3190MVA (2 x 1595MVA) [2000MVA 2 x 1000MVA for AC Cable only]	3190MVA (2 x 1595MVA)	2 conductor sets per circuit (6 conductors per circuit)	1 Cable per Phase (3 cables per circuit)	1 tube per phase (3 standard GIL tubes per circuit)	£1.5m/km (0.75m/km)	£8.8m/km (£4.4m/km)	£13.5m/km (£6.75m/km)
Med	N/A [3190MVA 2 x 1595MVA for AC Cable only]	6380MVA (2 x 3190MVA)	2 conductor sets per circuit (6 conductors per circuit)	2 Cables per Phase (6 cables per circuit)	1 tube per phase (3 "developing" new large GIL tubes per circuit)	£1.6m/km (£0.8m/km)	£18m/km (£9m/km)	£16.0m/km (£8.0m/km)
Hi	N/A	6930MVA (2 x 3465MVA)	3 conductor sets per circuit (9 conductors per circuit)	3 Cables per Phase (9 cables per circuit)	2 tubes per phase (6 standard GIL tubes per circuit)	£1.8m/km (£0.9m/km)	£22m/km (11m/km)	£23m/km (£11.5m/km)

Table B.2 - AC Technology Configuration and Capital Costs by Rating

Notes: -

- Capital Costs for all technologies are based upon rural/arable land installation with no major obstacles (examples of major obstacles would be Roads, Rivers, Railways etc...)
- All underground AC Cable and GIL technology costs are for direct buried installations only. AC cable and GIL Tunnel installations would have a higher capital installation cost than direct buried rural installations. However, AC cable or GIL replacement costs following the end of conductor life would benefit from re-use of the tunnel infrastructure.
- AC cable installation costs exclude the cost of reactors and mid point switching stations, which are described later in this Appendix.
- 275kV circuits will often require Super-Grid Transformers (SGT) to allow connection into the 400kV system, SGT capital costs are not included above but described later in this Appendix.
- 275kV AC cable installations above 1000MVA, as indicated in the table above, would require 2 cables per phase to be installed to achieve ratings of 1595MVA per circuit at 275kV.
- National Grid is aware of changes in cable sizes which are being developed by cable manufacturers that would potentially allow the use of 2 cables per phase at the "Hi" capacity rating. This would potentially utilise these larger cables, but could facilitate an amendment of cost in the "Hi" capacity rating, currently £22m/km, by a reduction of up to -£2.5m per kilometre. "Med" and "Lo" costs are unaffected by this potential change, "Hi" rating AC Cable costs would be amended when better information becomes available.
- 2011/12 cost for GIL has been raised to £8m from £7.6m for "Med" capacities and to £23m from £22.8m for "Hi" capacities. This is based upon latest information from projects and worldwide manufacturer information.

B-9 Table B.2 provides a summary of the capital costs associated with the key³ components of transmission circuits for each technology option. Additional equipment is required for technology configurations that include new:

- AC underground cable circuits
- Connections between 400 kV and 275 kV parts of the Transmission System.

B-10 The following sections provide an overview of the additional requirements associated with each of these technology options and indicative capital costs of additional equipment.

AC Underground Cable additional equipment

B-11 The Review of Strategic Options Report (June 2011) provides a summary of the electrical characteristics of AC underground cable systems and explains that reactive gain occurs on AC underground cables.

B-12 Table B.3 provides a summary of the typical reactive gain within AC underground cable circuits forming part of the Transmission System.

Category	Voltage	Design	Reactive Gain per circuit
Lo	275 kV	One 2500 mm ² cable per phase	5 Mvar/km
Med	275 kV	Two 2500 mm ² cable per phase	10 Mvar/km
Lo	400 kV	One 2500 mm ² cable per phase	10 Mvar/km
Med	400 kV	Two 2500 mm ² cable per phase	20 Mvar/km
Hi	400 kV	Three 2500 mm ² cable per phase	30 Mvar/km

Table B.3 – Reactive Gain Within AC underground cable circuits

³ Components that are not required for all technology options are presented separately in this Appendix.

- B-13 National Grid is required to ensure that reactive gain on any circuit that forms part of the Transmission System does not exceed 225 Mvar. Above this limit, reactive gain would lead to unacceptable voltages (voltage requirements as defined in the NETS SQSS). In order to manage reactive gain and therefore voltages, reactors are installed on AC underground cable circuits to ensure that reactive gain in total is less than 225 Mvar.
- B-14 For example a 50 km “Med” double circuit would have an overall reactive gain of 1000 Mvar per circuit (2000 Mvar in total for two circuits). The standard shunt reactor size installed at 400 kV on the National Grid System is 200 MVAR. Therefore four 200 Mvar reactors (800 Mvar) need to be installed on each circuit or eight 200 Mvar reactors (1600 Mvar) reactors for the two circuits. Each of these reactors cost £3m adding £24m to an overall cable cost for the example double circuit above.
- B-15 Mid point switching stations may be required as part of a design to meet the reactive compensation requirements for AC underground cable circuit circuit. The need for switching stations is dependent upon cable design, location and requirements which cannot be fully defined without detailed design.
- B-16 For the purposes of economic appraisal of Strategic Options, National Grid includes a cost allowance that reflects typical requirements for switching stations. These allowances shown in table B.4 are:

Category	Switching Station Requirement
Lo	Reactive Switching Station every 60km between substations
Med	Reactive Switching Station every 30km between substations
Hi	Reactive Switching Station every 20km between substations

Table B.4 – Reactive Gain Within AC underground cable circuits

- B-17 More detailed design of AC underground cable systems may require a switching station after a shorter or longer distance than the typical values used by National Grid at the initial appraisal stage.

B-18 Table B.5 below shows the capital cost associated with AC underground cable additional equipment.

Category	Cost per mid point switching station	Cost per 200 Mvar reactor
Lo	£9m	£3m per reactor
Med	£11m	
Hi	£11m	

Table B.5 – Additional costs associated with AC underground cables

Connections between AC 275 kV and 400 kV circuits additional equipment

B-19 Equipment that transform voltages between 275kV and 400kV (a 400/275 kV supergrid transformer or “SGT”) is required for any new 275 kV circuit that connects to a 400 kV part of the Transmission System (and vice versa). The number of supergrid transformers needed is dependent on the capacity of the new circuit. National Grid can estimate the number of STGTs required as part of an indicative scope of works that is used for the initial appraisal of Strategic Options.

B-20 Table B.6 below shows capital cost associated with the SGT requirement SGT.

275kV Equipment	Capital Cost (SGT - including civil engineering work)
400/275kV SGT 1100MVA (excluding switchgear)	£3.9m per SGT

Table B.6 – Additional costs associated with 275kV circuits requiring connection to the 400kV system

High Voltage Direct Current (“HVDC”) Capital Cost Estimates

- B-21 Conventional HVDC technology sizes are not easily translated into the “Lo”, “Med” and “Hi” ratings suggested in the IET, PB/CCI report. Whilst National Grid information for HVDC is presented for each of these categories, there are differences in the circuit capacity levels. As part of an initial appraisal, National Grid’s assessment is based on a standard 2GW converter size. Higher ratings are achievable using multiple circuits.
- B-22 The capital costs of HVDC installations can be much higher than for equivalent AC overhead line transmission routes. Each individual HVDC link, between each converter station, requires its own dedicated set of HVDC cables. HVDC may be more economic than equivalent AC overhead lines where the route length is many hundreds of kilometres.
- B-23 Table B.7 provides a summary of technology configuration and capital cost information (in financial year 2010/11 prices) for each of the HVDC technology options that National Grid considers as part of an appraisal of Strategic Options.

HVDC Converter Type	2 GW Total HVDC Link Converter Costs (Converter Cost at Each End)	2GW DC Cable Pair Cost
Current Source Technology or “Classic” HVDC	£290m HVDC link cost (£145m at each end)	£1.75m/km
Voltage Source Technology HVDC	£300m HVDC link cost (£150m at each end)	£1.75m/km

Table B.7 - HVDC Technology Capital Costs for 2GW installations

Notes: -

- Costs are updated to median of prices published in Appendix 4 of National Grid’s September 2011 Offshore Development Information Statement (ODIS).
http://www.nationalgrid.com/NR/rdonlyres/OCFEBA62-0986-408D-8154-E9E73123D4CA/49326/2011_Appendix_Protected.pdf
- Sometimes a different HVDC capacity (different from the required AC capacity) can be utilised for a project due to the different way HVDC technology can control power flow. The capacity requirements for HVDC circuits will be specified in any option considering HVDC.
- Where a single HVDC Link is proposed as an option, to maintain compliance with the NETS SQSS, there may be a requirement to install an additional “Earth Return” DC cable. For example a 2GW Link must be capable of operating at ½ its capacity i.e. 1GW during maintenance or following a cable fault. To allow this operation the additional cable known as an “Earth Return” must be installed, this increases cable costs by a further 50% to £2.6m/km.
- Capital Costs for HVDC cable installations are based upon subsea or rural/arable land installation with no major obstacles (examples of major obstacles would be Subsea Pipelines, Roads, Rivers, Railways etc...)

B-24 Costs can be adjusted from this table to achieve equivalent circuit ratings where required. For example a “Lo” rating 3190 MW would require two HVDC links of (1.6 GW capacity each), while “Med” and “Hi” rating 6380 MW-6930 MW would require three links with technology stretch of (2.1-2.3 GW each).

B-25 Converter costs at each end can also be adjusted, by Linear scaling, from the cost information in Table B.7, to reflect the size of the HVDC link being appraised. HVDC Cable costs are normally left unaltered, as operating at the higher load does not have a large impact the cable costs per km.

B-26 The capacity of HVDC circuits assessed for this Report is not always exactly equivalent to capacity of AC circuits assessed. However, Table B.8 below illustrates how comparisons may be drawn using scaling methodology outlined above.

IET, PB/CCI Report short-form label	Converter Requirements (Circuit Rating)	Total Cable Costs/km (Cable Cost per link)	CSC “Classic” HVDC Total Converter Capital Cost (Total Converter cost per end)	VSC HVDC Total Converter Capital Cost (Total Converter cost per end)
Lo	2 x 1.6 GW HVDC Links (3190MW)	£3.5m/km (2 x £1.75/km)	£463m (4 x £115.7m [4 converters 2 each end])	£479m (4 x £119.7m [4 converters 2 each end])
Med	3 x 2.1 GW HVDC Links (6380MW)	£5.25m/km (3 x £1.75/km)	£925m (6 x £154.2m [6 converters 3 each end])	£957m (6 x £159.5m [6 converters 3 each end])
Hi	3 x 2.3 GW HVDC Links (6930MW)	£5.25m/km (3 x £1.75/km)	£1005m (6 x £167.5m [6 converters 3 each end])	£1040m (6 x £173.3m [6 converter 3 each end])

Table B.8 – Illustrative example using scaled 2GW HVDC costs to match equivalent AC ratings (only required where HVDC requirements match AC technology circuit capacity requirements)

Indication of Technology end of design life replacement impact

- B-27 It is unusual for a part of the Transmission System to be decommissioned and the site reinstated. In general, assets will be replaced towards the end of the assets design life. Typically, transmission assets will be decommissioned and removed only as part of an upgrade or replacement by different assets.
- B-28 National Grid does not take account of replacement costs in the lifetime cost assessment.
- B-29 National Grid's asset replacement decisions take account of actual asset condition. This may lead to actual life of any technology being longer or shorter than the design life, depending on the environment it is installed in, lifetime loading, equipment family failures among other factors for example.
- B-30 The following provides a high level summary of common replacement requirements applicable to specific technology options.
- a) OHL - Based on the design life of component parts, National Grid assumes an initial design life of around 40 years for overhead line circuits. After the initial 40 year life of an overhead line circuit, substantial pylon replacement works would not normally be required. The cost of Pylons is reflected in the initial indicative capital costs, but the cost of replacement at 40years would not include the pylon cost. As pylons have an 80 year life and can be re-used to carry new replacement conductors. The replacement costs for overhead line circuits at the end of their initial design life are assessed by National Grid as being around 50% of the initial capital cost, through the re-use of pylons.
 - b) AC underground Cable - At the end of their initial design life, circa 40 years, replacement costs for underground cables are estimated to be equal or potentially slightly greater than the initial capital cost. This is because of works being required to excavate and remove old cables prior to installing new cables in their place in some instances.
 - c) GIL - At the end of the initial design life, circa 40 years, estimated replacement costs for underground GIL would be equal to or potentially greater than the initial capital cost. This is because of works being required

to excavate and remove GIL prior to installing new GIL in their place in some instances.

- d) HVDC - It should be noted at the end of the initial design life, circa 40 years, replacement costs for HVDC are significant. This due to the large capital costs for the replacement of converter stations and the cost of replacing underground or subsea DC cables when required.

Net Present Value Cost Estimates

B-31 At the initial appraisal stage, National Grid prepares estimates of the costs that are expected to be incurred during the design lifetime of the new assets. National Grid considers costs associated with:

- Operation and maintenance
- Electrical losses

B-32 For both categories, Net Present Value ("NPV") calculations are carried out using annual cost estimates and a generic percentage discount rate over the design life period associated with the technology option being considered.

B-33 The design life for all technology equipment is outlined in the technology description in The Review of Strategic Options Report (June 2011). The majority of expected design lives are of the order of 40 years, which is used to assess the following NPV cost estimates below.

B-34 In general discount rates used in NPV calculations would be expected to reflect the normal rate of return for the investor. National Grid's current rate of return is 6.25%. However, the Treasury Green Book recommends a rate of 3.5% for the reasons set out below⁴.

⁴ http://www.hm-treasury.gov.uk/d/green_book_complete.pdf Paragraph 5.49 on Page 26 recommends a discount rate of 3.5% calculation for NPV is also shown in the foot note of this page.

NPV calculations are carried out using the following equation over the period of consideration.

$$Dn = 1 / (1 + r)^n$$

"The discount rate is used to convert all costs and benefits to 'present values', so that they can be compared. The recommended discount rate is 3.5%. Calculating the present value of the differences between the streams of costs and benefits provides the net present value (NPV) of an option. The NPV is the primary criterion for deciding whether government action can be justified."

- B-35 National Grid considered the impact of using the lower Rate of Return (used by UK Government) on lifetime cost of losses assessments for transmission system investment proposals. Using the rate of 3.5% will discount loss costs, at a lower rate than that of 6.25%. This has the overall effect of increasing the 40 year cost of losses giving a more onerous cost of losses for higher loss technologies.
- B-36 For the appraisal of Strategic Options, National Grid recognises the value of closer alignment of its NPV calculations with the approach set out by government for critical infrastructure projects.

Annual Operations and Maintenance cost

- B-37 The maintenance costs associated with each technology vary significantly depending upon type. Some electrical equipment is maintained regularly to ensure system performance is maintained. More complex equipment like HVDC converters have a significantly higher cost associated with them, due to their high maintenance requirements for replacement parts. Table B.9 shows the cost of maintenance for each technology, which unlike capital and losses is not dependant on capacity.

	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	High Voltage Direct Current (HVDC)
Circuit Annual maintenance cost per two circuit km (AC)	£1,980/km	£4,200/km	£2,000/km	£100/km Subsea Cables
(Annual cost per circuit Km [AC])	(£999/km)	(£2100/km)	(£1,000/km)	
Associated equipment Annual Maintenance cost per item	N/A	£5,000 per reactor £31,000 per switching station	N/A	£968,000 per converter station
Additional costs for 275 kV circuits requiring connection to the 400kV system				
275/400 kV SGT 1100 MVA Annual maintenance cost per SGT	£5,000 per SGT	£5,000 per SGT	£5,000 per SGT	N/A

Table B.9 – Annual maintenance costs by Technology

B-38 As an example, annual maintenance costs for a 40 km circuits would be assessed as:

- For overhead line: $£1980/\text{km} \times 40 = £0.08\text{m}$
- For underground cable: $£4200/\text{km} \times 40 + (6 \times £5000) = £0.2\text{m}$
- For Gas Insulated line: $£2000/\text{km} \times 40 = £0.08\text{m}$
- For CSC HVDC (3 x 2.1 GW): $(3 \times £100 \times 40) + (6 \times £968,000) = £5.82\text{m}$
- For CSC HVDC (3 x 2.1 GW): $(3 \times £100 \times 40) + (6 \times £968,000) = £5.82\text{m}$

Annual Electrical Losses and Cost

B-39 Transmission losses occur in all electrical equipment and are related to the operation and design of the equipment. The main losses within a transmission system come from heating losses associated with the resistance of the electrical circuits, often referred to as I^2R losses (the electrical current flowing through the circuit, squared, multiplied by the resistance). As the load (the amount of power each circuit is carrying) increases, the current in the circuit is larger.

- B-40 The average load of a transmission circuit which is incorporated into the transmission system is estimated to be 34% (known as a circuit average utilisation). This figure is calculated from the analysis of the load on each circuit forming part of National Grid's transmission system over the course of a year. This takes account of varying generation and demand conditions and is an appropriate assumption for the majority of Strategic Options.
- B-41 This level of circuit utilisation is required because if a fault occurs there needs to be an alternative route to carry power to prevent wide scale loss of electricity for homes, business, towns and cities. Such events would represent a very small part of a circuits 40 year life, but this availability of alternative routes is an essential requirement at all times to provide secure electricity supplies to the nation.
- B-42 In all AC technologies the power losses are calculated directly from the electrical resistance properties of each technology and associated equipment. Table B.10 provides a summary of circuit resistance data for each AC technology and capacity options considered in this Report.

IET, PB/CCI Report short-form label	AC Overhead Line Conductor Type (complete single circuit resistance for conductor set)	AC Underground Cable Type (complete single circuit resistance for conductor set)	AC Gas Insulated Line (GIL) Type (complete single circuit resistance for conductor set)
Lo	2 x 570 mm ² (0.025 Ω/km)	1 x 2500 mm ² (0.013 Ω/km)	Single Tube per phase (0.0086 Ω/km)
Med	2 x 850 mm ² (0.0184 Ω/km)	2 x 2500 mm ² (0.0065 Ω/km)	Single Tube per phase (0.0086 Ω/km)
Hi	3 x 700 mm ² (0.014 Ω/km)	2 x 2500 mm ² (0.0043 Ω/km)	Two tubes per phase (0.0065 Ω/km)
Losses per 200Mvar Reactor required for AC underground cables			
Reactor Losses	N/A	0.4MW per reactor	N/A
Additional losses for 275kV circuits requiring connection to the 400 kV system			
275 kV options only 275/400 kV SGT losses	0.2576 Ω (plus 83 kW of iron losses) per SGT	0.2576 Ω (plus 83 kW of iron losses) per SGT	0.2576 Ω (plus 83 kW of iron losses) per SGT

Table B.10 – AC circuit technologies and associated resistance per circuit.

B-43 The process of converting AC power to DC is not 100% efficient. Power losses occur in all elements of the converter station: the valves, transformers, reactive compensation/filtering and auxiliary plant. Manufacturers typically represent these losses in the form of an overall percentage. Table B.11 below shows the typical percentage losses encountered in the conversion process, ignoring losses in the DC cable circuits themselves.

HVDC Converter Type	2 GW Converter Station losses	2GW DC Cable Pair Losses	2GW Total Link loss
Current Source (CSC) Technology or "Classic" HVDC	0.5% per converter	Ignored	1% per HVDC Link
Voltage Source (VSC) Technology HVDC	1.0% per converter	Ignored	2% per HVDC Link

Table B.11 – HVDC circuit technologies and associated resistance per circuit.

B-44 The example calculation explained in detail below is for "Med" category circuits and has been selected to demonstrate the principles of the mathematics set out in this section. This example does not describe specific options set out within this report.

B-45 The circuit category, for options contained within this report, is set out within each option. The example below demonstrates the mathematics and principles, which is equally applicable to "Lo", "Med" and "Hi" category circuits, over any distance.

B-46 The example calculations (using calculation methodology described later in this Appendix, from paragraph B-51 onwards) of instantaneous losses for each technology option for an example circuit of 40 km "Med" capacity 6380 MVA (two x 3190 MVA).

- Overhead Lines = $(2 \times 3) \times 1565.5 \text{ A}^2 \times (40 \times 0.0184 \text{ } \Omega/\text{km}) = 10.8 \text{ MW}$
- Underground Cable = $(2 \times 3) \times 1565.5 \text{ A}^2 \times (40 \times 0.0065 \text{ } \Omega/\text{km}) + (6 \times 0.4\text{MW}) = 6.2 \text{ MW}$
- Gas Insulated Lines = $(2 \times 3) \times 1565.5 \text{ A}^2 \times (40 \times 0.0086 \text{ } \Omega/\text{km}) = 5.1 \text{ MW}$
- CSC HVDC = $34\% \times 6380 \text{ MW} \times 1\% = 21.7 \text{ MW}$
- VSC HVDC = $34\% \times 6380 \text{ MW} \times 2\% = 43.4 \text{ MW}$

B-47 An annual loss figure can be calculated from the instantaneous loss. National Grid multiplies the instantaneous loss figure by the number of hours in a year and

also by the cost of energy. National Grid uses £60/MWhr which is the cost of energy derived in the Ofgem "project discovery" document⁵.

B-48 The following is a summary of National Grid's example calculations of Annual Losses and Maintenance costs for each technology option for an example circuit of 40 km "Med" capacity 6380 MVA (two x 3190 MVA).

(a) Overhead Line annual loss = $10.8 \text{ MW} \times 24 \times 365 \times \text{£}60/\text{MWhr} = \text{£}5.7\text{m}$.

(b) U-ground Cable annual loss = $6.2 \text{ MW} \times 24 \times 365 \times \text{£}60/\text{MWhr} = \text{£}3.3\text{m}$.

(c) Gas Insulated lines annual loss = $5.1 \text{ MW} \times 24 \times 365 \times \text{£}60/\text{MWhr} = \text{£}2.7\text{m}$

(d) CSC HVDC annual loss = $21.7 \text{ MW} \times 24 \times 365 \times \text{£}60/\text{MWhr} = \text{£}11.4\text{m}$

(e) VSC HVDC annual loss = $43.4 \text{ MW} \times 24 \times 365 \times \text{£}60/\text{MWhr} = \text{£}22.8\text{m}$

Example Lifetime costs and NPV Cost Estimate

B-49 The annual Operation, Maintenance and loss information is assessed against the NPV model at 3.5% over 40 years and added to the capital costs to provide a lifetime cost for each technology.

B-50 Table B.12 shows an example for a "Med" capacity 6380 MVA (2 x 3190 MVA) 400 kV over 40 years.

5

http://www.ofgem.gov.uk/markets/whlmkts/discovery/Documents1/Discovery_Scenarios_ConDoc_FINAL.pdf 2012 figure from figure 3.19 Wholesale Electricity Prices Graph "Dash for Energy" Cost £60/MWhr including marginal cost of carbon.

Example 400 kV "Med" Capacity over 40km	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	CSC High Voltage Direct Current (HVDC)	VSC High Voltage Direct Current (HVDC)
Capital Cost	£64m	£738m	£640m	£1,135m	£1,167m
NPV Loss Cost over 40 years at 3.5% discount rate	£125m	£72m	£58m	£250m	£501m
NPV Loss Cost over 40 years at 3.5% discount rate	£2m	£4m	£2m	£128m	£128m
Lifetime Cost	£191m	£814m	£700m	£1,513m	£1,796m

Table B.12 – Example Lifetime Cost table (rounded to the nearest £m)

Detailed mathematical principles used for AC Loss calculation method (including Examples).

B-51 This section of the Appendix provides a detailed description of the mathematical formulae and principles that National Grid applies when calculating losses on the Transmission System. The calculations use recognised mathematical equations which can be found in power system analysis text books.

B-52 The example calculation explained in detail below is for "Med" category circuits and has been selected to demonstrate the principles of the mathematics set out in this section. This example does not describe specific options set out within this report.

B-53 The circuit category, for options contained within this report, is set out within each option. The example below demonstrates the mathematics and principles, which is equally applicable to "Lo", "Med" and "Hi" category circuits, over any distance.

Example Loss Calculation (1) – 40 km 400 kV "Med" Category Circuits

B-54 The following is an example loss calculation for a 40 km 400 kV "Med" category (capacity of 6,380 MVA made up of two 3,190 MVA circuits).

B-55 Firstly the current flowing in each of the two circuits is calculated from the three phase power equation of $P = \sqrt{3}V_{LL}I_{LL} \cos \theta$. Assuming a unity power factor ($\cos \theta = 1$), the current in each circuit can be calculated using a rearranged form of the three phase power equation of:

(In a star (Y) configuration electrical system $I = I_{LL} = I_{LN}$)

$$I = P/\sqrt{3}V_{LL}$$

Where, P is the circuit utilisation power, which is 34% of circuit rating as set out in Table B.10, which for the each of the two circuits in the "Med" category example is calculated as:

$$P = 34\% \times 3190 \text{ MVA} = 1,084.6 \text{ MVA}$$

And, V_{LL} is the line to line voltage which for this example is 400 kV.

For this example, the average current flowing in each of the two circuits is

$$I = 1,084.6 \times 10^6 / (\sqrt{3} \times 400 \times 10^3) = 1,565.5 \text{ Amps}$$

B-56 The current calculated above will flow in each of the phases of the three phase circuit. Therefore from this value it is possible to calculate the instantaneous loss which occurs at the 34% utilisation loading factor against circuit rating for any AC technology.

B-57 For this "Med" category example, the total resistance for each technology option is calculated (from information in Table B.10) as follows:

$$\text{Overhead Line} = 0.0184\Omega/\text{km} \times 40 \text{ km} = 0.736 \Omega$$

$$\text{Cable Circuit}^6 = 0.0065\Omega/\text{km} \times 40 \text{ km} = 0.26 \Omega$$

$$\text{Gas Insulated Line} = 0.0086\Omega/\text{km} \times 40 \text{ km} = 0.344 \Omega$$

These circuit resistance values are the total resistance seen in each phase of that particular technology taking account the number of conductors needed for each technology option.

B-58 The following is a total instantaneous loss calculation for the underground cable technology option for the "Med" category example:

Losses per phase are calculated using $P=I^2R$

$$1,565.5^2 \times 0.26 = 0.64 \text{ MW}$$

Losses per circuit are calculated using $P=3I^2R$

$$3 \times 1,565.5^2 \times 0.26 = 1.91 \text{ MW}$$

⁶ A 40 km three phase underground cable circuit will also require three reactors to ensure that reactive gain is managed within required limits.

Losses for "Med" category are calculated by multiplying losses per circuit by number of circuits in the category

$$2 \times 1.91 \text{ MW} = 3.8 \text{ MW}$$

B-59 For underground cable circuits, three reactors per circuit are required (six in total for the two circuits in the "Med" category). Each of these reactors has a loss of 0.4 MW. The total instantaneous losses for this "Med" category example with the underground cable technology option are assessed as:

$$3.8 + (6 \times 0.4) = 6.2 \text{ MW}$$

B-60 The same methodology is applied for the other AC technology option types for the "Med" category example considered in this Appendix. The following is a summary of the instantaneous total losses that were assessed for each technology option:

$$\text{Overhead Lines} = (2 \times 3) \times 1,565.5^2 \times 0.736 = 10.8 \text{ MW}$$

$$\text{Cables} = (2 \times 3) \times 1,565.5^2 \times 0.26 + (6 \times 0.4) = 6.2 \text{ MW}$$

$$\text{Gas Insulated Lines} = (2 \times 3) \times 1,565.5^2 \times 0.344 = 5.1 \text{ MW}$$

Example Loss Calculation (2) – 40 km 275 kV "Lo" Category Circuits Connecting to a 400 kV part of the Transmission System.

B-61 The following is an example loss calculation for a 40 km 275 kV "Lo" category (capacity of 3,190 MVA made up of two 1,595 MVA circuits) and includes details of how losses of the supergrid transformer ("SGT") connections to 400 kV circuits are assessed. This example assesses the losses associated with the GIL technology option up to a connection point to the 400 kV system.

The circuit utilisation power (P) which for the each of the two circuits in the "Lo" category example is calculated as:

$$P = 34\% \times 1,595 = 542.3 \text{ MVA}$$

For this example, the average current flowing in each of the two circuits is:

$$I = 542.3 \times 10^6 / (\sqrt{3} \times 275 \times 10^3) = 1,138.5 \text{ Amps}$$

B-62 For this "Lo" category example, the total resistance for the GIL technology option is calculated (from information in Table B.10) as follows:

$$0.0086 \Omega/\text{km} \times 40 \text{ km} = 0.344 \Omega$$

B-63 The following is a total instantaneous loss calculation for the GIL technology option for this "Lo" category example:

Losses per circuit are calculated using $P=3I^2R$

$$3 \times 1138.5 \times 0.344 = 1.35 \text{ MW}$$

Losses for "Lo" category 275 kV circuits are calculated by multiplying losses per circuit by number of circuits in the category

$$2 \times 1.35 \text{ MW} = 2.7 \text{ MW}$$

B-64 SGT losses also need to be included as part of the assessment for this "Lo" category example which includes connection to 400 kV circuits. SGT resistance⁷ is calculated (from information in Table B.10) as 0.2576 Ω .

B-65 The following is a total instantaneous loss calculation for the SGT connection part of this "Lo" category example:

The average current flowing in each of the two SGT 400 kV winding are calculated as:

$$I_{HV} = 542.3 \times 10^6 / (\sqrt{3} \times 400 \times 10^3) = 782.7 \text{ Amps}$$

Losses per SGT are calculated using $P=3I^2R$

$$\text{SGT Loss} = 3 \times 782.7 \times 0.2576 = 0.475 \text{ MW}$$

Iron Losses in each SGT = 84kW

⁷ Resistance value referred to the 400 kV side of the transformer.

Total SGT instantaneous loss (one SGT per GIL circuit) = $(2 \times 0.475) + (2 \times 0.084) = 1.1$ MW

B-66 For this example, the total "Lo" category loss is the sum of the calculated GIL and SGT total loss figures:

"Lo" category loss = $2.7 + 1.1 = 3.8$ MW

FIGURES

Figure 1: Study Areas

Figure 2: Study Area AB – Overhead and Underground Alignment Options

Figure 3: Study Area AB – Corridor 2A Northern Overhead Alignment Option

Figure 4: Study Area AB – Corridor 2A Southern Overhead Alignment Option

Figure 5: Study Area AB – Corridor 2B Northern Overhead Alignment Option

Figure 6: Study Area AB – Corridor 2B Southern Overhead Alignment Option

Figure 7: Study Area C - Overhead and Underground Alignment Options

Figure 8: Study Area D – Overhead and Underground Alignment Options

Figure 9: Study Area E - Overhead and Underground Alignment Options

Figure 10: Study Area F – Overhead and Underground Alignment Options

Figure 11: Study Area G – Overhead and Underground Alignment Options

Figure 12: Interim Alignment

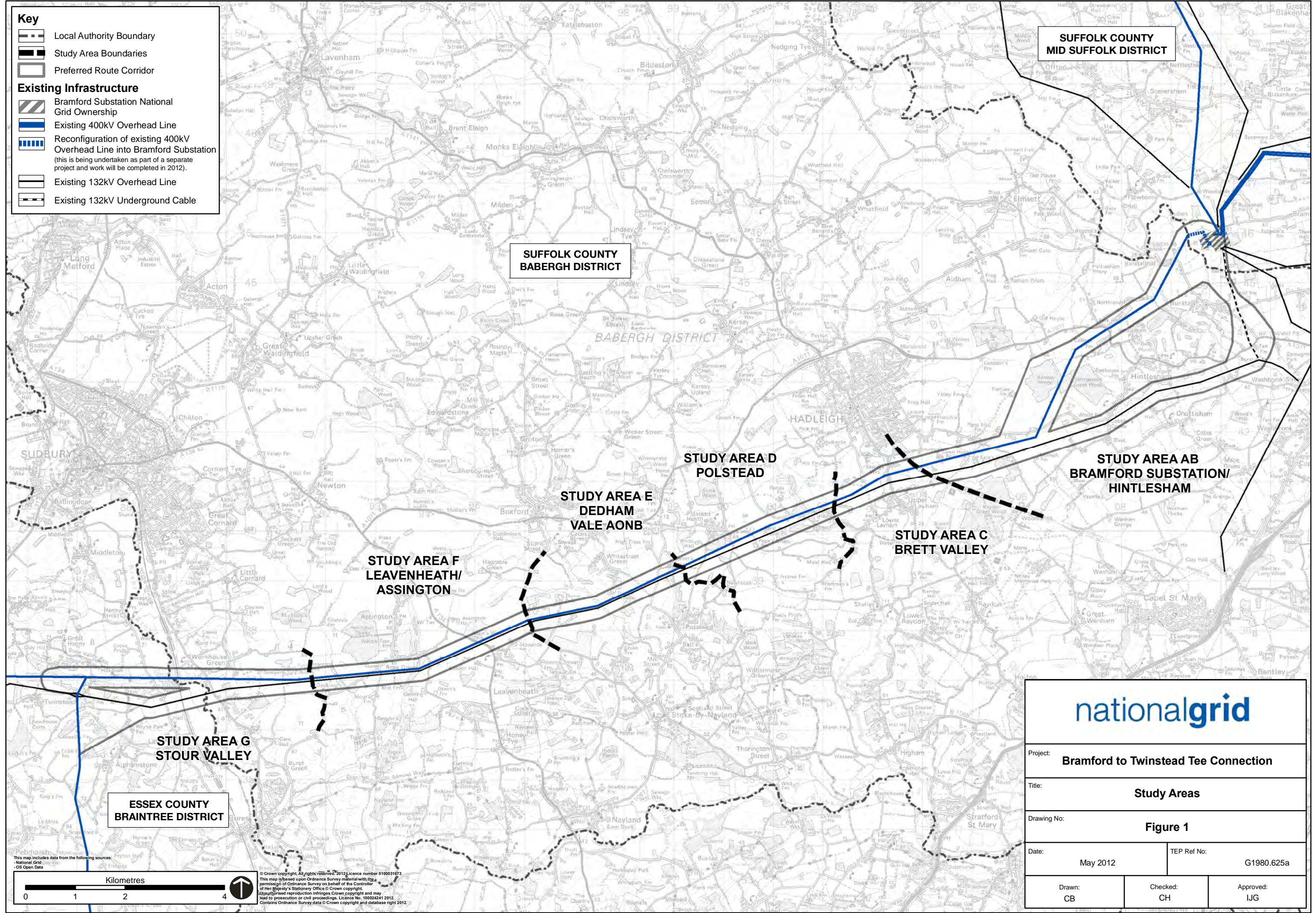
Figure A (to accompany Appendix A): Hintlesham Woods SSSI – Overhead Alignment Options

Key

- Local Authority Boundary
- Study Area Boundaries
- Preferred Route Corridor

Existing Infrastructure

- Bramford Substation National Grid Ownership
- Existing 400kV Overhead Line
- Reconfiguration of existing 400kV Overhead Line into Bramford Substation (this is being undertaken as part of a separate project and work will be completed in 2012).
- Existing 132kV Overhead Line
- Existing 132kV Underground Cable



SUFFOLK COUNTY
MID SUFFOLK DISTRICT

SUFFOLK COUNTY
BABERGH DISTRICT

STUDY AREA AB
BRAMFORD SUBSTATION/
HINTLESHAM

STUDY AREA E
DEDHAM
VALE AONB

STUDY AREA C
BRETT VALLEY

STUDY AREA F
LEAVENHEATH/
ASSINGTON

STUDY AREA G
STOUR VALLEY

ESSEX COUNTY
BRAintree DISTRICT

nationalgrid

Project: **Bramford to Twinstead Tee Connection**

Title: **Study Areas**

Drawing No: **Figure 1**

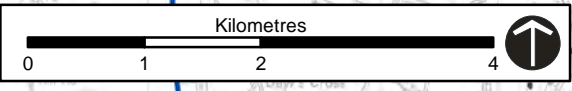
Date: **May 2012**

TEP Ref No: **G1980.625a**

Drawn: **CB**









Checked: **CH**

Approved: **IJG**

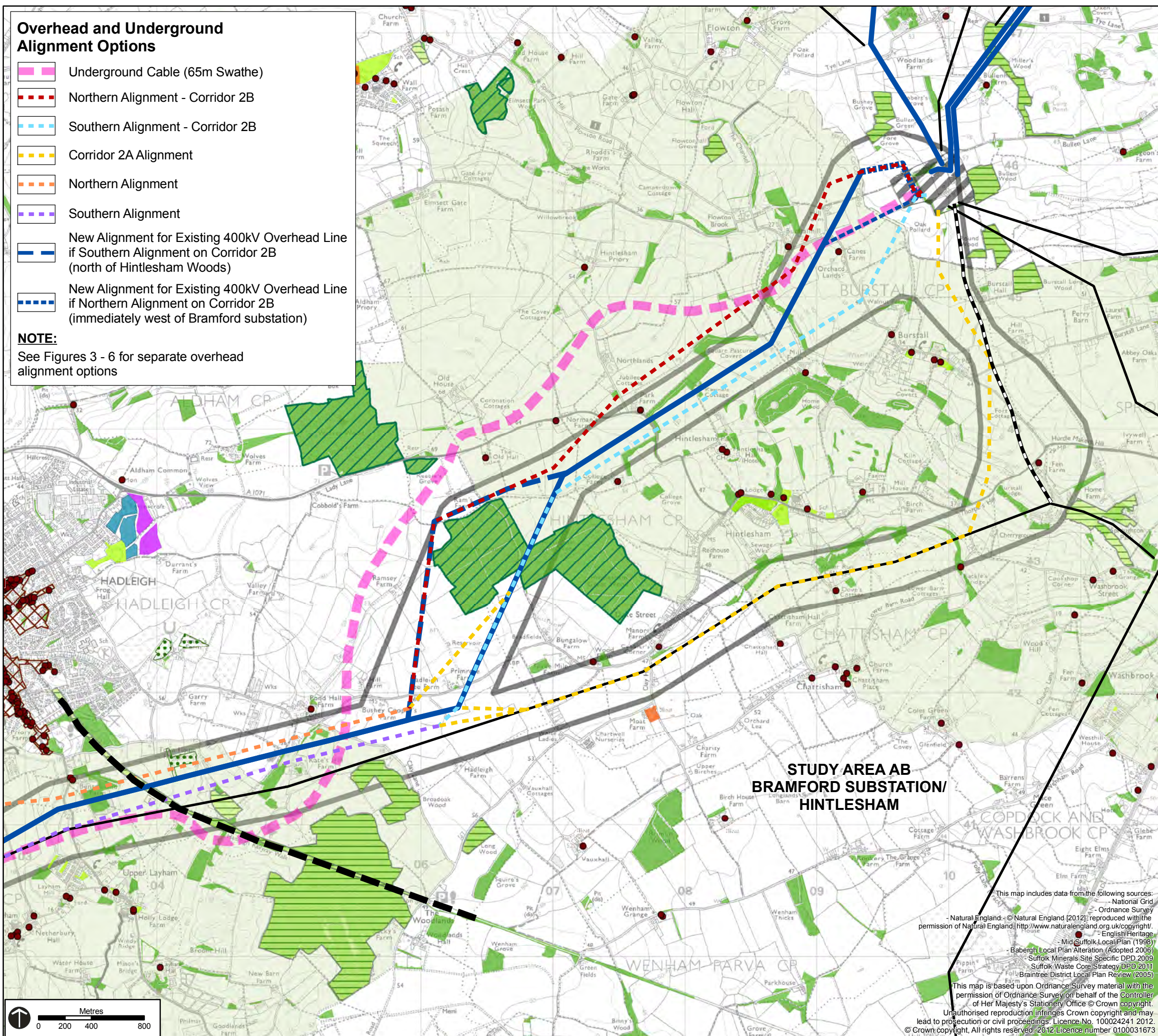









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Overhead and Underground Alignment Options

-  Underground Cable (65m Swathe)
-  Northern Alignment - Corridor 2B
-  Southern Alignment - Corridor 2B
-  Corridor 2A Alignment
-  Northern Alignment
-  Southern Alignment
-  New Alignment for Existing 400kV Overhead Line if Southern Alignment on Corridor 2B (north of Hintlesham Woods)
-  New Alignment for Existing 400kV Overhead Line if Northern Alignment on Corridor 2B (immediately west of Bramford substation)

NOTE:
See Figures 3 - 6 for separate overhead alignment options



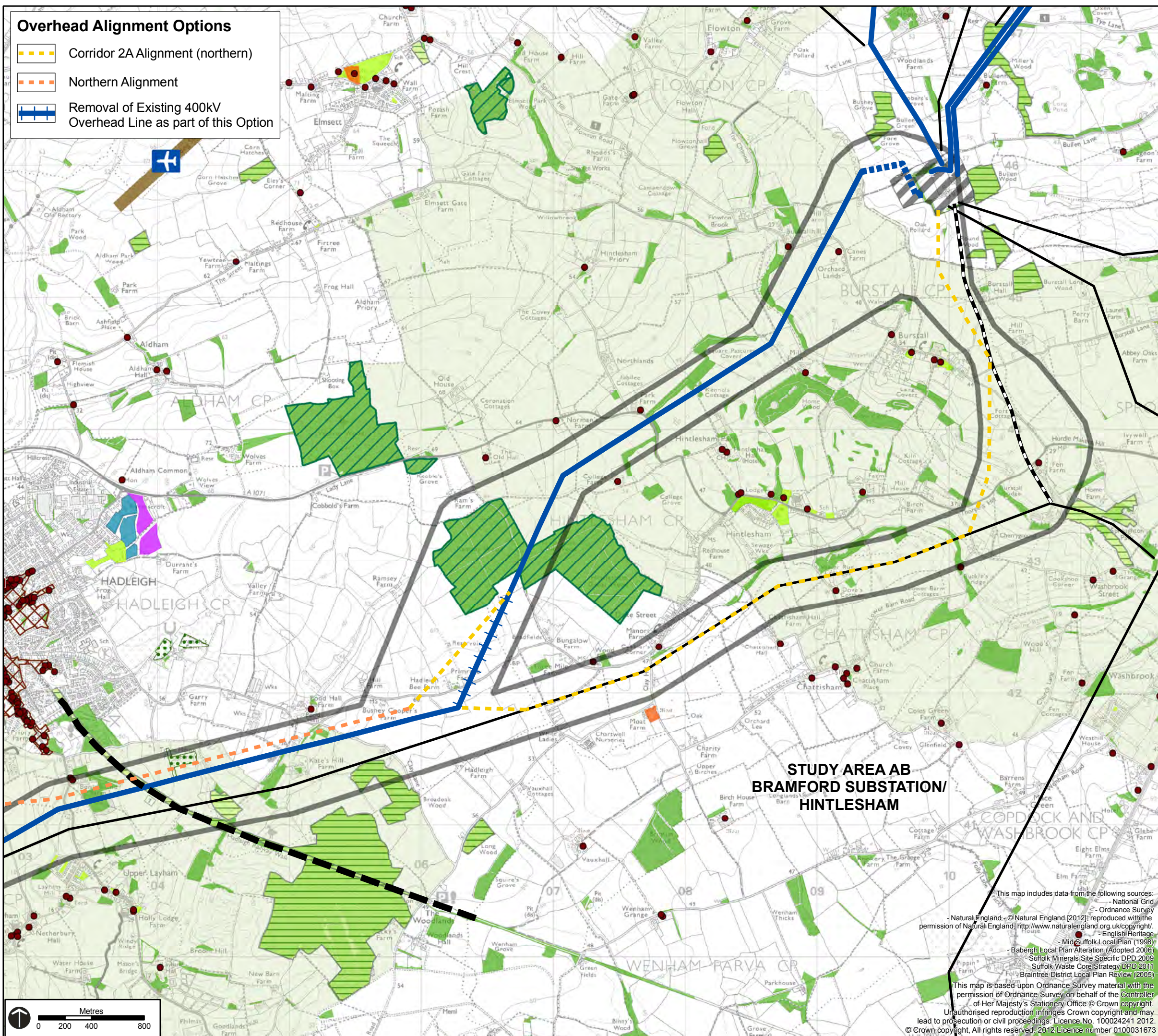
- ### Key
-  Preferred Route Corridor
 -  Study Area Boundary
- ### Existing Infrastructure
-  Bramford Substation National Grid Ownership
 -  Existing 400kV Overhead Line
 -  Reconfiguration of existing 400kV Overhead Line into Bramford Substation (this is being undertaken as part of a separate project and work will be completed in 2012).
 -  Existing 132kV Overhead Line
 -  Existing 132kV Underground Cable
- ### Environmental Constraints
-  Site of Special Scientific Interest
 -  Scheduled Monument
 -  Listed Building (Grade I, II* or II)
 -  Woodland
 -  Local Wildlife Site
 -  Orchard (Derived from available satellite imagery)
- ### Local Authority Local Plan Designations/Allocations
-  Special Landscape Area
 -  Conservation Area
 -  Mixed Use Allocation
 -  Proposed Employment
 -  Public Open Space and/or Open Space for Recreation or Visual Amenity



Project: Bramford to Twinstead Tee Connection		
Title: Study Area AB – Overhead and Underground Alignment Options		
Drawing No: Figure 2		
Date: 01-05-2012	TEP Ref No: G1980.607d	
Drawn: CB	Checked: CH	Approved: CH

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Key

- Preferred Route Corridor
- Study Area Boundary

Existing Infrastructure

- Bramford Substation National Grid Ownership
- Existing 400kV Overhead Line
- Reconfiguration of existing 400kV Overhead Line into Bramford Substation (this is being undertaken as part of a separate project and work will be completed in 2012).
- Existing 132kV Overhead Line
- Existing 132kV Underground Cable

Environmental Constraints

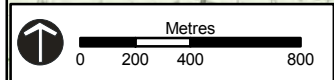
- Site of Special Scientific Interest
- Scheduled Monument
- Listed Building (Grade I, II* or II)
- Woodland
- Local Wildlife Site
- Orchard (Derived from available satellite imagery)
- Airport/Airfield

Local Authority Local Plan Designations/Allocations

- Special Landscape Area
- Conservation Area
- Mixed Use Allocation
- Proposed Employment
- Public Open Space and/or Open Space for Recreation or Visual Amenity

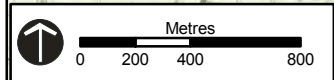
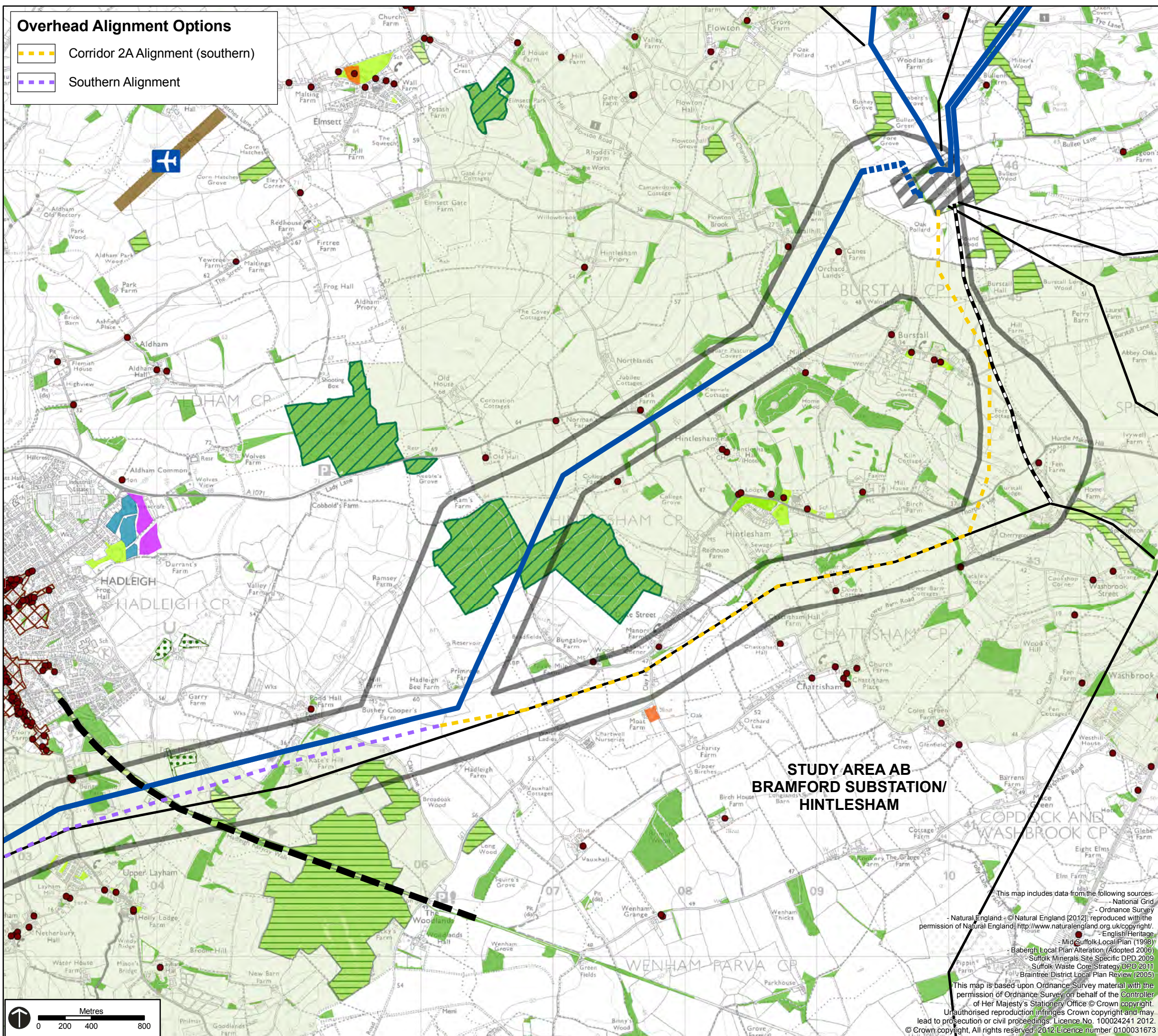


Project: Bramford to Twinstead Tee Connection		
Title: Study Area AB – Corridor 2A Northern Overhead Alignment Option		
Drawing No: Figure 3		
Date: 09-05-2012	TEP Ref No: G1980.626a	
Drawn: CB	Checked: CH	Approved: CH







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









Project: Bramford to Twinstead Tee Connection		
Title: Study Area AB – Corridor 2A Southern Overhead Alignment Option		
Drawing No: Figure 4		
Date: 09-05-2012	TEP Ref No: G1980.627a	
Drawn: CB	Checked: CH	Approved: CH






Overhead Alignment Options

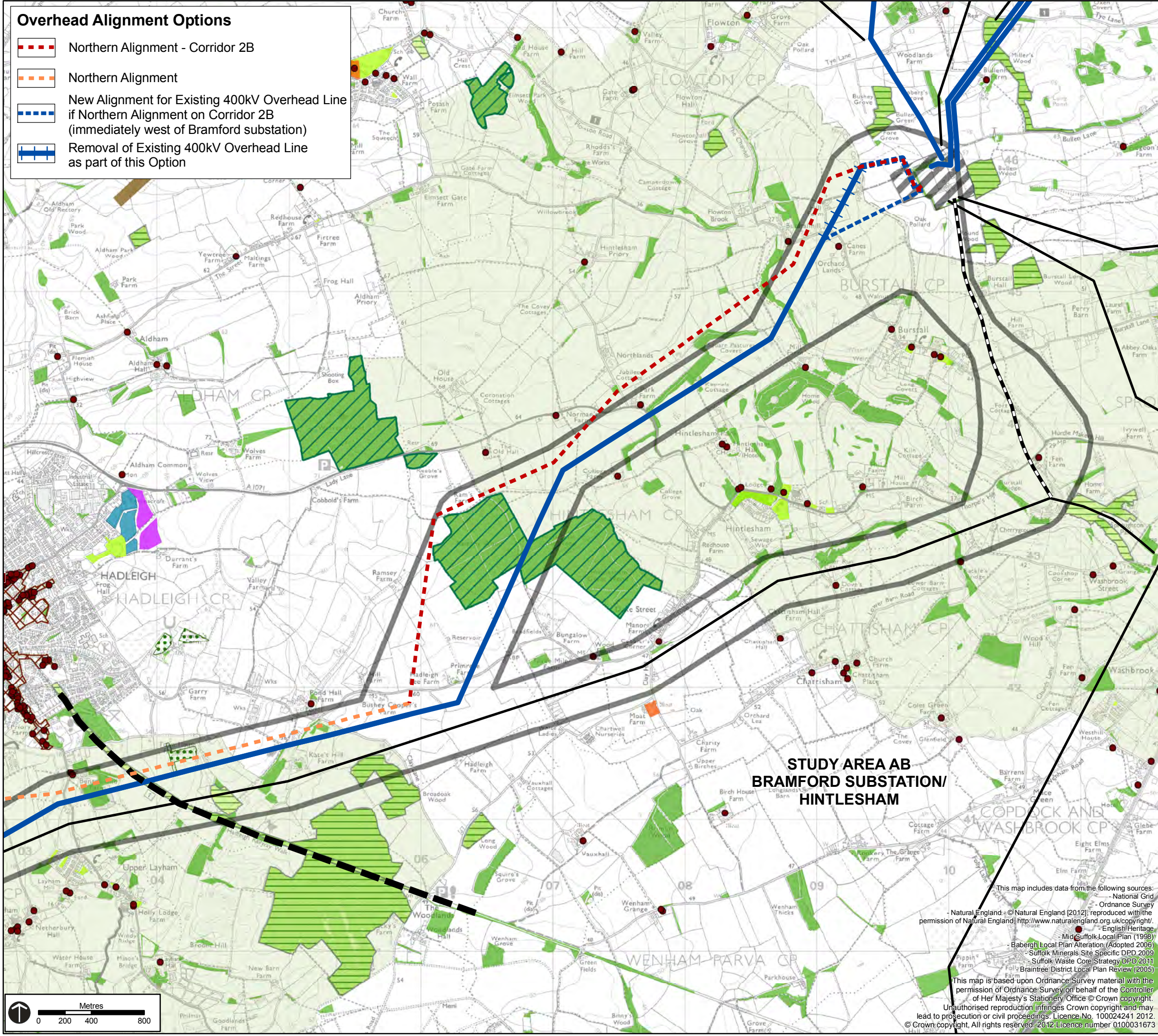
-  Northern Alignment - Corridor 2B
-  Northern Alignment
-  New Alignment for Existing 400kV Overhead Line if Northern Alignment on Corridor 2B (immediately west of Bramford substation)
-  Removal of Existing 400kV Overhead Line as part of this Option

Key

-  Preferred Route Corridor
-  Study Area Boundary
- Existing Infrastructure**
-  Bramford Substation National Grid Ownership
-  Existing 400kV Overhead Line
-  Reconfiguration of existing 400kV Overhead Line into Bramford Substation (this is being undertaken as part of a separate project and work will be completed in 2012).
-  Existing 132kV Overhead Line
-  Existing 132kV Underground Cable
- Environmental Constraints**
-  Site of Special Scientific Interest
-  Scheduled Monument
-  Listed Building (Grade I, II* or II)
-  Woodland
-  Local Wildlife Site
-  Orchard (Derived from available satellite imagery)
-  Airport/Airfield

Local Authority Local Plan Designations/Allocations

-  Special Landscape Area
-  Conservation Area
-  Mixed Use Allocation
-  Proposed Employment
-  Public Open Space and/or Open Space for Recreation or Visual Amenity



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 - Suffolk Waste Core Strategy DPD 2011
 - Braintree District Local Plan Review (2005)

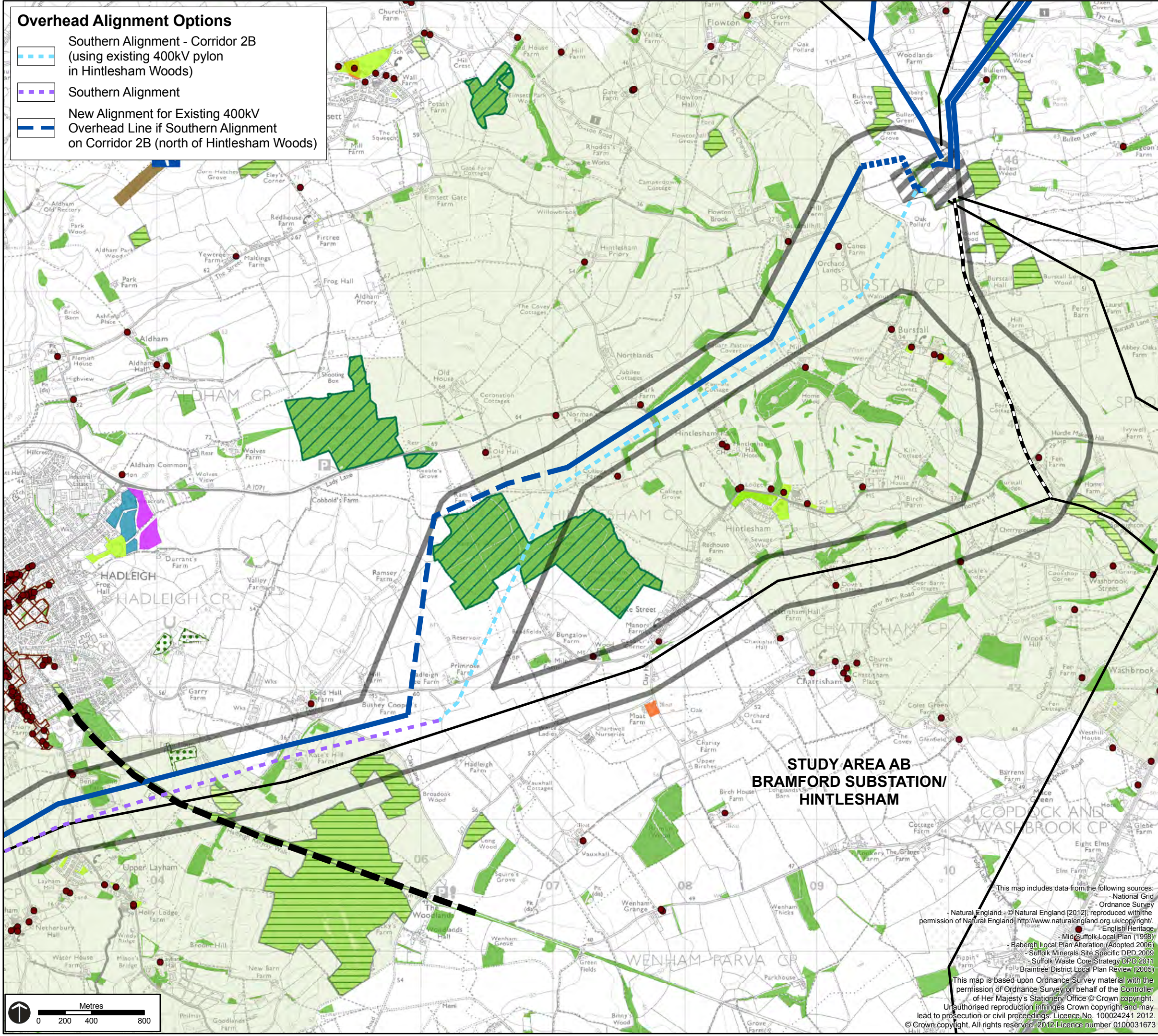
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Project: Bramford to Twinstead Tee Connection		
Title: Study Area AB – Corridor 2B Northern Overhead Alignment Option		
Drawing No: Figure 5		
Date: 09-05-2012	TEP Ref No: G1980.628a	
Drawn: CB	Checked: CH	Approved: CH

- Overhead Alignment Options**
- Southern Alignment - Corridor 2B (using existing 400kV pylon in Hintlesham Woods)
 - Southern Alignment
 - New Alignment for Existing 400kV Overhead Line if Southern Alignment on Corridor 2B (north of Hintlesham Woods)

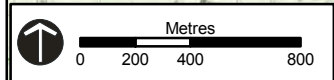
- Key**
- Preferred Route Corridor
 - Study Area Boundary
- Existing Infrastructure**
- Bramford Substation National Grid Ownership
 - Existing 400kV Overhead Line
 - Reconfiguration of existing 400kV Overhead Line into Bramford Substation (this is being undertaken as part of a separate project and work will be completed in 2012).
 - Existing 132kV Overhead Line
 - Existing 132kV Underground Cable
- Environmental Constraints**
- Site of Special Scientific Interest
 - Scheduled Monument
 - Listed Building (Grade I, II* or II)
 - Woodland
 - Local Wildlife Site
 - Orchard (Derived from available satellite imagery)
 - Airport/Airfield
- Local Authority Local Plan Designations/Allocations**
- Special Landscape Area
 - Conservation Area
 - Mixed Use Allocation
 - Proposed Employment
 - Public Open Space and/or Open Space for Recreation or Visual Amenity



**STUDY AREA AB
BRAMFORD SUBSTATION/
HINTLESHAM**

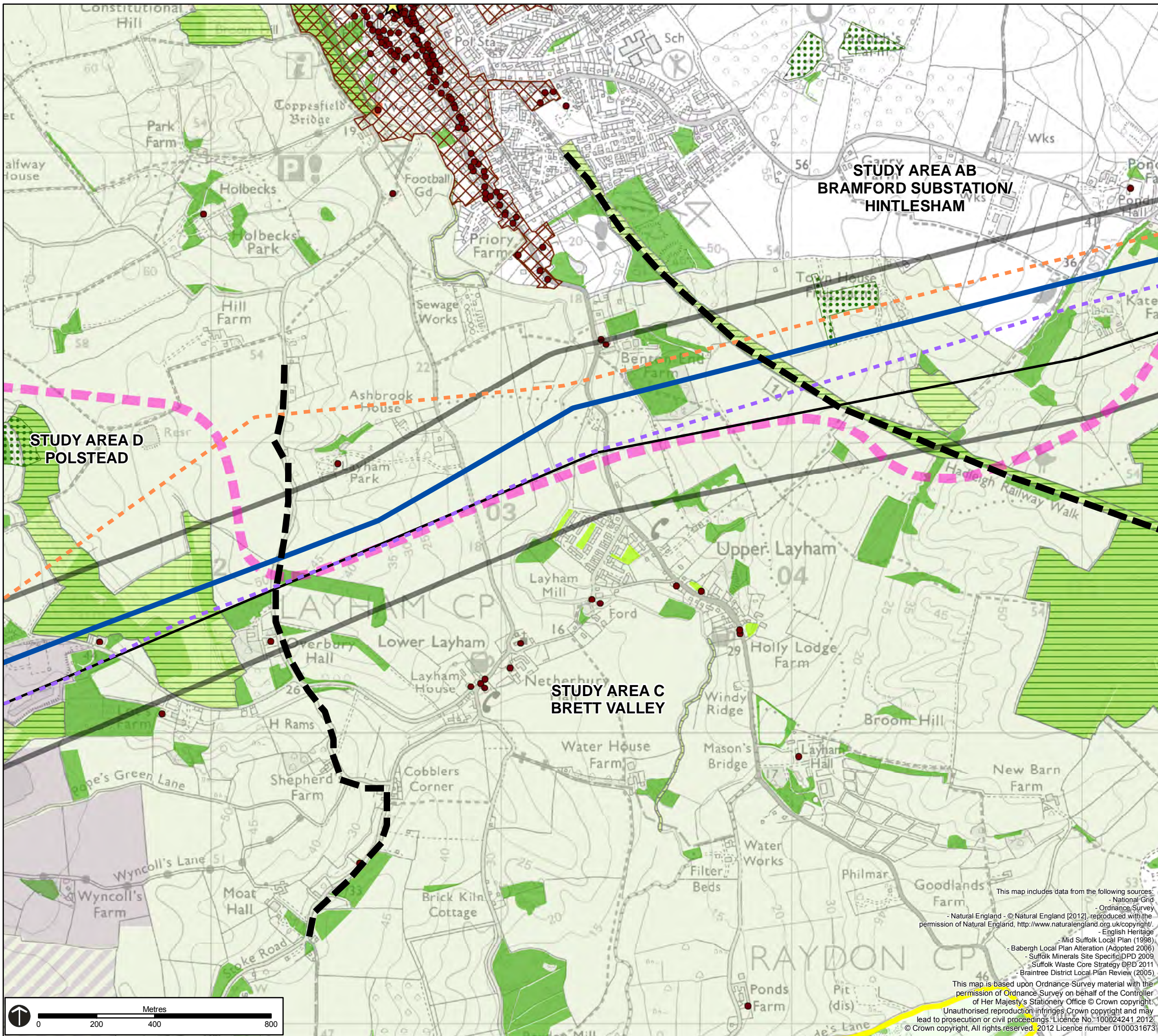
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nationalgrid

Project: Bramford to Twinstead Tee Connection		
Title: Study Area AB – Corridor 2B Southern Overhead Alignment Option		
Drawing No: Figure 6		
Date: 09-05-2012	TEP Ref No: G1980.629a	
Drawn: CB	Checked: CH	Approved: CH



Key

- Preferred Route Corridor
- Study Area Boundary

Existing Infrastructure

- Existing 400kV Overhead Line
- Existing 132kV Overhead Line

Overhead and Underground Alignment Options

- Underground Cable (65m swathe)
- Northern Alignment
- Southern Alignment

Environmental Constraints

- Area of Outstanding Natural Beauty
- Listed Building (Grade I, II* or II)
- Woodland
- Local Wildlife Site
- Orchard (Derived from available satellite imagery)

Local Authority Local Plan Designations/Allocations

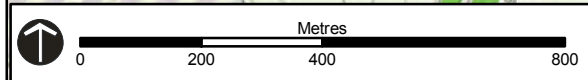
- Special Landscape Area
- Conservation Area
- Public Open Space and/or Open Space for Recreation or Visual Amenity

County Council Mineral Allocations

- Layham Quarry
- Layham Quarry Southern Extension (Proposed Site)

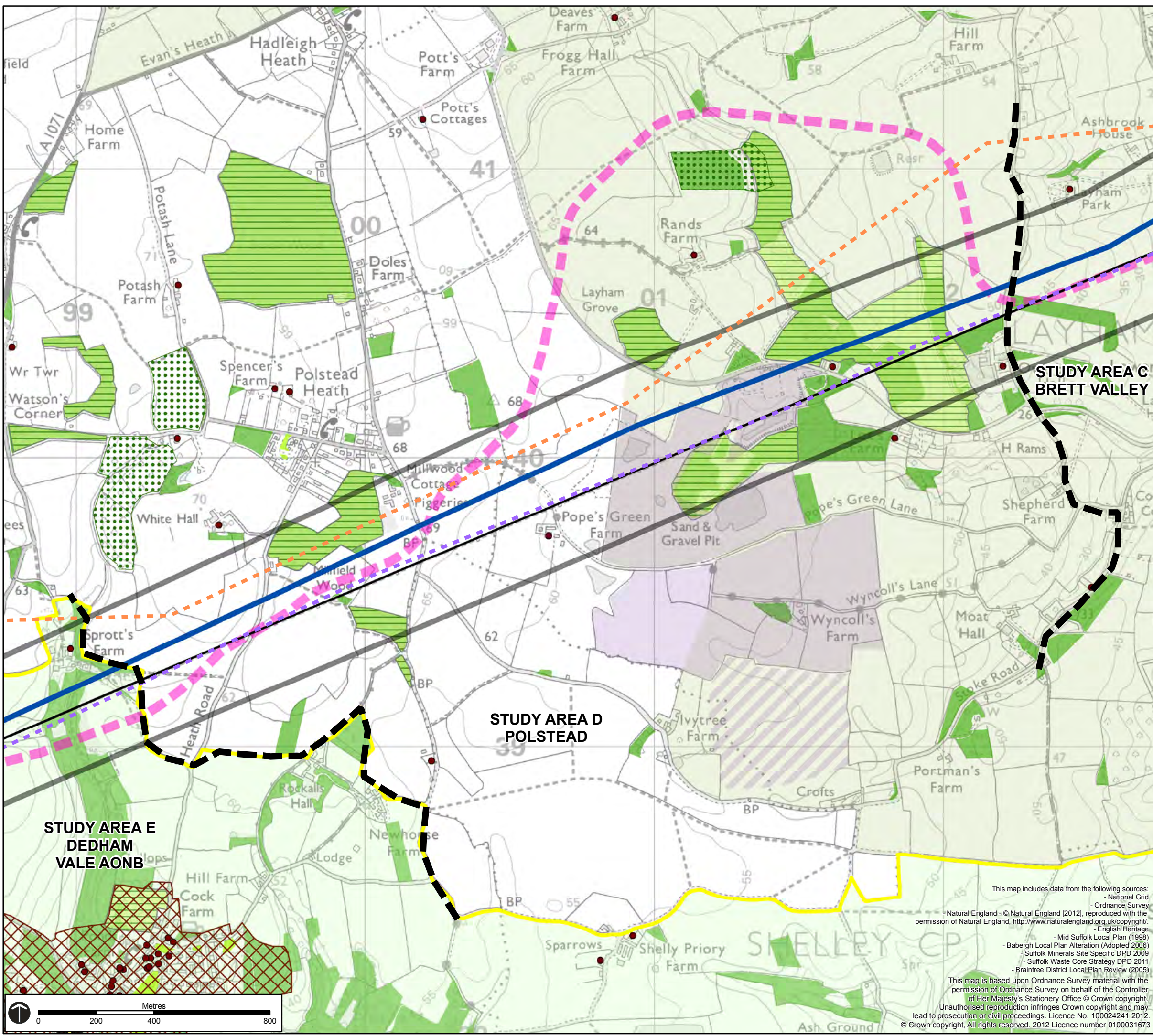


Project: Bramford to Twinstead Tee Connection		
Title: Study Area C - Overhead and Underground Alignment Options		
Drawing No: Figure 7		
Date: 01-05-2012	TEP Ref No: G1980.608b	
Drawn: CB	Checked: CH	Approved: CH



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 - Suffolk Waste Core Strategy DPD 2011
 - Bintree District Local Plan Review (2005)

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Key

- Preferred Route Corridor
- Study Area Boundary

Existing Infrastructure

- Existing 400kV Overhead Line
- Existing 132kV Overhead Line

Overhead and Underground Alignment Options

- Underground Cable (65m swathe)
- Northern Alignment
- Southern Alignment

Environmental Constraints

- Area of Outstanding Natural Beauty
- Listed Building (Grade I, II* or II)
- Woodland
- Local Wildlife Site
- Orchard (Derived from available satellite imagery)

Local Authority Local Plan Designations/Allocations

- Special Landscape Area
- Conservation Area
- Public Open Space and/or Open Space for Recreation or Visual Amenity

County Council Mineral Allocations

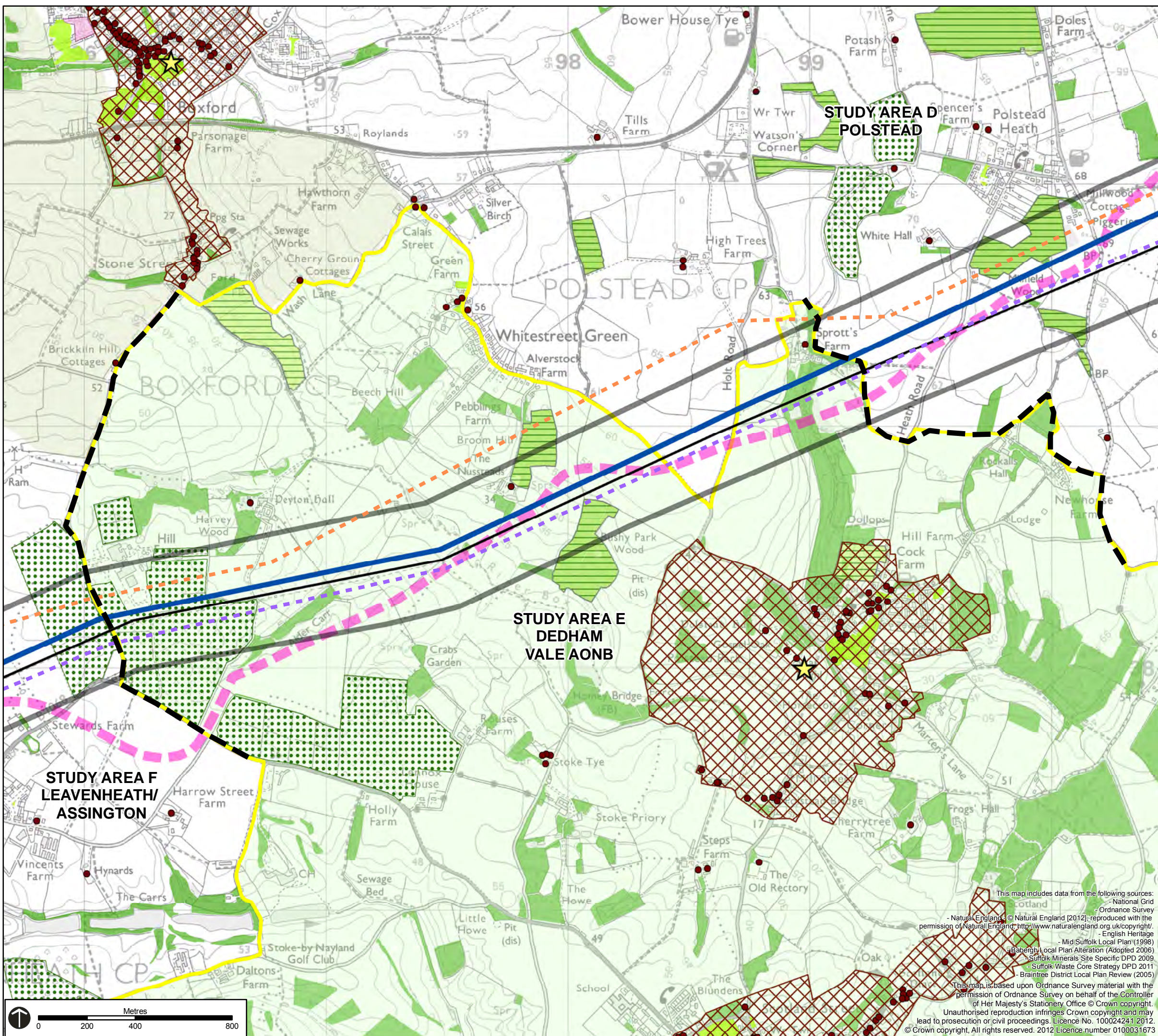
- Layham Quarry
- Layham Quarry Southern Extension (Proposed Site)

Project: Bramford to Twinstead Tee Connection		
Title: Study Area D – Overhead and Underground Alignment Options		
Drawing No: Figure 8		
Date: 01-05-2012	TEP Ref No: G1980.609b	
Drawn: CB	Checked: CH	Approved: CH

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 - Suffolk Waste Core Strategy DPD 2011
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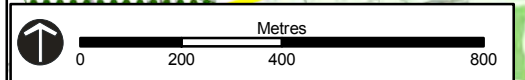




- Key**
- Preferred Route Corridor
 - Study Area Boundary
- Existing Infrastructure**
- Existing 400kV Overhead Line
 - Existing 132kV Overhead Line
- Overhead and Underground Alignment Options**
- Underground Cable (65m swathe)
 - Northern Alignment
 - Southern Alignment
- Environmental Constraints**
- Area of Outstanding Natural Beauty
 - Listed Building (Grade I, II* or II)
 - Woodland
 - Local Wildlife Site
 - Orchard (Derived from available satellite imagery)
- Local Authority Local Plan Designations/Allocations**
- Special Landscape Area
 - Conservation Area
 - Public Open Space and/or Open Space for Recreation or Visual Amenity
 - Housing Allocation

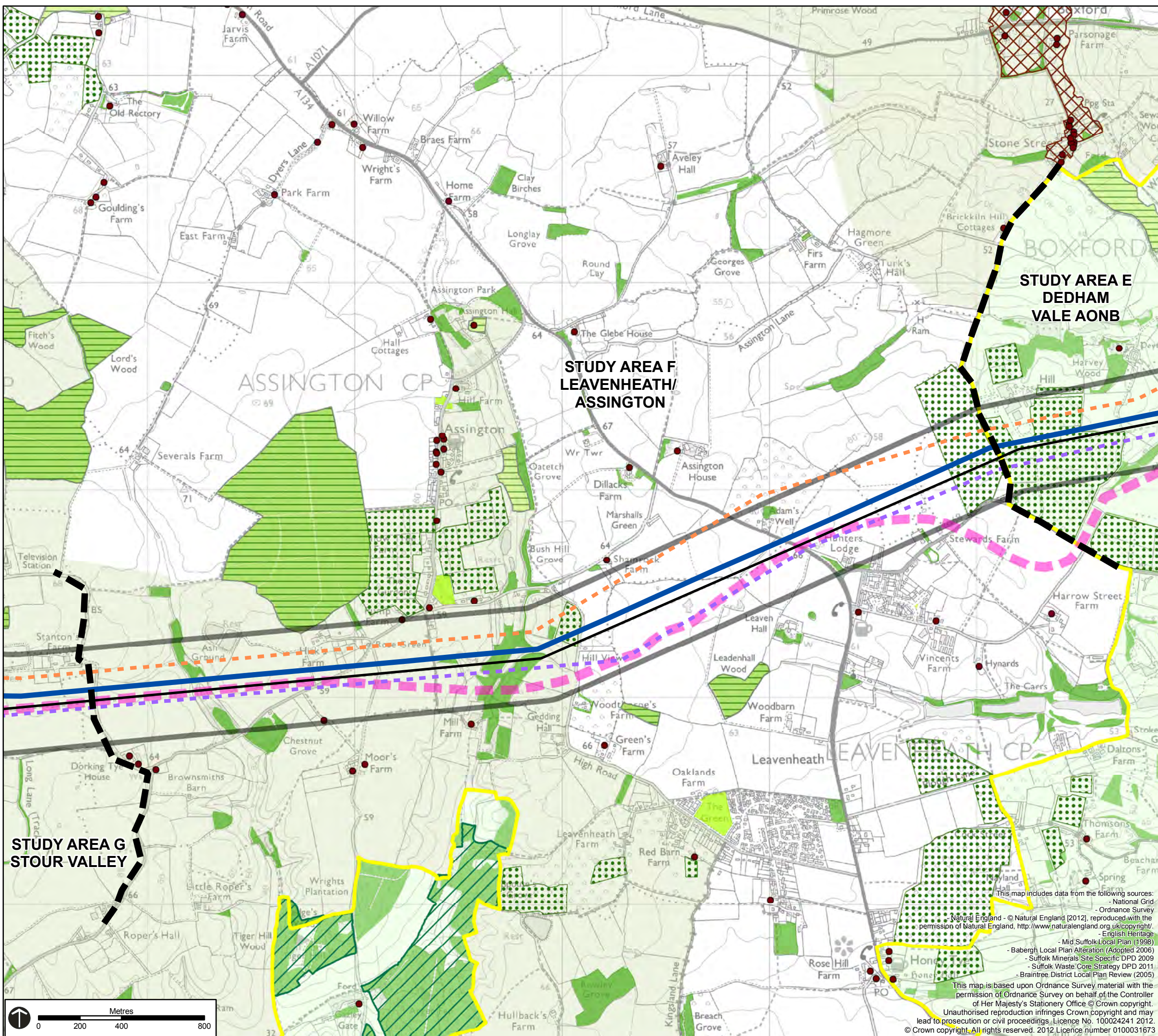


Project: Bramford to Twinstead Tee Connection		
Title: Study Area E - Overhead and Underground Alignment Options		
Drawing No: Figure 9		
Date: 01-05-2012	TEP Ref No: G1980.610b	
Drawn: CB	Checked: CH	Approved: CH



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Key

- Preferred Route Corridor
- Study Area Boundary

Existing Infrastructure

- Existing 400kV Overhead Line
- Existing 132kV Overhead Line

Overhead and Underground Alignment Options

- Underground Cable (65m swathe)
- Northern Alignment
- Southern Alignment

Environmental Constraints

- Area of Outstanding Natural Beauty
- Site of Special Scientific Interest
- Listed Building (Grade I, II* or II)
- Woodland
- Local Wildlife Site
- Orchard (Derived from available satellite imagery)

Local Authority Local Plan Designations/Allocations

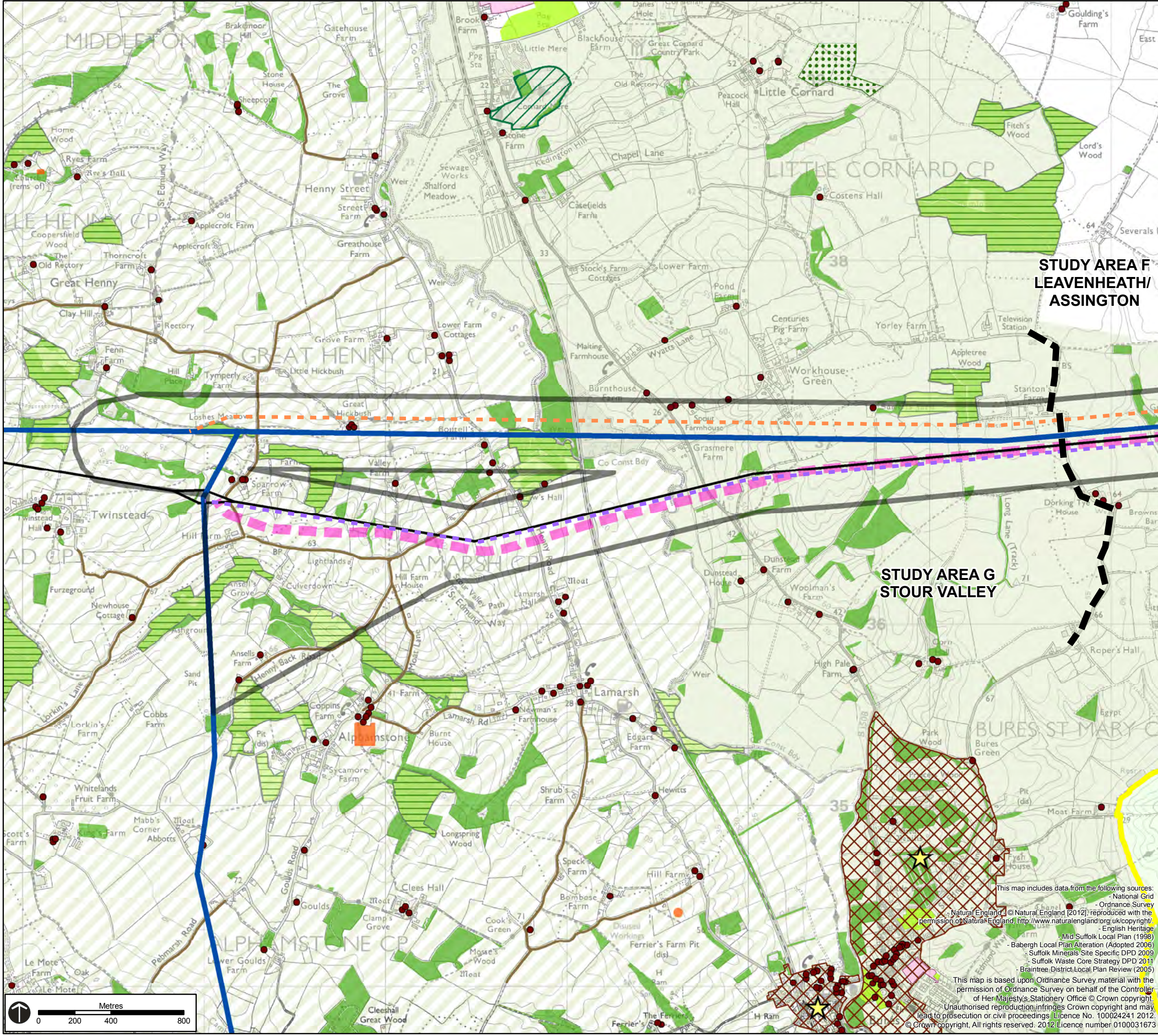
- Special Landscape Area
- Conservation Area
- Public Open Space and/or Open Space for Recreation or Visual Amenity



Project: Bramford to Twinstead Tee Connection		
Title: Study Area F – Overhead and Underground Alignment Options		
Drawing No: Figure 10		
Date: 01-05-2012	TEP Ref No: G1980.611b	
Drawn: CB	Checked: CH	Approved: CH

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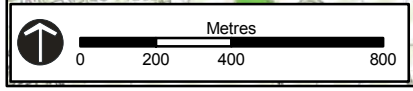
- Key**
- Preferred Route Corridor
 - Study Area Boundary
- Existing Infrastructure**
- Existing 400kV Overhead Line
 - Existing 132kV Overhead Line
- Overhead and Underground Alignment Options**
- Underground Cable (65m swathe)
 - Northern Alignment
 - Southern Alignment
- Environmental Constraints**
- Area of Outstanding Natural Beauty
 - Site of Special Scientific Interest
 - Listed Building (Grade I, II* or II)
 - Woodland
 - Local Wildlife Site
 - Orchard (Derived from available satellite imagery)
 - Scheduled Monument
- Local Authority Local Plan Designations/Allocations**
- Special Landscape Area
 - Former Braintree DC
 - Special Landscape Area (up to Sept. 2011)
 - Conservation Area
 - Public Open Space and/or Open Space for Recreation or Visual Amenity
 - Housing Allocation
 - Protected Lane

**STUDY AREA F
LEAVENHEATH/
ASSINGTON**

**STUDY AREA G
STOUR VALLEY**

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 - Suffolk Waste Core Strategy DPD 2011
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nationalgrid

Project: Bramford to Twinstead Tee Connection		
Title: Study Area G – Overhead and Underground Alignment Options		
Drawing No: Figure 11		
Date: 01-05-2012	TEP Ref No: G1980.612b	
Drawn: CB	Checked: CH	Approved: CH

Key

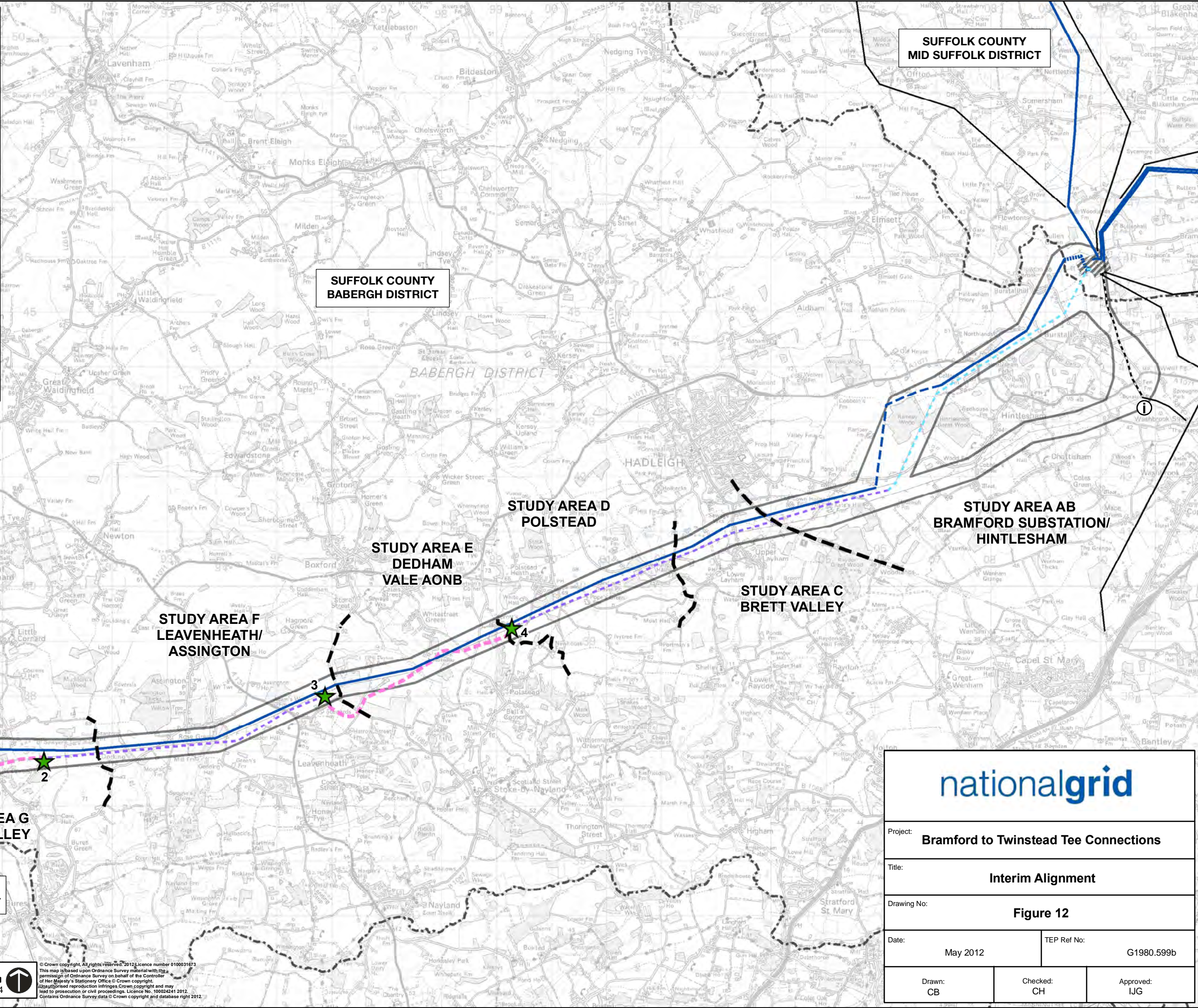
- Local Authority Boundary
- Study Area Boundaries
- Preferred Route Corridor

Existing Infrastructure

- Bramford Substation National Grid Ownership
- Existing 400kV Overhead Line
- Reconfiguration of existing 400kV Overhead Line into Bramford Substation (this is being undertaken as part of a separate project and work will be completed in 2012).
- Existing 132kV Overhead Line (to be retained east of i and west of ii)
- Existing 132kV Underground Cable (to remain in situ)

Interim Alignment and Cable Sealing End Compounds

- Underground Cable (65m swathe)
- Southern Alignment - Corridor 2B (using the existing 400kV pylon in Hintlesham Woods)
- Southern Alignment
- New Alignment for Existing 400kV Overhead Line around Hintlesham Woods
- Cable Sealing End Compound



SUFFOLK COUNTY
MID SUFFOLK DISTRICT

SUFFOLK COUNTY
BABERGH DISTRICT

STUDY AREA AB
BRAMFORD SUBSTATION/
HINTLESHAM

STUDY AREA E
DEDHAM
VALE AONB

STUDY AREA C
BRETT VALLEY

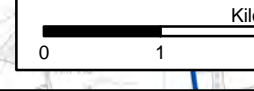
STUDY AREA F
LEAVENHEATH/
ASSINGTON

STUDY AREA G
STOUR VALLEY

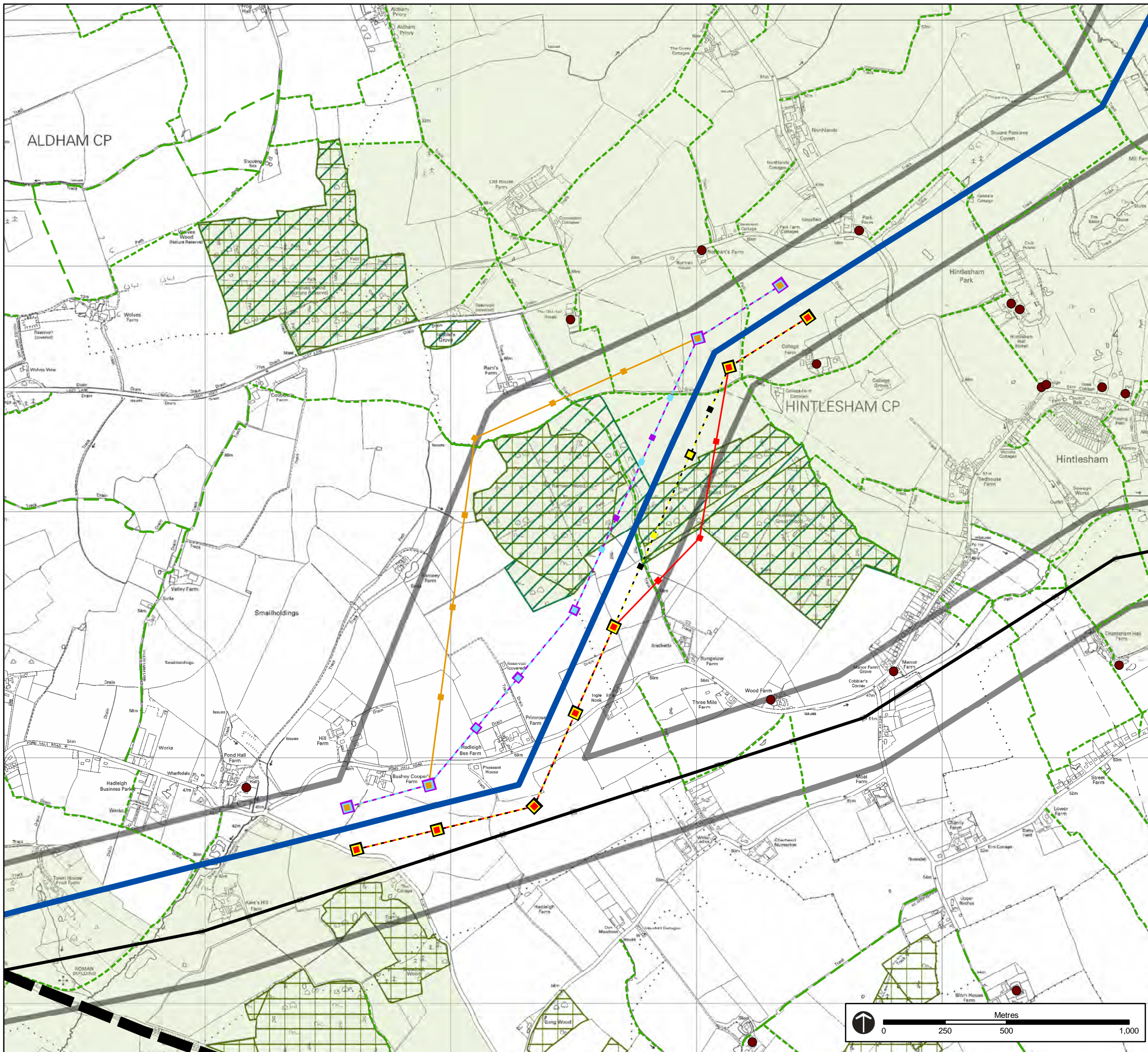
ESSEX COUNTY
BRAintree DISTRICT

Project: Bramford to Twinstead Tee Connections		
Title: Interim Alignment		
Drawing No: Figure 12		
Date: May 2012	TEP Ref No: G1980.599b	
Drawn: CB	Checked: CH	Approved: IJG

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Key

- Preferred Route Corridor
- Study Area Boundary

Existing Infrastructure

- Existing 400kV Overhead Line
- Existing 132kV Overhead Line

Hintlesham Woods Alignment Options

- OP2-NL: North of Ramsey Wood
- OP1-NL(a): Northern Parallel through wood with pylons outside
- OP1-NL(b): Northern parallel through wood with pylon inside
- OP1-SL(a): Southern parallel through wood with pylons outside
- OP1-SL(b): Southern parallel through wood with pylon inside
- OP2-SL: Southern route through wood at shortest crossing

Selected Environmental Constraints

- Site of Special Scientific Interest
- Listed Buildings (Grade I, II* & II)
- Ancient Woodland Inventory

Local Authority Local Plan Designations

- Special Landscape Area

Public Rights of Way

- Footpath
- Bridleway

Note: Pylons indicative only (not to scale)

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Project: Bramford to Twinstead Tee Connection		
Title: Hintlesham Woods SSSI – Overhead Alignment Options		
Drawing No: Figure A		
Date: 27-04-12	TEP Ref No: G1980.603a	
Drawn: CB	Checked: JB	Approved: IJG