

nationalgrid

The power of action.

Bramford to Twinstead 400kV Overhead Line Project

Route Corridor Study for Public Consultation

National Grid
National Grid House,
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

October 2009

PREFACE

I. PURPOSE OF REPORT

- a. This Preface introduces the findings of a Route Corridor Study which considers the characteristics of four broad corridors between Bramford in Suffolk and Twinstead in Essex and assesses their suitability to provide a route for a proposed 400,000 volt overhead electricity transmission line. The promoter, National Grid, is seeking the views of the public, as well as statutory bodies and the local authorities, before developing its detailed proposals.

II. BACKGROUND TO NATIONAL GRID

- a. National Grid owns the high voltage electricity transmission system in England and Wales, and is responsible for its operation across Great Britain. The system operates mainly at 400,000 and 275,000 volts, connecting the electricity generators to substations where the high voltages are transformed to lower voltages, enabling the power to be distributed to homes and businesses by Distribution Network Operators (EdF Energy in East Anglia).
- b. National Grid has a number of statutory obligations. It must offer to connect new power generators to the system. It must develop and maintain an efficient, co-ordinated and economical transmission system, in accordance with adopted standards governing the security and quality of supply. In planning new connections, it must have regard to the desirability of preserving natural beauty and conserving flora and fauna and sites of archaeological, architectural, historic or scientific interest.

III. THE PROJECT

- a. The existing transmission system in East Anglia is adequate to meet current demand. However, East Anglia is an area where more power generation is planned. Within the next decade, National Grid is contractually obliged to provide connections for almost 8 Gigawatts of new generation, including the proposed Sizewell C nuclear power station (3600 Megawatts). In addition to this, a significant amount of potential offshore wind development has been identified in this area to help meet the Government's 2020 renewable energy targets.
- b. The National Grid high-voltage transmission network in the East Anglia region has reached the limit of its capacity, therefore these proposals mean that National Grid must reinforce its system to ensure this additional electricity can flow into the wider network.
- c. There is currently only one overhead transmission line running south from Bramford substation, near Ipswich in Suffolk. This does not have the capacity to take the planned additional electricity generation and a national study has identified a strategic need for a new transmission line between Bramford, in Suffolk, and Twinstead, in Essex, where two existing transmission lines meet.

- d. The new overhead line will allow the electricity from the proposed new generators to flow around East Anglia and into the wider network.
- e. In this context, National Grid has considered a wide range of potential connection options, taking account of existing and planned generation and demand forecasts by the relevant Distribution Network Operator (EdF Energy). It has also concluded that constructing a new connection between Bramford and Twinstead would provide an efficient, co-ordinated and economical solution to the need for additional system capacity, although it recognises that there are environmental sensitivities in the study area, including the Dedham Vale Area of Outstanding Natural Beauty. The Route Corridor Study was commissioned to identify possible route corridors between the connection points and to assess how these performed against National Grid's statutory environmental obligations. A detailed desk based assessment, supplemented with site visits, has identified route corridors which seek to avoid environmental constraints and also 'opportunity corridors' which use the routes of existing overhead lines. The Route Corridor Study has been undertaken by environmental consultants TEP.
- f. Four broad corridors between Bramford and Twinstead have been identified :
 - one parallel to the existing 400kV overhead line;
 - one using the route of the existing 132kV line between Bramford and Twinstead; and
 - two corridors for an entirely new route, to the north of Hadleigh.
- g. It is considered that it would be technically feasible to construct an overhead line in any of these corridors and National Grid has confirmed that it would be willing to implement any of them.
- h. Initial consultations have been held with officers of the potentially effected local authorities and statutory consultees to gain their views on the key issues for each corridor. Corridor 2 would involve utilising the route currently occupied by one of the Distribution Network Operator's 132kV overhead lines. Discussions with the Distribution Network Operator suggest that if this corridor were to be chosen, a new grid supply point substation would be required in the Braintree District Council or Uttlesford District Council area to support the local electricity distribution network. Siting studies to determine the location of this proposed substation are underway and, when a possible location is defined, will be the subject of consultation if National Grid selects Corridor 2 for the connection.
- i. The current consultation is designed to seek the widest possible views on the four route corridors. While National Grid's starting point must be to identify the least environmentally constrained route, it is keen to canvass the views of local residents and groups with an interest in the area. To that end, formal presentations have already been made to the local authorities in whose areas the corridors and potential substation site are situated. A programme of 11 Parish Council briefings is planned and a series of about 20 public exhibitions is to be held across the area between the end of October 2009 and mid-February 2010.

IV. NEXT STEPS

- a. National Grid has not yet determined its preferred corridor and will not do so until the results of the consultation exercise are available in Spring 2010.
- b. Following the selection of a preferred route corridor, detailed consideration will be given to possible alignments for overhead lines, and tower locations, within the preferred corridor. The potential justification for certain sections of transmission line to be undergrounded will also be considered, in accordance with National Grid's policy, when detailed route alignments are being developed. The detailed alignments will be subject to an environmental impact assessment and further public consultation. The refinement of a proposed alignment will emerge as part of this consultation process. The proposal will then be finalised and a submission made to the Infrastructure Planning Commission in Summer 2011, seeking consent for the connection and associated development.
- c. National Grid welcomes comments on this Route Corridor Study, which can be sent :

- by email to : bramford-twinstead@uk.ngrid.com
- by letter to the following freepost address:

Bramford to Twinstead 400kV Overhead Line Project
Consultation Response
Freepost RRKX/EBGK/XXHT
PO Box 5689
London
W1A 4FG

- by telephone to our freephone number:

0800 377 7340 (lines open 7.30am-7.30pm Monday to Friday and
7.30am-1pm Saturday)

Copies of this Route Corridor Study can be purchased
from National Grid at a cost of £30.00 for the printed
document and £15.00 for a CD-Rom from:

TEL: 0800 377 7340

EMAIL: bramford-twinstead@uk.ngrid.com

**BRAMFORD TO TWINSTEAD
ROUTE CORRIDOR STUDY**

13th October 2009

**ROUTE CORRIDOR STUDY
FOR PUBLIC CONSULTATION**

(Report Ref: 1980.011 r2)

Prepared by

**TEP
Genesis Centre
Birchwood Science Park
Warrington, WA3 7BH
Tel: 01925 844004
Fax: 01925 844002
e-mail: tep@tep.uk.com**

for

National Grid Electricity Transmission

Written:	Checked:	Approved:
JB	JB	IJG

CONTENTS	PAGE
1.0 INTRODUCTION	1
2.0 CONSULTATION AND INFORMATION EXCHANGE	5
3.0 DEFINITIONS AND STUDY ASSUMPTIONS	9
4.0 APPROACH AND METHOD	13
5.0 NATIONAL GRID'S ENVIRONMENTAL GUIDANCE	17
6.0 CONSTRAINTS USED IN IDENTIFYING POTENTIAL ROUTE CORRIDORS	23
7.0 CONSTRAINTS WITHIN THE STUDY AREA	31
8.0 ROUTE CORRIDOR OPTIONS	43
9.0 COMPARISON OF CORRIDORS	57

FIGURES

FIGURE 1	Study Area
FIGURE 2	Environmental Constraints
FIGURE 3	Topography
FIGURE 4	Landscape Character
FIGURE 5	Historic Landscape Characterisation
FIGURE 6	Environmental Constraints and Proposed Corridors
FIGURE 7	Potential Grid Supply Locations
FIGURE 8	Photo Sheet 1 Bramford Substation
FIGURE 9	Photo Sheet 2 Twinstead Tee
FIGURE 10	Photo Sheet 3 Existing 132 and 400kV Overhead Lines
FIGURE 11	Photo Sheet 4 Existing 132 and 400kV Overhead Lines
FIGURE 12	Photo Sheet 5 Existing parallel lines between Bramford and Sizewell (L6)
FIGURE 13	Photo Sheet 6 Examples of Parallel Lines with L6 and L12 Tower Designs
FIGURE 14	Photo Sheet 7 Typical Character of Corridor 3
FIGURE 15	Photo Sheet 8 Typical Character of Corridor 4
FIGURE 16	Zone of Visual Influence (Existing Situation)
FIGURE 17	Zone of Visual Influence (Corridor 2)
FIGURE 18	Zone of Visual Influence (Corridor 3)
FIGURE 19	Zone of Visual Influence (Corridor 4)

APPENDICES

APPENDIX 1: NG'S SCHEDULE 9 STATEMENT
APPENDIX 2: THE HOLFORD RULES
APPENDIX 3: NG'S UNDERGROUNDING POLICY

1.0 INTRODUCTION

- 1.1 This Route Corridor Study (RCS) has been produced by TEP–The Environment Partnership (TEP) for National Grid Electricity Transmission plc (National Grid). The study considers potential route corridors which could accommodate a 400kV overhead line between Bramford Substation near Ipswich, Suffolk and a tee point on the existing transmission system at Twinstead.

Background

- 1.2 The purpose of the new connection is to reinforce this part of the 400kV transmission system in response to the need to connect new generation in the East Anglia area.
- 1.3 The section of the transmission system in question consists of a 400kV double circuit overhead line route which runs between Bramford Substation near Ipswich and a tee point at Twinstead from where one circuit continues to Pelham substation, near Bishop’s Stortford, while the other turns south to Braintree Rayleigh.
- 1.4 In March 2009 the Electricity Networks Strategy Group published its report ‘*The Electricity Transmission Network: Our Vision for Its Future*’. This document has been produced in response to requests from the Office of the Gas and Electricity Markets (Ofgem) and Government for transmission companies to identify transmission reinforcements needed to support the achievement of the 2020 renewable targets and ensuring that electricity supply remains secure and affordable. ENSG was invited to provide critical industry-wide input to this work.
- 1.5 ENSG’s report identified a requirement in the event of either offshore wind generation and/or nuclear replanting at Sizewell for a range of reinforcements in the South East region including ‘*a new section of 400kV double circuit overhead line, approximately 27km in length, from Bramford to the existing tee point down to Rayleigh (near Twinstead). This would then create two double circuit routes to the west out of Bramford.*’

Source: http://www.ensg.gov.uk/assets/1696-01-ensg_vision2020.pdf

- 1.6 A new connection between Bramford and Twinstead would allow the lines to be reconfigured in the vicinity of the existing tee at Twinstead so that one double circuit would run between Bramford and Pelham and another would run between Bramford and Rayleigh.

National Grid’s Statutory Duties

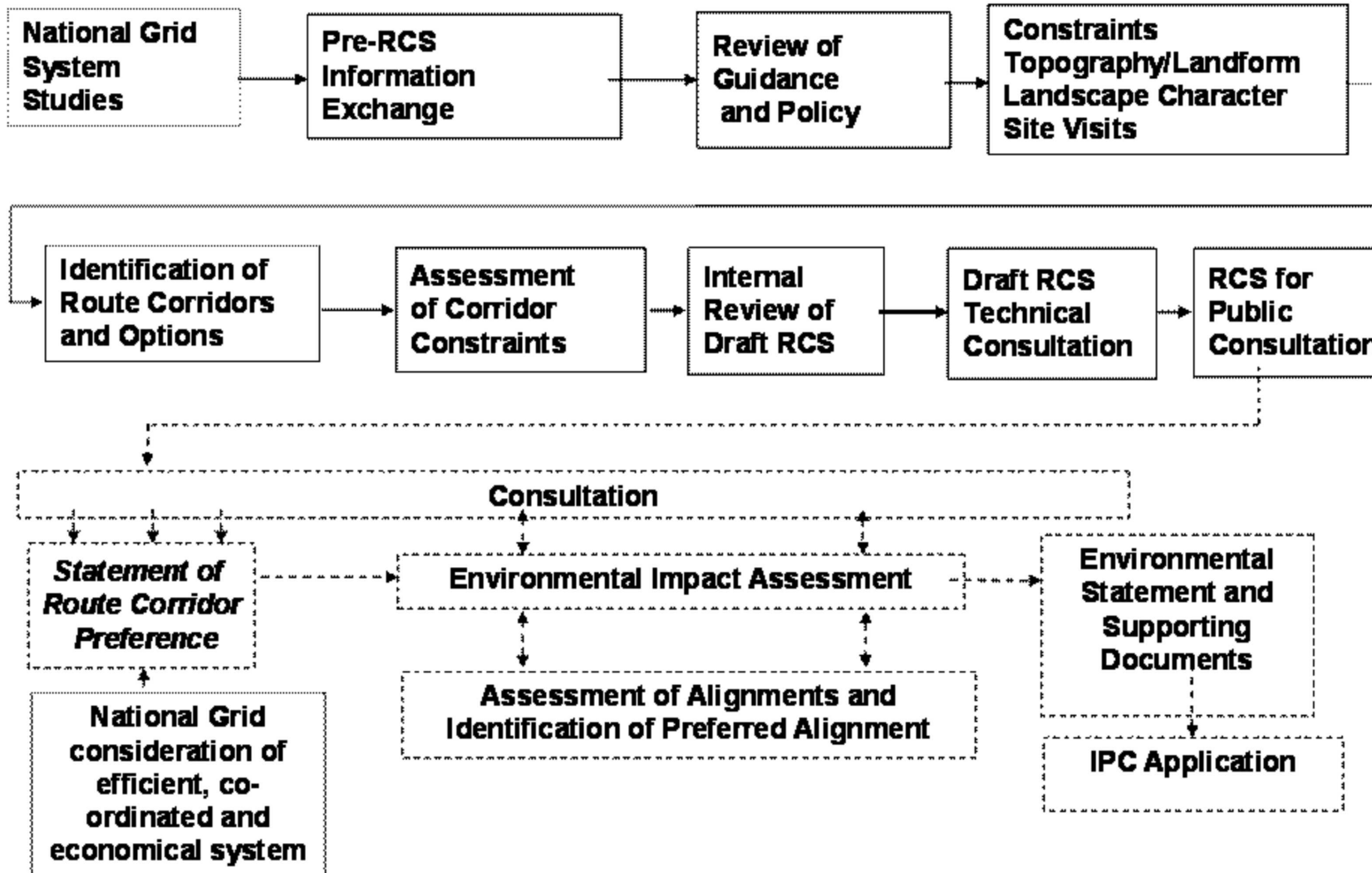
- 1.7 National Grid has the following statutory duties (under the Electricity Act 1989) which apply to its operation of the high voltage electricity transmission system:
- **Section 9** - to ‘*develop and maintain an efficient, co-ordinated and economical system of electricity distribution*’; and
 - **Schedule 9** - when formulating proposals to have regard to the ‘*desirability of preserving natural beauty, of conserving flora, fauna and geological or physiological features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest.*’

- 1.8 The proposed connection is consistent with National Grid's statutory duty under Section 9 of the Electricity Act 1989. National Grid is seeking to be consistent with its statutory duty under Schedule 9 by undertaking environmental studies to assist with formulation of its proposals for the proposed connection.

Process to Application for Consent

- 1.9 The proposed connection is a nationally significant infrastructure project under the Planning Act 2008.
- 1.10 The details of intended procedures to be followed for applications made to the Infrastructure Planning Commission (IPC) for such projects, stages, consultations, information and evidence required with an application were subject to consultation by the government until 19th June 2009. National Grid will revise its programme of activities to comply with the requirements established by the Planning Act, associated secondary legislation and in guidance issued by the government and the IPC, notably on consultation and engagement with stakeholders, communities and individuals.
- 1.11 An outline of National Grid's procedure from receipt of a connection application from the generator to submission of an application for consent to the IPC is presented at Diagram 1 overleaf and described below.
- 1.12 National Grid will take into account the responses received to this 'Route Corridor Study for Public Consultation' and consider these against its other statutory duties to '*develop and maintain an efficient, co-ordinated and economical system of electricity distribution*' before it makes its 'Statement of Route Corridor Preference'. This statement will include an explanation of how National Grid has taken into account responses to statutory and public consultation and how those responses have shaped its preference. It will confirm the preferred route corridor to be taken forward to the EIA stage where potential alignments will be identified and, following further consultation, a preferred alignment proposed. The Environmental Statement will form an important part of the application to the IPC.

DIAGRAM 1: SUMMARY FLOW CHART OF ROUTE CORRIDOR STUDY AND APPLICATION PROCESS



2.0 CONSULTATION AND INFORMATION EXCHANGE

Pre-Study Information Exchange

2.1 In advance of the route corridor study, National Grid commenced an exercise to give awareness of the connection requirements and the imminent RCS to key stakeholder agencies and to seek any initial responses. The following organisations were contacted with regard to the Bramford to Twinstead connection:

- Natural England
- English Heritage
- Environment Agency
- Potentially affected local planning authorities. These comprised Suffolk County Council, Babergh District Council, Braintree District and Mid Suffolk District Council.

2.2 Information on the proposed connection studies was provided and local planning authorities were invited to respond if they wished to meet to discuss issues. A meeting was held with the Strategic Officers Group of Suffolk County Council, Dedham Vale Management Group, Babergh District Council, Braintree District Council and Mid-Suffolk District Council. Meetings were arranged with Natural England, English Heritage, Environment Agency and RSPB. The key outcomes of these meetings are summarised below.

Environment Agency

2.3 National Grid confirmed that flood risk is a consideration for siting its assets although that this applies particularly to its substations and is much less relevant to overhead lines. EA confirmed that surface water flood mapping has been available to local planning authorities from May 2009.

2.4 The feasibility of underground cables rather than overhead lines was discussed. National Grid confirmed that there are greater costs, technical difficulties and effects on the environment for underground cables as voltages increase. Distribution voltages (132kV and below) can be undergrounded more cost-effectively than higher transmission voltages.

2.5 National Grid confirmed that it would not be possible to put additional conductors on existing towers to meet the system requirements and that a new overhead line route was being sought between Bramford and Twinstead. The high level constraints to such a route were noted and that these would form part of the RCS.

English Heritage

2.6 English Heritage (EH) confirmed that its definition of historic environment is broad and goes beyond scheduled and designated sites, also covering historic landscapes and their preservation

2.7 EH emphasised that Historic Landscape Characterisation should be considered and that all information should be assessed by an appropriately competent archaeologist. Reference to contemporary schedules and registers was emphasised as information on historic resource is continually updated. The importance of the setting of historic features was emphasised. EH made reference to its Conservation Principles document and advised that it should guide any representation on proposals to EH.

Natural England

- 2.8 Natural England (NE) referred to sea level change and the need for awareness of managed retreat when considering where long-term assets may be installed. It referred National Grid to shoreline and catchment management plans to assist in understanding proposals in areas that may be considered for this management approach.

Planning Authority Officers

- 2.9 The key items emerging from the meeting with planning authority officers included awareness that although protection of designated areas is sought, it was acknowledged that a less direct route between connection points avoiding designated areas may bring a greater overall scale of effect.
- 2.10 Officers confirmed aspirations to extend the Dedham Vale Area of Outstanding Natural Beauty and concern that existing overhead lines weighed against extending the designation. The value attached to the 'Special Landscape Areas' adjacent the AONB was explained. The presence of existing lines in the AONB was not considered by officers to give rise to a greater prospect of acceptance or consent for an additional line.
- 2.11 It was broadly agreed that careful routeing is the optimal form of mitigation of adverse effects of overhead lines.

Summary of Information Exchange Responses

- 2.12 Although this pre-study consultation was primarily to give awareness of the project and to receive very initial responses, it proved useful in confirming that there are areas of high environmental value within study areas for connections and that these should be avoided where possible.

Statutory Consultees and Local Planning Authorities Consultation Draft RCS

- 2.13 Following desk studies, a draft RCS was produced for discussion with the local authorities and statutory consultees in order to obtain technical feedback and guidance on the RCS. The following organisations were consulted as part of this Technical Consultation:
- Natural England;
 - English Heritage;
 - Environment Agency;
 - Royal Society for the Protection of Birds (RSPB);
 - Dedham Vale and Stour Valley Project; and
 - potentially affected local planning authorities comprising Suffolk County Council; Essex County Council; Mid Suffolk District Council; Babergh District Council; and Braintree District Council.
- 2.14 Officers from the statutory bodies and local planning authorities were invited to attend workshop events during July 2009 at which the method and findings of the RCS were presented and key issues were discussed. Attendees were provided with copies of the draft RCS and a briefing pack and asked to provide technical feedback and officer views on the work undertaken to date. The outcome of these consultations are outlined below. The comments received are officers' technical and initial responses and do not form an official response or view of any of the organisations or planning authorities on the proposed connection.

2.15 A summary of the items raised in relation to the route corridor study and responses to these are set out in Table 2.1 below and comprise the main additions to the earlier draft route corridor study in this Public Consultation RCS.

Table 2.1: Consultation Responses

Initial National Grid Workshops with: <ul style="list-style-type: none"> • Suffolk County Council, Mid Suffolk District Council, Dedham Vale and Stour Valley Project (1st July 2009) • The Environment Agency, Natural England and English Heritage (6th July 2009) • Essex County Council, Babergh District Council, Mid Suffolk District, Suffolk Coastal District and Braintree District Council (7th July 2009) 	
Comment	Response
The wider system options under initial consideration should be made available.	NG will make the report on system options available.
Further consideration needs to be given to the visual implications of the proposals, including locally important 'iconic views'.	A supplementary workshop was arranged to discuss landscape and visual aspects further (4 th August 2009)
Importance of the whole of the south Suffolk landscape has not been fully appreciated.	A supplementary workshop was arranged to discuss landscape and visual aspects further (4 th August 2009).
If undergrounding were considered would this affect the results of the study?	Reference is made to undergrounding where applicable. Undergrounding will be considered at an alignment stage.
Can Corridor 2 be amended to minimise effects on Hintlesham.	Corridor 2 split into Options A and B to enable a route to the north and south of Hintlesham to be considered.
Elmsett Airfield is of local importance.	The airfield is referenced in the RCS and full consultation will be undertaken with the airfield at alignment stage.
Conservation Area boundaries should be shown	Conservation Areas boundaries added to Figures 2 and 6.
Chilton Mixed-Use Development not shown on constraints mapping.	Chilton Mixed-Use Development added to Figures 2 and 6 and referred to in Chapter 7.
Several proposals around Ipswich including a Northern Bypass and a large housing allocation?	This is understood to be outside of the study area.
Consideration needs to be given to Village Design Statements.	Connection seeks to avoid villages. Consideration will be given to relevant Village Design Statements at the alignment stage.

Follow Up Workshop with Suffolk County Council, Babergh District Council, Dedham Vale and Stour Valley Project, Natural England and English Heritage (4 th August 2009)	
Comment	Response
Discuss on locally important 'iconic' views	Reference to this has been added at Chapter 9. Zone of Visual Influence (ZVI) mapping presented at Figures 16 – 19 and discussed in Chapter 9.
Discussion on the Suffolk Historic Landscape Characterisation (HLC)	Suggested further meeting with Edward Martin (SCC), Deborah Evans/Clare Campbell (EH). Met with Edward Martin (22/09/09) and reference to HLC included in Figure 5 and Chapters 7, 8 and 9.

3.0 DEFINITIONS AND STUDY ASSUMPTIONS

- 3.1 The purpose of this route corridor study (RCS) is to identify potential route corridors in which an alignment for an overhead line can in turn be identified.

Definitions

- 3.2 The following definitions have been used in considering connections:

Connection Point

- 3.3 A place on part of the existing or proposed electricity transmission system where there is an existing connection or to which a new electrical connection is proposed.

Route Study Area

- 3.4 A geographic area containing one or more connection points.

Constraint

- 3.5 An influence on routeing overhead lines.

Overhead Line

- 3.6 One or more high voltage electricity transmission circuits suspended from above ground supports. Typically refers to conductors suspended from steel lattice towers (pylons).

Cable Sealing End

- 3.7 Structures used to transfer transmission circuits between underground cables and overhead lines.

Route Corridor

- 3.8 A defined linear shape identified on a map which may be of variable width and whose extent at any point is typically defined by constraints or differentiation from other route corridors.

Alignment

- 3.9 The actual route of an existing overhead line or a proposed detailed route for an overhead line associated with a route corridor. A route corridor may contain a number of possible alignment options.

Option

- 3.10 A means of making a connection which applies to a route corridor. A route corridor may have more than one option which applies. For example, a corridor may split where consideration should be given to each option within the corridor.

Study Assumptions

Overhead or Underground Transmission

- 3.11 National Grid's high voltage electricity transmission network is almost exclusively an overhead line network. National Grid owns and operates approximately 7,200 kilometres of overhead lines and approximately 675 kilometres of underground cables in England and Wales. The very high proportion of overhead lines reflects the very high relative costs of underground cables, in respect of manufacture, installation and operation, and also the more extensive land requirements for underground cables as compared to overhead lines. This approach is consistent with other European countries.

- 3.12 National Grid has a policy related to the use of underground cables which in summary reserves consideration of their use to areas of high technical constraint and to areas of the highest recognised amenity value. The policy is discussed at paragraphs 5.9 to 5.16 below.
- 3.13 It is intended that the required connection would be by overhead line, although where National Grid's policy indicates that it is appropriate to do so, detailed consideration would be given to use of underground cables. This consideration would take place when potential detailed alignments are being considered.

Overhead Line Design

- 3.14 An overhead line for an appropriate connection between Bramford and Twinstead would be a double circuit 400kV overhead line with triple 'Ribus' conductors per phase, supported by lattice steel towers (pylons). This means that each tower would have three side arms on two opposite sides, with three sets of conductors (wires) suspended from each of the six side arms of each tower.
- 3.15 There is presently no approved 400kV tower design for the type of line required and the final design will be determined during 2010. However the approved design will resemble previous tower types with the following characteristics:
- Standard height 47m;
 - Standard base footprint 10m x 10m (total area enclosed by tower base comprising four stub foundations); and
 - Typical span 360m.
- 3.16 Where an overhead line changes direction and where lines terminate at substations or cable sealing end compounds, stronger towers are required which have heavier steelwork and larger footprints than the standard towers. Taller towers than the standard heights may be required in some locations and these have extensions and may require larger footprints. Longer and shorter spans than the typical span are likely to be needed in some locations, with longer spans often used to oversail potential obstacles and shorter spans on either side of longer spans than typical.

Use of Lower Voltage Line Routes

- 3.17 Where there is an existing overhead line route running for part or the entirety of a possible route corridor between two connection points (typically a 132kV overhead line suspended from lattice steel towers), it has been assumed that it may be possible for a higher voltage overhead line to use part or all of that route, subject to detailed survey. Detailed survey would demonstrate whether there are appropriate safety clearances from adjacent structures for the higher voltage line and if there are other technical or severe amenity constraints which would be incurred. These constraints may result in adjustments to the existing route to make it appropriate for the higher voltage line or discounting the use of that route as unsuitable for the higher voltage line.
- 3.18 Where there is the possibility to use the route of an existing overhead line, it is assumed that options are to build the new 400kV overhead line parallel to the existing line and leave the existing line in place; or to build the new 400kV line and remove the existing overhead line.
- 3.19 Determination of the feasibility of removing the lower voltage line requires liaison with the Distribution Network Operator (DNO) which owns and operates the line as part of the distribution network in any area.

- 3.20 If a 132kV overhead line is removed, action is generally required to ensure that the remaining 132kV distribution system remains secure and robust following removal of that line. The necessary action in each case would be identified in liaison with the relevant DNO. This may involve the installation of a new 132kV overhead line; underground cables; a new grid supply point (GSP) or a combination of each of these actions. (A GSP in this case is a point of connection between the high voltage transmission system and the distribution network. It would require installation of switchgear and transformers to 'step down' voltage from 400kV used in transmission to 132kV used in distribution.)
- 3.21 Information on the feasibility of using existing 132kV line routes as corridors and the consequent requirements for actions to maintain distribution supplies is stated in relation to corridors where this is relevant.

Consent and Environmental Impact Assessment

- 3.22 An authority authorised by statute to grant consent for development is termed a competent authority. For development requiring planning permission under the Town and Country Planning Act 1990 as amended, the competent authority is generally the local planning authority. For development comprising an overhead line, the competent authority is generally the Secretary of State for Energy and Climate Change (ECC).
- 3.23 The Infrastructure Planning Commission (IPC) is a national commission established to determine applications for consent for nationally significant infrastructure projects. The IPC was established under the 2008 Planning Act and is anticipated to begin receiving applications in 2010.
- 3.24 The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 (as amended) require that consideration is given to Environmental Impact Assessment (EIA) for applications for consent for overhead lines of voltages of 132kV and higher made to the Secretary of State for ECC.
- 3.25 The government has issued a consultation document on application of EIA to projects submitted to the IPC for consent.
- 3.26 It is anticipated that an application for consent for the proposed connection between Bramford and Twinstead would be made to the IPC and that EIA would be required. However the potential consent regime, competent authority for consent and Regulations under which EIA would be considered and undertaken for a connection has not influenced the route corridor study.

4.0 APPROACH AND METHOD

- 4.1 This Chapter presents the approach and method followed for the Route Corridor Study which is one part of the overall process of preparing the application for consent.
- 4.2 Following the review of initial options and identification of the potential connection points, National Grid undertook an initial stage of information exchange, primarily targeted at making statutory agencies including local planning authorities aware of the need for a connection and the start of the Route Corridor Study. The primary purpose of this was for National Grid to provide information although useful initial responses were obtained from consultees.

Routeing Constraints

- 4.3 Information from pre-study information exchange was considered in a review of National Grid's guidance and policies on infrastructure siting and routeing. This guidance has been in use and has evolved with experience over many years.
- 4.4 A brief review of key elements of planning policy was undertaken to identify important aspects that may influence siting and routeing of infrastructure but which was not represented in National Grid's guidance.
- 4.5 These reviews identified potential constraints and influences on siting and routeing infrastructure including statutory and planning designations. These were collated and analysed from desk study and also considered in site visits.

Landform (Topography and Physiography)

- 4.6 The Holford Rules (see paragraph 5.7 – 5.8 below) refer to aspects of topography and physiography such as hills, ridges, dips, open valleys and flat land in considering overhead line routeing. For example, the Rules advise on exploiting the 'backgrounding' effect of high land and seeking to avoid ridges.
- 4.7 Landform has been considered in identifying route corridors by interpreting contour and spot height information on Ordnance Survey mapping. In addition, visualisations of levels and slopes have been prepared in computer software based on Ordnance Survey digital terrain model height information at 10m intervals.
- 4.8 This information has been used to consider the opportunities for potential route corridors that may produce alignments that comply with the Holford Rules and which have potential to minimise adverse effects on the landscape.

Landscape Character

- 4.9 There are designations relating to protection of the landscape that include reference to character, although character is not the only factor considered in designation. Reference is made to these designations in the review of National Grid's policy and guidance (see Chapters 5.0 and 6.0 below).

- 4.10 Prior to the reform of the planning system introduced in the Planning and Compulsory Purchase Act 2004, local planning authorities identified areas of high relative landscape value within their administrative districts in designations such as 'Area of Special Landscape Value' and 'Special Landscape Area'. These were development plan designations in which restrictions on development applied.
- 4.11 National planning policy guidance issued in Planning Policy Statement 7: Sustainable Development in Rural Areas notes that, whilst it is accepted that there are areas of landscape outside nationally designated areas that are particularly highly valued locally, policies can provide sufficient protection for these areas, without the need for rigid local designations. It advises that landscape character assessment can provide the basis for policies.
- 4.12 This guidance places emphasis on landscape character assessment as a tool for guiding policy. Landscape character assessments generally identify areas of landscape of a similar character and describe that character referring to aspects and features which, alone or in combination, make it distinct. Assessments typically refer to types of development or activity to which a landscape may be particularly sensitive. For example, in a small-scale intimate landscape characterised by rolling topography and a high degree of enclosure by hedges, low buildings with a large footprint may introduce a scale of development that is inconsistent with defining features. By contrast, this scale of development may be more consistent with a landscape that is open and expansive.
- 4.13 Landscape character assessments are undertaken and reported at a range of scales, usually to support land use planning at different scales. There are landscape character assessments in England undertaken at national, regional, county and district levels, although coverage at levels below national is not comprehensive. Landscape character assessments also identify aspects of land management not usually covered by land use planning which affect character, such as treatments of hedgerows, walls and fences and agricultural practices.
- 4.14 In identifying potential route corridors, reference has been made to available landscape character assessments which have been presented on maps. The descriptions of landscape character and sensitivity of landscape have been used to assist in identifying potential overhead line route corridors. It is acknowledged that the scale of development presented by a new 400kV overhead line would inevitably give rise to landscape effects. However landscape character assessments can indicate which landscape characters have greatest ability to assimilate these effects.
- 4.15 Landscape character has also been considered on site visits, with photographs and notes recording aspects of landscape character and views in the study area.

'Opportunity' Corridors

- 4.16 The primary basis on which route corridors have been identified are environmental constraints, considered with topography and landscape character. However where there are existing overhead lines whose routes, completely or in part, have potential to be used for new overhead lines which would make the required connection, these have also been identified. For example a 132kV overhead line may run on a route which a new 400kV overhead line may be able to take between connection points. These existing routes may affect features identified as constraints to new route corridors, although the scale of change from the existing situation by installing a new

line in addition to or replacing the existing line may be lower than a new line in a situation where no line presently exists.

- 4.17 Where identified, these 'opportunity corridors' have been compared to new route corridors.

Comparison of Route Corridors

- 4.18 Once route corridors have been identified, route corridors have been compared using judgement applied to their performance against identified constraints, topography and landscape character.

- 4.19 Identification of the least constrained route corridor has been presented as the completion of this Route Corridor Study.

Sources of Information

- 4.20 The study has been undertaken using desk-based information and from site visits undertaken by TEP's specialists in landscape, town and country planning, ecology and archaeology in April and May 2009. (Archaeology was sub-contracted to RSK.)

- 4.21 The main sources of information were:
- 'shape files' from sources of environmental information as presented in Table 6.1 below;
 - Google Earth and Windows Live web based aerial imagery;
 - Ordnance Survey Explorer 1:25,000 and Landranger 1:50,000 mapping;
 - Local Plans and Unitary Development Plans (local authorities' planning guidance sourced from the internet and hard copies of documents where these were available);
 - Reports on landscape character assessments; and
 - Landform information derived from Ordnance Survey digital terrain modelling.

5.0 NATIONAL GRID'S ENVIRONMENTAL GUIDANCE

- 5.1 This Chapter considers National Grid's guidance relevant to identifying route corridors.
- 5.2 National Grid refers to guidance notes on siting infrastructure when considering options for connections and changes to its network.

National Grid's Schedule 9 Statement

- 5.3 National Grid has a two-fold duty placed on it under Schedule 9 of the Electricity Act 1989:
- 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
 - to 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.
- 5.4 There is also an obligation for National Grid to publish a statement presenting how it will comply with this duty.
- 5.5 National Grid's Schedule 9 Statement (see Appendix 1) sets out ten commitments under which it takes action to address the obligations under Schedule 9 of the Electricity Act 1989. These 10 headings and action points are reproduced below:

1. Establishing need, in particular only seeking to build lines along new routes, or substations in new locations, where the existing transmission infrastructure cannot be upgraded to meet transmission security standards, or where National Grid foresees an increase in demand for electricity which will not be satisfied by other means, or where connections to customers are required.

2. Avoiding nationally and internationally designated areas, specifically National Parks; Areas of Outstanding Natural Beauty; Sites of Special Scientific Interest including Special Protection Areas, Special Areas of Conservation and Ramsar sites; National Nature Reserves; Heritage Coasts; World Heritage Sites; and Scheduled Monuments.

3. Minimising the effects of new transmission infrastructure, seeking to minimise the effects of new transmission infrastructure on other sites valued for their amenity such as listed buildings, conservation areas, areas of archaeological interest, local wildlife sites, historic parks and gardens and historic battlefields. National Grid will take into account the significance of these and other areas through consultation with statutory bodies and local authorities.

4. Mitigating adverse effects of works. Where works are likely to have an adverse effect on amenity, National Grid will carry out mitigation measures to reduce those effects as far as practicable. It will use environmental impact assessment techniques to assess possible effects and identify opportunities for mitigation measures, and in the course of this National Grid will consult the relevant statutory and non-statutory consultees together with landowners. Where the effect of works is significant, National Grid will consult affected residents.

5. Compensating where mitigation is not possible

Where mitigation measures cannot fully mitigate against loss of amenity, or where mitigation is not possible, National Grid will offer to undertake practical offsetting measures. These could include landscaping and planting works or other benefits to affected communities.

6. Enhancing the environment around National Grid's works

When undertaking works, National Grid will consider what practicable measures can be done to enhance areas in the vicinity of the works for the benefit of the local community or the natural environment.

7. Monitoring and continuous improvement

Post-construction, National Grid will carry out a review of the environmental impact of its works and consider the effectiveness of its assessment and any mitigation National Grid has undertaken. The results of reviews will be used to improve management practices and to foster continuous improvement in the environmental assessment and management of schemes.

8. Best practice in assessing environmental impact

In determining the environmental impact of its works, National Grid will ensure that it utilises best practice methods, undertaking research to refine its understanding of best practice. National Grid will undertake relevant environmental investigations and report on these in any applications for consent for new works.

9. Consultation and liaison

When planning works that will have a high impact on a residential area or a site valued for its amenity, National Grid will consult with local interest groups and residents, with the aim of identifying key environmental issues which can be taken into account and more effectively mitigated. In order for consultation to be most effective it will be done at a stage where the results can be used to influence the design of the project. When undertaking works, which will have a less significant impact, National Grid will liaise with and inform affected residents according to the severity of that impact. National Grid will take into account local biodiversity action plans and other local initiatives being undertaken by local communities.

10. Reviewing this Statement

National Grid intends to review its Schedule 9 Statement at least every five years. However, as a responsible company practising good corporate governance, it undertakes to review the relevance of this statement annually and report on its website case studies illustrating its Schedule 9 performance.

- 5.6 Commitments 1, 2 and 3 are those relevant to the identification of route corridors. Commitment 1 refers to the need for the new infrastructure, including the need for new routes. Commitment 2 sets out areas of the highest sensitivity which National Grid seeks to avoid in siting and routeing new infrastructure. Commitment 3 sets out areas of value on which National Grid seeks to minimise effects of its infrastructure.

The Holford Rules

- 5.7 In addition to the above guidance on siting all infrastructure, specific guidance on routeing overhead lines is provided by the 'Holford Rules', presented in Appendix 2. This guidance is primarily related to minimising effects on landscape and includes 'rules', explanatory and supplementary notes. The key 7 rules on minimising landscape effects in routeing overhead lines are presented below:
- 1. Avoid altogether, if possible, the major areas of highest amenity value** (An explanatory note states that these designations include Areas of Outstanding Natural Beauty, National Parks, Heritage Coasts and World Heritage Sites.)
 - 2. Avoid smaller areas of high amenity value or scientific interest by deviation where this can be done without using too many angle towers** (An explanatory note explains that Sites of Special Scientific Interest may require special consideration for effects on ecology. A further explanatory note states that where possible routes should be chosen which minimise effects on the settings of areas of architectural, historic and archaeological interest including Conservation Areas, Listed Buildings, Listed Parks and Gardens and Ancient Monuments.)
 - 3. Other things being equal, choose the most direct line, with no sharp changes of direction to minimise use of angle towers.**
 - 4. Choose tree and hill backgrounds in preference to sky backgrounds, wherever possible; and where the line has to cross a ridge, secure this opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where there is no dip in the ridge, cross directly, preferably between belts of trees.**
 - 5. Prefer moderately open valleys with woods where the apparent height of towers will be reduced and views of the line will be broken by trees.**
 - 6. Where land is flat and sparsely planted, keep high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, to avoid 'wirescape'.**
 - 7. Approach urban areas through industrial zones, where they exist. When pleasant residential and recreational land intervenes between the approach line and the substation, consider carefully the comparative costs of undergrounding, for lines other than those of the highest voltage.**
- 5.8 The Supplementary Note to Rule 5 refers to the desirability of avoiding vegetation including woodlands. A Supplementary Note to Rule 7 states that alignments should be chosen after consideration of effects on the amenity of existing development and on proposals for new development. A further general Supplementary Note advises avoid routeing close to residential areas as far as possible on grounds of general amenity.

National Grid's Undergrounding Policy

- 5.9 Holford Rule 7 above refers to the consideration of use of underground cables instead of overhead lines. National Grid has a policy referring to the use of underground cables for high voltage transmission circuits which is presented in Appendix 3.

- 5.10 National Grid acknowledges in its policy the very high cost of installation of underground cables for high voltage transmission as compared to the equivalent overhead line. There are also higher operational costs and greater risks in the event of faults (as faults need to be discovered, excavated and repairs made to circuits below ground). Installation of high voltage underground cables also causes disturbance to large areas of land with adverse effects on land use during installation and subsequent operation and in particular potential risks to areas of ecological and archaeological sensitivity during installation.
- 5.11 National Grid's policy is that due to the very high relative costs of underground transmission, it reserves detailed consideration of its use instead of overhead lines for 'exceptionally constrained areas'. The policy gives explanations of these as set out below.

Exceptionally Constrained Urban Areas

- 5.12 Urban areas where there may be exceptional constraints on siting of overhead transmission lines comprise those locations where the density of residential community and associated development and public open space is such that a reasonably direct overhead route is impracticable.

Exceptionally Constrained Rural Areas

- 5.13 The policy states that of special concern in the siting of overhead transmission lines in the countryside is the protection of important landscape features in nationally or internationally designated areas of amenity value. These designated areas comprise National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts and World Heritage Sites.
- 5.14 National Grid's policy explains that exceptionally constrained rural areas comprise locations within or immediately alongside those designated areas where the scale of new high voltage transmission towers and conductors would dominate unspoilt landscape and cause serious damage to major open views or spectacular panoramas, crests of prominent ridges and skylines or attractive small scale valleys seen from important locations within or immediately alongside the designated areas.

Exceptionally Constrained Estuary and Major River Crossings

- 5.15 The policy states that such crossings occur where the exceptional difficulty and cost of an overhead line would be comparable with or exceed those of an underground cable.
- 5.16 Detailed consideration of undergrounding will occur when considering alignments within route corridors which include areas of exceptional constraint.

Summary of National Grid's Guidance and Policy on Overhead Line Routeing

- 5.17 National Grid's guidance on overhead line routeing identifies areas which it seeks to avoid and areas on which it seeks to minimise effects. These are summarised with reference to the aspect of guidance which identifies them in Tables 5.1 and 5.2 below.

Table 5.1: Features National Grid Seeks to Avoid in Routeing

Feature	Reference
National Parks	Schedule 9 Commitment 2/Holford Rule 1
Areas of Outstanding Natural Beauty	Schedule 9 Commitment 2/Holford Rule 1
Heritage Coasts	Schedule 9 Commitment 2/Holford Rule 1
World Heritage Sites	Schedule 9 Commitment 2/Holford Rule 1
Sites of Special Scientific Interest	Schedule 9 Commitment 2
Special Protection Areas	Schedule 9 Commitment 2
Special Areas of Conservation	Schedule 9 Commitment 2
Ramsar sites	Schedule 9 Commitment 2
National Nature Reserves	Schedule 9 Commitment 2
Scheduled Monuments	Schedule 9 Commitment 2
Settlements	Supplementary Note on Residential Areas

Table 5.2: Features on which National Grid Seeks To Minimise Effects

Listed buildings	Schedule 9 Commitment 3/Note to Holford Rule 2
Conservation Areas	Schedule 9 Commitment 3/Note to Holford Rule 2
Listed Parks and Gardens	Schedule 9 Commitment 3
Registered Battlefields	Schedule 9 Commitment 3
Areas of archaeological interest	Schedule 9 Commitment 3
Designations of County, District and Local Value	Schedule 9 Commitment 3/Supplementary Note to Holford Rules on Designations of County/District and Local Value
Woodlands	Note to Holford Rules 4 and 5
Local Plan Allocations	Note to Holford Rule 7

- 5.18 In addition to identifying constraints in the form of specific features designated for protection, the Holford Rules identify guidance on landscape and landform to be considered in overhead line routeing.
- 5.19 National Grid’s guidance has been in use for many years influencing routeing studies and proposals for new overhead lines. It is important to note that National Grid has overhead lines and substations in areas of constraint, including those listed in Table 5.1 as those it seeks to avoid. For example it has approximately 195 kilometres of overhead lines in National Parks and approximately 440 kilometres of overhead lines in Areas of Outstanding Natural Beauty.
- 5.20 A national transmission grid connecting areas of demand with areas of generation will inevitably involve crossing areas of constraint, including those features which National Grid seeks to avoid and on which to minimise effects.
- 5.21 The following chapter identifies which constraints have been taken into account along with landscape and landform in identifying potential route corridors.

6.0 CONSTRAINTS USED IN IDENTIFYING POTENTIAL ROUTE CORRIDORS

Approach to Features Identified in National Grid Guidance

- 6.1 The constraints listed in Tables 5.1 and 5.2 above have been considered in identifying route corridors. The paragraphs below consider each of the constraints identified in relation to National Grid's guidance in turn below.
- 6.2 Where particular types of constraint are present in the study area, they are considered further in Chapter 7.

National Parks

- 6.3 There are no National Parks in the Bramford to Twinstead study area.

Areas of Outstanding Natural Beauty

- 6.4 Areas of Outstanding Natural Beauty (AONBs) are designated under the National Parks and Countryside Act 1949 (as amended) for the purpose of conserving and enhancing the natural beauty of the area. A new overhead line would have an effect on landscape which could affect the objective to conserve and enhance natural beauty. National Grid's undergrounding policy applies to AONBs as areas of exceptional constraint.
- 6.5 National Grid's undergrounding policy (see Appendix 3) states that use of underground cables will be considered where it will:
- (i) outweigh the adverse effects upon other environmental factors;
 - (ii) justify the high additional cost; and
 - (iii) where it is technically possible and will not conflict with National Grid's statutory duties.
- 6.6 The purpose of considering underground cables in AONBs is to consider how this would contribute to the objective to conserve and enhance the natural beauty of the area.
- 6.7 Installing underground cables bring risks of adverse effects on environmental factors including natural beauty because installation involves a wide swathe of ground disturbance. This can affect other environmental factors including cultural heritage and wildlife. Archaeological remains present would be disturbed by installation and habitat damage can occur. Enduring constraints on tree and hedgerow planting after installation can also affect the objective of conserving natural beauty.
- 6.8 Technical feasibility may be constrained by features such as built form or ground conditions not suited to cables installation. Conflict with National Grid's statutory duties may arise in relation to its duty to maintain an efficient, co-ordinated and economical system of electricity distribution (see paragraph 1.7), although this would be balanced with its duty under Schedule 9 relating to the preservation of amenity.
- 6.9 National Grid's guidance says that it should seek to avoid AONBs when siting infrastructure and these are features to 'seek to avoid' in route corridor studies. Where avoidance could not be achieved, it would be appropriate when considering alignments to give detailed consideration to the use of underground cables in accordance with National Grid's policy.

Heritage Coasts

- 6.10 There are no Heritage Coasts in the Bramford to Twinstead route corridor study area.

World Heritage Sites

- 6.11 There are no World Heritage Sites in the Bramford to Twinstead study area.

Sites of Special Scientific Interest (SSSIs)

- 6.12 SSSIs are sites designated for their biodiversity or geological interest and are protected under the Wildlife and Countryside Act 1981 as amended by the Countryside and Rights of Way Act 2004. SSSIs are protected from development and operations which are likely to damage their special interest. Consultation with Natural England is required before consent can be granted for any development operations or likely to damage the SSSI interest.
- 6.13 The nature of the interest for each site varies. The potential effect of an overhead line on a SSSI would vary depending upon the nature of the effect caused and the interest of the sites. The risk of harm to a SSSI from a new overhead line would depend on the nature of the effect considered in light of the special interest of that designated site. Planning Policy Statement 9 Biodiversity and Geological Conservation advises local planning authorities, with regard to preparing policies and exercising development control, that:

'Where a proposed development on land within or outside a SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), planning permission should not normally be granted. Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs.'

- 6.14 National Grid's guidance advises that it should seek to avoid SSSIs when siting infrastructure and these have been regarded as features to 'seek to avoid' in route corridor studies.
- 6.15 Where avoidance is not possible, it is appropriate when investigating alignments within a corridor to consider in detail the effects of the overhead line on the interest of the SSSI.

Special Protection Areas (SPAs)/Special Areas of Conservation (SACs)/Ramsar sites

- 6.16 These sites are all SSSIs but comprise the highest grade of sites of biodiversity importance and are afforded protection under The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (The Habitats Regulations).
- 6.17 The Regulations only permit development in the first instance on such sites where it is directly connected with or necessary to site management for nature conservation; or where the proposal would not be likely to have a significant effect on the conservation objectives of the site, alone or in combination with other plans and projects.

- 6.18 Where there are likely to be significant effects, consent for development can only be granted where it would not adversely affect the integrity of the site taking into account the manner in which the development will be carried out and any conditions that might be imposed on the consent or there are no alternative solutions and the development must be carried out for imperative reasons of overriding public interest relating to human health, public safety or benefits of primary importance to the environment.
- 6.19 National Grid's guidance advises that it should seek to avoid Special Protection Areas, Special Areas of Conservation and Ramsar sites when siting infrastructure. These are appropriate to regard as features to 'seek to avoid' in route corridor studies. Where avoidance is not possible, it would be appropriate when investigating alignments within a corridor to consider the nature of effects, particularly with regard to whether the proposed overhead line would be likely to give rise to significant effect on the conservation objectives of the site and with regard to potential effects on integrity of the site.
- 6.20 There are no Special Areas of Conservation in the Bramford to Twinstead route corridor study area.

National Nature Reserves (NNRs)

- 6.21 There are no NNRs in the Bramford to Twinstead route corridor study area.

Scheduled Monuments

- 6.22 The Ancient Monuments and Archaeological Areas Act 1979 is the legislation protecting archaeological features which appear on the 'schedule' kept by the Department of Culture, Media and Sport. 'Scheduling' is the only legal protection specifically for archaeological sites.
- 6.23 Scheduled Monument Consent is required from English Heritage, the statutory adviser on the historic environment, for works directly affecting a scheduled monument. English Heritage must be consulted by local planning authorities outside Greater London on applications for planning permission likely to affect the site of a scheduled monument.
- 6.24 National Grid's guidance advises that it should seek to avoid Scheduled Monuments in siting infrastructure. These are appropriate to regard as features to 'seek to avoid' in route corridor studies. Where avoidance is not possible, it would be appropriate when investigating alignments within a corridor to consider the nature of effects, including on setting of the monument, on a case-by-case basis.

Listed buildings

- 6.25 National Grid's guidance summarised in Table 5.2 advises that it will 'seek to minimise effects' on listed buildings. Listed buildings are designated in three categories. The majority are Grade II listed buildings with 5.5% of listed buildings Grade II* and 2.5% of listed buildings are Grade I.
- 6.26 Planning authorities are required to consult with English Heritage on planning applications which may affect Grade I and Grade II* listed buildings outside Greater London. The setting of listed buildings is an important consideration when considering effects of development. Grade I and Grade II* listed buildings have been

considered in identifying route corridors to try to ensure that there is sufficient distance between them and potential alignments to ensure effects do not occur or can be minimised. Effects on setting would be considered initially in route corridor preference and in detail when identifying alignments.

Conservation Areas

- 6.27 Conservation Areas are designated under the Civic Amenities Act 1967 (as amended). They are often, although not exclusively, associated with settlements and may be in their core or embedded within a larger expanse of built form. The setting of Conservation Areas may be particularly important as the designation refers to the overall character of an area and the juxtaposition of buildings, spaces and other features which contribute to its character.
- 6.28 During identification of route corridors settlements are sought to be avoided and this is likely to minimise effects on Conservation Areas by increasing the separation between them and a new overhead line.
- 6.29 Conservation Areas have been considered in identifying route corridors. Effects on setting would be considered initially in route corridor preference and in detail when identifying alignments.

Registered Parks and Gardens

- 6.30 National Grid seeks to minimise effects on Registered Parks and Gardens. English Heritage holds a Register of Parks and Gardens which are listed as being of national importance for their special historic interest. The interest of an historic park or garden may be in a confined area or relate to wider views and vistas and the setting of the park or garden, but is likely to include interest in the landscape.
- 6.31 An overhead line very close to a Registered Park or Garden is likely cause adverse effects. Registered Parks and Gardens are considered in identifying route corridor preference by seeking to maintain sufficient distance between a corridor or possible alignments within a corridor that effects can be minimised.

Registered Battlefields

- 6.32 There are no Registered Battlefields in the Bramford to Twinstead study area.

Areas of Archaeological Interest

- 6.33 Above ground archaeological interest is addressed in identifying route corridors by considering Listed Buildings, Scheduled Monuments and Conservation Areas. Development plans indicate areas of archaeological potential and interest. These are at the scale of a local planning authority's administrative area and typically refer to areas of below ground potential.
- 6.34 The potential effects of an overhead line on these areas are usually limited to areas of ground excavation which are limited to tower foundations. These areas of archaeological interest will be considered when identifying alignments. Measures to minimise effects would include siting of tower foundations and mitigation such as archaeological investigation during excavation.

Designations of County, District and Local Value

- 6.35 There are a number of county, district and local designations related to environmental value which are presented in development plans. These typically relate to archaeology, landscape and ecology. Effects on areas of archaeological interest are discussed above.
- 6.36 National government guidance in Planning Policy Statement 7: Sustainable Development in Rural Areas advises that local planning authorities should move from designations of special landscapes for protection to a criteria-based approach to protecting the best landscapes and promoting enhancement of other landscapes using tools such as landscape character assessment. It advises at paragraph 25 that *'local landscape designations should only be maintained or, exceptionally, extended where it can be clearly shown that criteria-based planning policies cannot provide the necessary protection.'*
- 6.37 Landscape character has been considered in the identification of route corridors (see 3.9 – 3.15 above).
- 6.38 Where there are sites of ecological interest at county, district and local level, these have not been considered in identifying route corridors. Minimising effects on these would be considered in identifying route alignments where options to route the line to reduce effects or the use of mitigation such as habitat creation would be considered.

Woodlands

- 6.39 Table 5.2 notes that Holford Rules 4 and 5 refer to woodlands and their value in providing background to views and advice to avoid cutting extensive swathes through woodland blocks where possible.
- 6.40 Any form of woodland generally has landscape value whereas ecological value can vary greatly between different types of woodland. A woodland with relatively low ecological value may perform the same screening or backgrounding function in the landscape as one with very high ecological value. However ancient woodland is an irreplaceable nature conservation asset. Much ancient woodland is SSSI and is protected by that designation.
- 6.41 Woodland has been considered in the identification of route corridors and ancient woodland has been identified separately. Corridors have been identified which seek to avoid woodland.
- 6.42 Where woodland is included in an identified route corridor, it is where there is high confidence that at least one alignment can be found within the corridor which would avoid the woodland. Ancient woodland will be identified separately when considering alignments, so that if route corridors include woodland that cannot be avoided, a distinction can be made between ancient and other woodland.

Settlements

- 6.43 National Grid's guidance states that overhead line routes should avoid residential areas and that developed areas should be treated as areas of exceptional constraint.

- 6.44 There is no accepted definition of a settlement which has been applied in the route corridor study. However identification of route corridors has sought to avoid areas where there are groups of residential properties with only small gaps between them.

Local Plan Allocations

Housing Allocations

- 6.45 Table 5.2 confirms that the Supplementary Note to Holford Rule 7 advises that routeing should consider '*effects on the amenity of existing development and on proposals for new development*'.
- 6.46 The identification of constraints has included allocations in adopted development plans for residential development. These have been treated as if existing residential development in the identification of route corridors. Other allocations for development, such as industrial and commercial allocations, have not been considered constraints to route corridors.

Mineral Reserves

- 6.47 Mineral reserves may extend for large areas, particularly where large 'areas of search' have been identified. It would be inappropriate to constrain route corridors to areas which are not in any area of search for mineral reserves. However it would also be imprudent to seek to site a new overhead line on scarce reserves which have a high prospect of being won in the life of the overhead line, as far as that can be determined at this time.
- 6.48 The approach taken to mineral reserves is to identify active mineral working sites with available reserves and to seek to avoid these areas.

Other Potential Constraints

Individual Properties

- 6.49 National Grid recognises that its works may have an adverse effect on amenity. Its Schedule 9 Statement's Commitment 4 commits to carrying out mitigation measures to reduce adverse effects as far as practicable. National Grid is committed to using environmental impact assessment techniques to assess effects and identify opportunities for mitigation. It commits to consultation during this process and, where the effect of its works is significant, to consulting affected residents.
- 6.50 Individual properties have been identified from Ordnance Survey maps and during site visits. Effects on individual properties will be considered in the identification of alignments within corridors.

Airports/Airfields

- 6.51 Local plan documents sometimes have consultation or exclusion zones shown around airports, airfields and airstrips. National Grid undertakes consultation with the operators, the Civil Aviation Authority and the Ministry of Defence when considering alignments. At this stage of the study, the presence of aircraft sites has been noted from Ordnance Survey maps, planning authority documents and from site visits. Where consultation zones are shown in planning documents, these have been considered. In identifying route corridors, judgement has been applied in each case to an appropriate distance to avoid encroaching within airports and airfields.

Flood Risk

- 6.52 The importance of flood risk has been emphasised since the severe floods of 2007 and was a key concern raised by the Environment Agency in initial discussion. National Grid considers its siting of installations such as substations very carefully in relation to flood risk. However it is relatively straightforward to build flood resilience into overhead lines by addressing safety clearances from anticipated flood levels in line design. The presence of overhead line towers in areas of flood risk has negligible effect on the risk or displacement of water as the lattice steel construction poses no material changes to water flow. Flood risk has therefore not been considered an influence on overhead line route corridors.
- 6.53 However sealing end compounds (large structures used to transfer transmission circuits between underground cables and overhead line) need to be protected from high flood risk and this influences locations in which undergrounding can be subject to detailed consideration for alignments in exceptionally constrained areas.
- 6.54 The feature considered as constraints to route corridors are presented in Table 6.1 below with the data sources from which information (where applicable) was taken.

Table 6.1: Constraints to Route Corridors and Data Sources

Feature	Data Sources
National Parks	magic.gov.uk
Areas of Outstanding Natural Beauty	magic.gov.uk
Heritage Coasts	magic.gov.uk
World Heritage Sites	english-heritage.org.uk
Sites of Special Scientific Interest	gis.naturalengland.org.uk
Special Protection Areas	gis.naturalengland.org.uk
Special Areas of Conservation	gis.naturalengland.org.uk
Ramsar sites	gis.naturalengland.org.uk
National Nature Reserves	gis.naturalengland.org.uk
Scheduled Monuments	english-heritage.org.uk
Settlements	Digitised from Ordnance Survey
Historic buildings (Listed I and II*)	english-heritage.org.uk
Conservation Areas	Development plans
Registered Parks and Gardens	magic.gov.uk
Registered Battlefields	english-heritage.gov.uk
Woodlands	National Inventory of Woodlands
Development plan allocations for housing	Development plans
Active mineral extraction sites with reserves	Development plans
Airfields/airstrips	Digitised from Ordnance Survey and development plans

- 6.55 The following Chapter describes the study area, referring to these constraints.

7.0 CONSTRAINTS WITHIN THE STUDY AREA

General Overview

- 7.1 The study area extends from Bramford Substation, northwest of Ipswich, to Twinstead, to the south of Sudbury. There is an existing 400kV overhead line which runs on a northeast-southwest alignment through the study area from Bramford to Pelham, with a 'tee' in the vicinity of Twinstead from where another 400kV overhead line runs south to Rayleigh. A new 400kV overhead line is required between Bramford Substation and this tee to reinforce the system by creating a new circuit as described in paragraph 1.6. The general study area is shown on Figure 1 with the focus of the study area described below and highlighted on Figure 1.
- 7.2 A key constraint in the study area is the Dedham Vale Area of Outstanding Natural Beauty (AONB) discussed at paragraphs 7.10 – 7.14 below. The existing 400kV overhead line between Bramford and Twinstead and the 132kV Burstall Bridge to Twinstead overhead line take the shortest route through the most northerly point of the Dedham Vale AONB. These existing overhead lines offer potential as 'opportunity corridors' through the AONB. However there is no merit investigating longer corridors through the designated site, given National Grid's commitment to seek to avoid AONBs in siting its infrastructure. The focused study area has therefore been limited to 1km to the south of these existing lines.
- 7.3 The northern extent of the area of focused study is limited by Sudbury, villages and built development along the B1115, the A1141 and the B1078, Wattisham Airfield and by woodland particularly along the river Brett around Monks Eleigh. It is possible that a route corridor could be identified through these constraints, however there appears no advantage in taking identifying a longer route to the north.
- 7.4 The study area spans two counties and three local planning authority districts. Bramford Substation is within the county of Suffolk and the local planning authority of Mid-Suffolk District adjacent to its western boundary with Babergh District. Babergh District, also within Suffolk, occupies the majority of the study area, with its boundary with Braintree District, in the county of Essex, at the River Stour close to the tee at Twinstead.
- 7.5 The area is predominantly rural, with much of the land under arable crop production and also with many apple orchards. The key towns within the study area are Sudbury and Hadleigh, with the county town of Ipswich located just to the east of the study area beyond Bramford Substation. Smaller towns, villages and hamlets are dispersed throughout the study area.
- 7.6 The A1071, A134 and A1141 are the main roads in the study area. The A1071 runs east-west from Ipswich to the north of Hadleigh and the south of Boxford before joining the A134 approximately 3km to the east of Sudbury. The A134 runs in a southeast direction from Sudbury towards Colchester, and the A1141 runs north from Hadleigh through Monks Eleigh and Lavenham towards Bury St Edmunds. The larger towns and villages are located along these roads, with the remainder of the area comprising a network of minor roads linking smaller villages and isolated properties and farmsteads.
- 7.7 Several rivers flow through the landscape in a broadly north-south direction including the River Stour, the River Box, the River Brett and Flowton/Belstead Brook, a tributary of the River Orwell.

- 7.8 A description of the focused study area in relation to the environmental constraints defined in Chapter 6.0 follows below. The environmental constraints are presented on Figure 2, with Topography, Landscape Character and Historic Landscape Characterisation shown on Figures 3, 4 and 5 respectively.

Environmental Constraints Used for Identifying Corridors

- 7.9 As described in Chapter 6.0 there are no National Parks, Heritage Coasts, World Heritage Sites, Special Areas of Conservation, National Nature Reserves or Registered Battlefields within or close to the study area.

Areas of Outstanding Natural Beauty (AONB)

- 7.10 Dedham Vale AONB straddles the Suffolk-Essex border along the River Stour. It is designated as an exceptional example of a lowland river valley. Picturesque villages, rolling farmland, slow meandering rivers, water meadows and ancient woodlands combine to create an example of the traditional English lowland landscape. The area has a rich history and has been the inspiration of many writers and painters, notably Constable. The history of the area has led to the AONB being designated not only for its landscape but also for its cultural significance.
- 7.11 The designated area of the AONB stretches upstream from Manningtree to within one mile of Bures covering an area of approximately 90km². It extends into the study area in its northern extent where the existing 132kV and 400kV overhead lines between Bramford Substation and Twinstead tee pass through approximately 3km of the AONB to the north west of Polstead.
- 7.12 The landscape quality of the remainder of the Stour Valley has resulted in its designation as a Special Landscape Area and countryside management takes place within this wider framework under the title the Stour Valley Project. The Twinstead Tee is within this wider Stour Valley area.
- 7.13 In addition to its scenic and landscape values, the AONB includes several key habitats including ancient woodland, acid grassland/lichen heath, ancient hedgerows, hay meadows, cereal field margins, wet woodlands, eutrophic open water (ponds and lakes), flood-plain grassland, grazing marsh and ancient hedgerows.
- 7.14 Management plans for the area focus on addressing responses to the challenges faced by the landscape. Key challenges in the area are listed on the Dedham Vale AONB and Stour Valley Project website as:
- changing agricultural practices;
 - winter storage reservoirs;
 - horsiculture (development associated with an increase in horse grazing);
 - infrastructure developments (e.g. sewage works, telecom masts, overhead lines and roads);
 - lack of screening around some buildings; and
 - inappropriate development.

(Source: www.dedhamvalestourvalley.org)

Sites of Special Scientific Interest (SSSIs)

7.15 Sites of Special Scientific Interest (SSSIs) are designated as examples of the country's best wildlife and geological sites. They form the highest level of ecological constraint within the focused study area. The SSSIs are interspersed throughout the study area and predominantly comprise areas of woodland. A summary of the SSSIs within the study area follows below:

Table 4.1: Summary of SSSIs In Study Area

SSSI	Location / Grid Ref	Reason for Designation
Hintlesham Woods	North west of Hintlesham TM 055440	These woods are one of the largest remaining areas of ancient coppice-with-standards woodland in Suffolk. A variety of birds breed in these woods, encouraged by the recent resumption of coppicing in Wolves Wood. Species include Woodcock, Nightingale, Tawny Owl, Nuthatch and Whitethroat.
Arger Fen	North east of Bures TL 933357	Much of the site is woodland with areas of fen and grassland. The juxtaposition of several different habitats increases the value of the site for birds and insects. The steep sandy banks attract Badgers and there are a number of active setts within the site boundary.
Cornard Mere	South of Sudbury TL 888389	Cornard Mere comprises a seasonally flooded area of fen, species-rich ruderal herb vegetation, woodland, scrub and neutral grassland. Cornard Mere attracts considerable numbers of over-wintering snipe and provides a habitat for a variety of insects, including an uncommon sawfly.
Edwardstone Woods	North west of Edwardstone TL 935430	The Edwardstone Woods SSSI comprises an inter-related group of ancient woods (including Cowper's Wood, Park Wood and Stallington Wood) containing a diversity of stand types. These form a transition from mainly ash-maple-hazel woods of mid-Suffolk to the lime of south Suffolk.
Elmsett Park Woods	East of Elmsett TM 065465	A very wide range of woodland types are present and with an equally diverse ground flora the site is considered to be one of the richest small woods in Suffolk.
Milden Thicks	North of Edwardstone TL 942452	This group of woods (including Long Wood, Hazel Wood, Hall Wood, and Bulls Cross Wood) are of ecological and historical interest as individual woods. As a group they are of national importance for the comparison that can be made between them, especially in explaining the ecological behaviour of trees and the distribution of tree communities.

7.16 The Hintlesham Woods SSSI designation covers two areas of woodland: Hintlesham Wood, and Wolves Wood approximately 500m to the north-west. Both woods are also part of an RSPB reserve as the area of coppiced woodland is valuable for several species of bird. The existing 400kV Bramford to Twinstead overhead line runs through this woodland.

Special Protection Areas (SPA)

- 7.17 The Stour and Orwell Estuaries SPA is over 7km to the south of the focused study area around the lower reaches of the River Stour and estuary.

Ramsar Sites

- 7.18 The Stour and Orwell Estuaries Ramsar site (coincident with the SPA described above) is over 9km to the south of the study area around the lower reaches of the River Stour and estuary.

Scheduled Monuments (SMs)

- 7.19 Scheduled monuments are given legal protection by being placed on a list, or 'schedule'. English Heritage takes the lead in identifying sites in England which should be placed on the schedule by the Secretary of State for Culture, Media and Sport. A schedule has been kept since 1882 of monuments whose preservation is worthy of protection. The current legislation, the Ancient Monuments and Archaeological Areas Act 1979, supports a formal system of Scheduled Monument Consent for any work to a designated monument.
- 7.20 There are 18 SMs interspersed within or very close the area of focused study. Primarily the SMs are isolated moated sites or the remains of castles which are not interlinked. The SMs in the area are listed below:

Table 4.2: Scheduled Monuments in Study Area

Reference	Name	Easting	Northing
24872	Roman Villa South Of Alphamstone Church Alphamstone	587884.6	235389.1
33299	Moated Site At Moat Farm, 230m North East Of St Peter's Church, Milden	596017.2	246694.1
SF50	Kersey Priory, Kersey	599892.5	244465.4
33295	Moated Site At Moat Farm, 450m South Of Cobbler's Corner	607751.2	241839.3
33298	Moated Site At Naughton Hall, Naughton	602251.4	249044.2
32439	Remains Of Church And Churchyard, 80m South East Of The Ryes, Little Henny	586098.2	238492.2
33297	Moated Site At The Old Rectory, 150m North East Of Malting Farm, Elmsett	605484.4	246691.1
SF163	Pitches Mount, Groton	596322.4	242555.6
SF57	Offton Castle, Offton	606530.2	249150.2
SF181	Bridge north of Bridge Farm, Chelsworth	598244.1	247975.8
SF49	Lindsey Castle, Lindsey	597996.2	244151
SF20	Toppesfield Bridge, Hadleigh	602574.5	242151.5
SF111	Mound of Milden Castle	594971.1	246120.2
SF19	St James' Chapel, Lindsey	597786.1	244376.3
SF132	Manorial bank adjacent to Lindsey Chapel	597818	244274.7
33293	Moated Site and remains of demolished parts of Shelley House	602872	238223
SF23	Wenham Castle (Little Wenham Hall)	608077	239066
SF56	Great Bricestt Moated Site	603682	250672

Historic Buildings

- 7.21 There are numerous Listed Buildings throughout the study area. These are predominantly contained within town and village centres. In particular there are clusters of historic buildings within the villages of Hadleigh, Kersey, Boxford, Sudbury, Monks Eleigh and Chelsworth. Beyond these settlements there are a number of listed buildings scattered throughout the area.

Conservation Areas

- 7.22 There are several Conservation Areas within the study area. These tend to be focused around town and village centres and include Bures, Bilesden, Boxford, Brent Eleigh, Chelsworth, Great Waldingfield, Hadleigh, Kersey, Little Waldingfield, Monks Eleigh, Naughton, Polstead and Sudbury. Several Conservation Area boundaries extend to include an area beyond the settlement boundary, particularly at Monks Eleigh, Chelsworth and Hadleigh.

Registered Parks and Gardens

- 7.23 The Grade II Listed Chilton Hall and its gardens are located within the north west of the study area to the north of Chilton. The hall and 9.3ha gardens are included on English Heritage's Register of Park and Gardens. Tendring Hall Registered Park and Garden is located approximately 2km to the south of the existing overhead lines within in the Dedham Vale AONB and Melford and Kentwell Registered Parks and Gardens are located over 3km to the north west of the study area.

Woodlands

- 7.24 There are numerous woodlands interspersed throughout the study area and these tend to be present in discrete blocks rather than large swathes. Many of the woodlands are Ancient Woodland, with several also designated as SSSIs.
- 7.25 The majority of woodlands are relatively small ,however larger woodland blocks are found to the west of Assington (Assington Thicks), to the southeast of Hadleigh (Raydon Great Wood) and to the east of Hadleigh (Hintlesham Wood and Wolves Wood).
- 7.26 Woodland types within the area primarily consist of semi-mature and mature mixed broadleaved woodland.

Settlements

- 7.27 Bramford Substation is approximately 2km to the west of the villages of Bramford and Sroughton. These villages are to the west of the A14 which forms the western periphery of the county town of Ipswich.
- 7.28 The key settlements within the study area are the towns of Hadleigh and Sudbury. Hadleigh is a small market town located approximately 7km to the south west of Bramford Substation and to the east of the River Brett. The town has a historic core with numerous listed buildings and a Conservation Area, with modern expansion including new housing and light industrial developments on the perimeter of the town, particularly noticeable to the north.

- 7.29 Sudbury is a larger market town, centred around a historic core at Market Hill. It is in the western extent of the study area adjacent the River Stour which flows in a north-south direction to the west of the town.
- 7.30 There are numerous other villages dispersed throughout the area, the larger of which are located along the classified roads, with smaller villages and hamlets linked by the minor road system. The river valleys appear to support most of the transport corridors and subsequently settlements within the area.

Individual Dwellings/Sensitive Receptors

- 7.31 There are many scattered dwellings typically along the network of narrow lanes throughout the study area.
- 7.32 A network of footpaths covers the study area. These footpaths are largely used for recreational purposes and include long distance walks which include the Stour Valley Path which follows the River Stour from Newmarket through Dedham Vale AONB to the Stour estuary; and the St Edmund Way which runs from Flatford on the Stour, through the AONB, to Brandon in Sussex. The Stour Valley Path passes under the existing overhead lines to the east of Twinstead.
- 7.33 The area is of interest as a tourist destination, particularly the Dedham Vale area and its association with Constable. Numerous local walks, cycle routes and buildings and landscapes of interest are identified in visitor leaflets.

Development Plan Allocations for Housing

- 7.34 There are 4 development plan allocations for housing and open space within the focused study area. They are located to the south and south east of Sudbury, to the north east of Hadleigh and to the north of Whatfield.
- 7.35 The Chilton Mixed-Use Development is a significant mixed use allocation to the north of Sudbury. The allocation proposes an extension of the urban edge of Sudbury by creating a new neighbourhood of integrated sustainable development comprising housing, employment, community and retail facilities and community woodland.

Mineral Sites

- 7.36 There are four sites within the study area designated as current or proposed sand and gravel working sites in the Suffolk County Council Minerals Local Plan (1999). They include an 8.8 hectare site to the north of Hadleigh at Peyton Hall Farm; a 41 hectare site to the south west of Great Waldingfield; a 28 hectare extension to the existing 68.5 hectare site at Popes Green Farm to the south west of Hadleigh between Polstead and Layham adjacent the existing 400kV and 132kV overhead lines; and a 9 hectare site to the north west of Edwardstone which has mineral consent for extraction until 2042.

Airfields/Airstrips

- 7.37 There are two airfields within the study area. Elmsett Airfield lies to the north east of Hadleigh to the west of Elmsett at Poplar Hall. The airfield is a small private facility.

- 7.38 Wattisham Airfield lies to the north of the study area between Wattisham and Great Bricett. The airport is managed by the Army Air Corps and is primarily used by regiments of the Army Air Corps and as a helicopter base.

Topography

- 7.39 The area comprises a broadly flat plateau at around 70-80mAOD dissected by several river valleys (the River Stour, River Box, River Brett and Flowton/Belstead Brook) which give rise to lower lying valley areas surrounded by areas of higher ground. The river valleys run in a broadly northnorthwest–southsoutheast direction through the study area with the Rivers Stour, Box and Brett joining together to the south to give rise to the important lowland river valley landscape designated as the Dedham Vale AONB. The topography of the area is illustrated on Figure 3.

Landscape Character

National Landscape Character Assessment

- 7.40 The entire study area falls within *Character Area 86 South Suffolk and North Essex Clayland* in the national character assessment produced by the Countryside Council (now Natural England).
- 7.41 The area is described as a broadly flat chalky boulder clay plateau dissected by undulating river valleys. The area is predominantly arable with some pasture within the valleys. Small settlements around tyes (commons), farmsteads and moated sites are scattered throughout the area, with buildings often timber framed and colour washed. Impressive churches are notable. There are few large woods, but smaller woods, including ancient coppice, and trees and hedgerows join together to give rise to some wooded skylines, with others bare ridgelines. There is a strong winding road network with characteristic sunken lanes.
- 7.42 The area has a cultural association with Constable centring on Dedham Vale, which is an example of *'preserved, archetypal lowland pastoral English countryside coupled with attractive vernacular buildings dating from a period of industrial wealth'*.

County Landscape Character Assessments (LCA)

- 7.43 The landscape character of the area is closely related to the river valleys, comprising the water courses and the river valleys, and the 'interfluves' which comprise the higher land between the rivers. The study area includes the counties of Suffolk and Essex and landscape character assessments for both counties have been reviewed. The county landscape character assessments are summarised on Figure 4.

River and Valley Landscapes

Character Area 26: Valley Meadowlands (Suffolk LCA)

- 7.44 These are flat valley floors of alluvium or peat supporting grasslands divided by a network of wet ditches. The meadows include occasional carr woodland, poplar plantations and small reedbeds and the area is generally grazed by cattle, however there is some conversion to arable production. These tranquil meadows form picturesque landscapes within the wider arable landscape.
- 7.45 These landscapes are generally unsettled due to their low lying nature, with occasional farms located on slightly higher ground.
- 7.46 This character area is found along the Rivers Stour, Box, and Brett within the study area.

Character Area 18: Rolling Valley Farmlands (Suffolk LCA)

- 7.47 These gentle valley sides have a smaller organic field pattern than that found on the plateau, which increases in size towards the plateau edges. The valley sides also support a scattering of parks and some ancient woodlands on the fringes. There is a concentration of prosperous medieval towns and villages linked by sunken lanes within the valleys often with distinctive churches.
- 7.48 This character area embraces some of the most famous views in Suffolk, with the Stour valley being known as 'Constable Country' as it was the inspiration for many of his paintings.
- 7.49 This character area is found along the valleys of the River Stour, River Box, River Brett and Belstead Brook (including Flowton and Spring Brooks) within the study area.

Character Area C8: Stour Valley (Essex LCA)

- 7.50 This area has a wide valley floor with floodplain meadows, riverbank willow trees and small areas of wet woodland. The rolling valley sides comprise a complex mosaic of small woods, pasture and arable fields with a sinuous pattern of lanes and roads. Traditional villages with church towers, farmsteads, barns and mills are distinctive features in the landscape.
- 7.51 The valley is relatively undeveloped with a secluded tranquil character. In more open areas panoramic views are possible within the valley, whereas in more enclosed parts views are framed or focused.
- 7.52 This character area is located along the Stour Valley on the Essex side of the county boundary. The existing tee point at Twinstead is located within this character area.

The 'Interfluve' Landscapes

- 7.53 The remaining landscape character areas within the study area are considered to be 'interfluves' (the land 'in-between' the rivers).

Character Area 3: Ancient Plateau Claylands (Suffolk LCA)

- 7.54 The area is characterised by a flat or gently rolling arable landscape dissected by small river valleys. Field patterns are of ancient enclosure with hedgerows of hawthorn and elm and hedgerow trees of oak, ash and field maple.
- 7.55 The settlement pattern is of loosely clustered villages, hamlets and isolated farmsteads, with villages often associated with greens or tyes. Farmstead buildings are often timber framed, houses colour washed and barns tar blackened with roofs predominantly tiled, or occasionally thatched.
- 7.56 Parcels of ancient woodland are scattered through the area, and these together with a network of winding hedged lanes create visual intimacy in places. The plateau areas are more open as a result of 20th century agricultural change and World War II airfield use.
- 7.57 This character area is located between Bramford and Hadleigh in between the River Orwell tributaries and the River Brett.

Character Area 1: Ancient Estate Claylands (Suffolk LCA)

- 7.58 This area is described as a dissected boulder clay plateau with an organic field pattern. The settlement pattern comprises villages, hamlets and farmsteads which include timber framed buildings and estate cottages, with enclosed greens and commons. An estate and parkland influence is evident and the area also supports areas of ancient semi natural woodland.
- 7.59 Despite being a well wooded landscape the plateau landform means that views are often open and can be long. However winding lanes and hedgerows result in other areas being more intimate.
- 7.60 This character area is located between Chattisham and Raydon to the south of Bramford.

Character Area 4: Ancient Rolling Farmlands (Suffolk LCA)

- 7.61 This area is characterised by a rolling arable landscape of chalky clays and loams dissected widely and sometimes deeply by river valleys. Field patterns are of ancient random enclosure with hedgerows of hawthorn and elm and hedgerow trees of oak, ash and field maple. There are however substantial open areas arising from airfield creation and field amalgamation for agricultural improvement.
- 7.62 The settlement pattern is of loosely clustered villages, hamlets and isolated farmsteads, with villages often associated around greens. Farmstead buildings are often timber framed, houses colour washed and barns tar blackened with roofs predominantly tiled, or occasionally thatched.
- 7.63 Parcels of ancient woodland are scattered through the area and a network of winding hedged lanes combines to create visual intimacy in places. The field amalgamation on the interfluves has however created longer views over a lightly wooded countryside.
- 7.64 This character area is located between Hadleigh and Sudbury on the interfluves between the Rivers Brett, Box and Stour.

Character Area B3: Blackwater and Stour Farmlands (Essex LCA)

- 7.65 This character area is defined as a gently undulating or flat landform with a large scale arable field pattern giving rise to wide views across farmland. There are relatively few woodlands and hedgerows which are confined to localised areas. Intermittent mature trees and electricity pylons are strong features within this flat landscape. Small villages and hamlets linked by winding lanes contain a wealth of historic buildings and the area has a tranquil character.
- 7.66 This character area is located to the west of the study area beyond Twinstead Tee. No new works in relation to this connection are proposed within this area.
- 7.67 There are policies contained within local plans which relate to specific landscapes or landscape features. These are not national designations however these areas are nevertheless considered to be valuable landscapes within the local area with specific policies affording their protection. Although contemporary central government planning advice presumes against their retention, their local value has been emphasised in responses received from the pre-study information exchange and information on their landscape character has been considered.

Special Landscape Areas (SLA)

7.68 Several areas of land within the Babergh District Council Local Plan and the Braintree District Local Plan are designated as 'Special Landscape Areas'. These SLAs spread northwards from the Dedham Vale AONB in swathes following the valleys of the Rivers Stour, Box, Brett and Belstead Brook.

7.69 These areas are designated for their special landscape character under policy CRO4 of the Babergh District Local Plan. Policy CRO4 states:

'Development proposals in Special Landscape Areas will only be permitted where they maintain or enhance the special landscape qualities of the area identified in the relevant landscape appraisal; and are designed and sited so as to harmonise with the landscape setting.'

7.70 The local plan makes specific reference to proposals by statutory undertakers within special landscape areas in Policy CRO5, which states:

'In considering proposals by statutory undertakers and utility providers for buildings and other installations in Special Landscape Areas, particular regard will be paid to siting, design and landscaping. 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.'

7.71 A large area including the existing Twinstead Tee is designated a SLA in the Braintree District Local Plan. Policy RLP79 of the local plan states:

'Development likely to cause permanent loss or damage to the traditional rural qualities of the countryside, or its essential landscape character will be refused. Any development that is permitted in Special Landscape Areas will be expected to conform to the highest standards of design, siting and layout with materials appropriate to the character of the area, with appropriate landscaping. The conservation and maintenance of features important to the local landscape such as trees, hedges, copses, woodlands and ponds will be encouraged.'

Historic Landscape Characterisation

The Suffolk Historic Landscape Characterisation

7.72 The Suffolk HLC map was created as the first part of a regional East of England HLC map. It has identified and defined a set of historic landscape character types based on current land use and an assessment of its historical origin. The HLC identifies 14 broad character types (which are shown on Figure 5) which can further be subdivided into 77 subtypes.

7.73 The study area, and much of south Suffolk, predominantly comprises Type 1.0 - Pre 18th Century Enclosure. This is described as land which was enclosed for agriculture before 1700. This landscape of 'ancient enclosure' shows little evidence of change however it includes pockets of Type 3.0 - Post 1950 Agricultural Landscape where the character has been altered as a result of agricultural changes in the post war period, for example the weakening or removal of hedgerows and the conversion of meadow land to arable crop production.

- 7.74 Type 5.0 - Meadow or Managed Wetland is also found within the study area along the river valleys of the Stour, Box, Brett and Belstead.
- 7.75 Small pockets of Type 7.0 – Woodland are dispersed through the study area. Woodland has been a characteristic part of the Suffolk landscape since prehistoric times with the majority of woodland still present being ancient woodland.
- 7.76 To the west of the study area there is greater evidence of Type 2.0 - 18th Century and Later Enclosure. This together with areas of Type 3.0 - Post 1950 Agricultural Landscape, Type 8.0 - Horticulture (Orchard), Type 4.0 Common Pasture and Type 9.0 Post Medieval Park and Leisure gives rise to a more modern field pattern.

8.0 ROUTE CORRIDOR OPTIONS

- 8.1 This section identifies potential corridors for a Bramford to Twinstead connection in accordance with the method described in Chapter 4.0. Reference is made to routeing constraints identified in the study area and described in Chapter 7.0.
- 8.2 Desk based assessment supplemented with site visits has enabled route corridors to be identified which seek to avoid the areas of greatest environmental constraint. Existing 132kV and 400kV overhead lines run in a broadly east-west alignment through the study area and offer potential to be used as 'opportunity corridors'. These existing overhead line routes may affect environmental constraints, although the scale of change which would result from the existing situation by installing a new line in addition to or replacing the existing line may be lower than a new line in a situation where no line presently exists.
- 8.3 The following have been identified for consideration:
- A corridor for a new line parallel to the existing 400kV overhead line;
 - A corridor using the route of the existing 132kV line between Bramford and Twinstead; and
 - Corridors for an entirely new route(s) which seek to avoid areas of environmental constraints.
- 8.4 This Chapter presents a description of the route corridors identified. A comparison of alternatives and identification of the least technically constrained option follows in Chapter 9.0. The corridors described below are illustrated on Figure 6, with photographs representing key aspects on Figures 8-15.
- 8.5 All of the corridors under consideration will have connection points at Bramford Substation and the existing tee at Twinstead. Photographs of these connection points are shown on Figures 8 and 9. All corridors will require an extension to the existing Bramford Substation and those works will be the same regardless of which option is taken forward and do not therefore factor in the comparison of corridors. All of the corridors would require the reconfiguration of the existing overhead line arrangement at Twinstead Tee, possibly extending to the adjacent tower to the west. However no other works (such as substations or compounds) would be required at Twinstead. Where other works are required to make the proposed connection these are described in the overview sections for each route corridor below.

Corridor 1 – Parallel to existing 400kV overhead line

Overview

- 8.6 Corridor 1 considers the option to parallel the existing 400kV overhead line which runs from Bramford to Twinstead Tee with a new 400kV overhead line. The existing 132kV line between Bramford and Twinstead tee would remain with this option. Photographs showing the existing 400kV and 132kV overhead lines are shown on Figures 10 and 11. The existing overhead line uses towers of an L6 design which are approximately 50m in height. The proposed overhead line would use towers of a new design, which are likely to be around 47m high.

- 8.7 This corridor proposes a closely aligned corridor to the north or south. A distance of 50 -70m is considered to be the closest technically achievable distance for paralleling and this closest distance is preferred to limit the extent of influence. This close alignment may be difficult to achieve along the full length of the corridor established around the existing line due to close proximity of environmental constraints, requiring offsetting in some places. A distance of 200m to either side of the existing overhead line has been indicated on Figure 6 to provide scope for offsetting. Photographs showing examples of close paralleling are shown on Figures 12 and 13.
- 8.8 The existing overhead line runs in a broadly southwest alignment from Bramford Substation to the south of Hadleigh to the existing Twinstead tee from where a 400kV overhead line continues west towards Pelham and a further line runs south to Braintree.
- 8.9 This corridor following the existing 400kV overhead line between Bramford and Twinstead tee is 26km in length.

Route Description in Relation to Environmental Constraints

Bramford/Burstall/Hintlesham

- 8.10 The existing 400kV overhead line exits Bramford Substation in a northwesterly direction before heading immediately south west and crossing Belstead Brook to the north of the village of Burstall near Burstall Hill. It continues to the north of Hintlesham village in the vicinity of Hintlesham Park and Hintlesham Hall Hotel.
- 8.11 From here the existing overhead line intersects Hintlesham Wood which is designated as a SSSI (as an example of ancient coppice-with-standards) and RSPB reserve for the associated bird life it supports.
- 8.12 Paralleling in this area would be constrained by and would need to consider scattered properties, smaller areas of woodland the north of Hintlesham and the larger Hintlesham Wood. Although the existing overhead line intersects this woodland, paralleling would lead to an effect over a much larger swathe of woodland.

Hadleigh

- 8.13 The overhead line runs west in the vicinity of several farms to the north of Tom's Wood and Great Wood. It continues to the south of Hadleigh and to the north of Upper Layham in the Brett river valley. It crosses the Railway Walk LNR (a footpath/cycle route along a disused railway supporting woodland) which extends in a south east direction from the south of Hadleigh.
- 8.14 Paralleling in this area would be constrained by and would need to consider scattered properties, smaller areas of woodland, Railway Walk, and the River Brett River and its valley.

Boxford/Polstead Heath

- 8.15 The overhead line continues west towards Polstead Heath crossing close to, and in places through, small woodlands, particularly at Overbury Hall. At Popes Green Farm to the east of Polstead Heath the existing overhead line crosses a sand and gravel extraction site.

- 8.16 To the south of Polstead Heath the overhead line passes through the Dedham Vale AONB for approximately 3km in the vicinity of the River Box. Peyton Hall, a 12th Century manor property, is situated in this part of the Box Valley. The area also supports several large orchards.
- 8.17 Paralleling in this area would be constrained by and would need to consider scattered properties, in particular Peyton Hall, areas of woodland and the sand and gravel extraction site at Popes Green Farm. The main consideration in this area is the valley of the River Box which lies within the AONB. This corridor option would result in an additional 400kV line in this designated landscape.

Leavenheath to Twinstead

- 8.18 The overhead line continues through arable land featuring orchards. The line passes to the south of the village of Assington and Assington Thicks ancient woodland intersecting smaller woodlands in places. It continues to the south of the Sudbury television transmitter masts and to the south of Workhouse Green before crossing the B1508, the railway and the River Stour valley before connecting at Twinstead.
- 8.19 Paralleling in this area would be constrained by and would need to consider scattered properties, areas of woodland, including that around Twinstead and along the River Stour, the existing television and radio transmitter masts (in accordance with the Holford Rules), the River Stour Valley (part of the Dedham Vale AONB Stour Valley Project). The lanes around Twinstead are protected in the local plan for their landscape and historical value, which would be a consideration particularly for construction access, although existing lines have been constructed and are maintained using these lanes.
- 8.20 A summary of the key environmental issues identified in relation to Corridor 1 is included in Table 8.1 and a comparison of the corridors follows in Chapter 9.

Corridor 2 – Existing 132kV Route

Overview

- 8.21 This option proposes the removal of the existing 132kV overhead line between Burstall and Twinstead and the adoption of its route for a new 400kV overhead line. The existing 132kV overhead line (comprising part of the electricity distribution system) runs from Burstall, 2.5 km to the south of Bramford Substation and is presently 26km in length, although the total length of overhead line required to utilise this route could be up to 28.5km to connect to the substation at Bramford.
- 8.22 The existing 132kV overhead line runs close to the existing 400kV overhead line for the majority of the route (approximately 17km) from a point to the south of Hintlesham Wood where they align, separating only as the 400kV line approaches Twinstead Tee.
- 8.23 There are two alternative options available for consideration at the eastern end of Corridor 2 from a point to the west of Hintlesham. Option A follows the existing 132kV line to the south of Hintlesham and Option B would parallel the existing 400kV line to the north of Hintlesham. Each of the options are described in the section below.

- 8.24 The existing standard 132kV overhead line towers are approximately 26.5m high and the existing 400kV overhead line towers are approximately 50m high. This option would remove the existing 132kV line and rebuild along its route with 400kV towers of a new design, which are likely to be around 47m high.
- 8.25 It has been assumed that a new 400kV overhead line using this corridor would be built closely along the existing alignment to minimise the scale of change. However this may not be possible in certain locations as there may be insufficient space to locate the larger 400kV towers due to environmental constraints, requiring offsetting in some places. 132kV towers are of lower height and width, as compared to 400kV towers as can be seen on the illustrative photographs on Figures 10 and 11. The safety clearances from 132kV overhead lines are less than those required from 400kV overhead lines.

Requirement for Grid Supply Point (400/132kV Substation)

- 8.26 It is understood that additional works will be required on the Distribution Network Operator's (DNO's) system to make the route of the existing 132kV overhead line available to National Grid. Discussions between National Grid and the DNO are still being undertaken regarding the extent of this additional work however it will likely include a Grid Supply Point (GSP) at a point on the system to the west of Twinstead. The GSP would be a 132/400 kV substation with a footprint of around 140x150m which will enable the DNO to continue to operate its network in the area.
- 8.27 The preferred location for the GSP in terms of system compliance is in close proximity to the existing 400 and 132kV overhead lines between Twinstead Tee and Thaxted.
- 8.28 Initial feasibility studies considering environmental and access issues have identified three potential locations for the GSP: Site A Colne Valley Park (near Castle Hedingham); Site B Delvyns Lane (1.5km to the east of Castle Hedingham) and site C Butlers Wood (adjacent to the A131 2.5km west from Twinstead Tee). These potential GSP locations are shown on Figure 7.

Route Description in Relation to Environmental Constraints

Bramford/Burstall/Hintlesham

Option A

- 8.29 The existing 132kV connection exits Bramford Substation to the south via underground cables to a point to the south of the A1071 and Belstead Brook to the west of Hintlesham. From here the connection continues in a south westerly direction on an overhead line.
- 8.30 There is no existing overhead line between the substation and Burstall as this section is cabled underground. A corridor has therefore been identified which takes the most direct route whilst addressing environmental constraints.
- 8.31 There are three blocks of woodland to the south east of the substation. One block is immediately adjacent to the eastern substation boundary, a second block (Round Wood), is approximately 260m to the south east of the substation and Burstall Long Wood is 100m to the south east of Round Wood.
- 8.32 Burstall village is approximately 1km to the south of the substation beyond which Belstead Brook flows lined by woodland (including Alder Carr and Home Wood).

- 8.33 The proposed corridor is defined by the woodlands and built development in the village of Burstall to the south west. Individual properties are included within this 500m corridor however it would enable separation to be achieved between possible alignments and sensitive receptors.
- 8.34 The 132kV line commences at a platform tower approximately 300m to the south of the A1071 near Fen Farm, adjacent ponds in the vicinity of Belstead Brook. This is the point where the existing cables terminate and the circuits continue as an overhead line.
- 8.35 From this point Corridor 2 would follow the existing overhead line. The existing overhead line runs in a westerly direction to the south of the A1071 and the village of Hintlesham, passing close to built development at Cobbler's Corner.

Option B

- 8.36 Option B would follow Corridor 1 along the existing 400kV line from Bramford Substation to a point 1.5km west of Cobblers Corner where the existing 400kV and 132kV overhead lines converge. The existing 400kV overhead line exits Bramford Substation in a northwesterly direction before heading immediately south west and crossing Belstead Brook to the north of the village of Burstall near Burstall Hill. It continues to the north of Hintlesham village in the vicinity of Hintlesham Park and Hintlesham Hall Hotel.
- 8.37 From here the existing overhead line intersects Hintlesham Wood which is designated as a SSSI (as an example of ancient coppice-with-standards) and RSPB reserve for the associated bird life it supports.
- 8.38 Using the 132kV overhead line route in this area would be constrained by and would need to consider scattered properties, smaller areas of woodland to the north of Hintlesham and the larger Hintlesham Wood. Although the existing overhead line intersects this woodland, paralleling would lead to an effect over a much larger swathe of woodland.
- 8.39 From a point 1.5km to the west of Cobbler's Corner the two options would join and the remaining description applies to both. The merits of Option A and Option B would be further considered if Corridor 2 were selected as the preferred corridor.

Hadleigh

- 8.40 To the east of Hadleigh the existing 132kV line passes close to a dwelling, immediately adjacent to woodland and close to the south of Kate's Farm where the existing 400kV line runs closely to the north.
- 8.41 It continues to the south of Hadleigh and to the north of Upper Layham in the Brett river valley 200-300m to the south of the existing 400kV overhead line. It crosses the Railway Walk footpath/cycle route described for Corridor 1 above.

Hadleigh to Leavenheath

- 8.42 From Hadleigh the 132kV overhead line runs closely parallel to the 400kV overhead line and the environmental constraints are similar to those described for Corridor 1 above, comprising river crossings, pockets of woodland and occasionally close to individual properties.
- 8.43 At Popes Green Farm to the east of Polstead Heath the existing overhead line crosses an existing sand and gravel extraction site.

- 8.44 To the south of Polstead Heath the overhead line passes through the Dedham Vale AONB for approximately 3km in the vicinity of the River Box. Peyton Hall, a 12th Century manor property, is situated in this part of the Box Valley. The area also supports several large orchards.
- 8.45 Using the 132kV overhead line route in this area would be constrained by and would need to consider scattered properties, including listed buildings, areas of woodland and the sand and gravel extraction site at Popes Green Farm. The main consideration in this area is the valley of the River Box which lies within the AONB. This corridor option would result in the replacement of an existing 132kV overhead line with a larger 400kV overhead line in this designated landscape.

Leavenheath to Twinstead

- 8.46 The overhead line continues through arable land featuring orchards. The line passes to the south of the village of Assington and Assington Thicks ancient woodland intersecting smaller woodlands in places. It continues to the south of the Sudbury television transmitter masts and to the south of Workhouse Green where the 132kV line deviates slightly from the 400kV line to create a separation of approximately 500m. This deviation appears to be due to the presence of scattered dwellings and blocks of woodland.
- 8.47 Using the 132kV overhead line route in this area would need to consider effects on scattered properties, areas of woodland, including that around Twinstead and along the River Stour, the existing television and radio transmitter masts (in accordance with the Holford Rules), and the River Stour Valley (part of the Dedham Vale AONB Stour Valley Project). The lanes around Twinstead are protected in the Local Plan for their landscape and historical value, which would be a consideration particularly for construction access, although existing lines have been constructed and are maintained using these lanes.
- 8.48 A summary of the key environmental issues identified in relation to Corridor 2 is included in Table 8.1 and a comparison of the corridors follows in Chapter 9.0.

Corridor 3 – New Route Corridor (Direct Option to the North of Hadleigh)

Overview

- 8.49 Corridors 3 and 4 have been identified to avoid the high environmental constraints of the Dedham Vale AONB and with regard to other environmental constraints.
- 8.50 Corridor 3 has sought to take the most direct route between Bramford Substation and Twinstead Tee to the north of Hadleigh whilst avoiding the key environmental constraints identified in Chapter 7.0. Photographs showing this general area are shown on Figure 14.
- 8.51 As for other options, the proposed overhead line would use towers of a new design, which are likely to have standard tower heights of approximately 47m.
- 8.52 This corridor is approximately 26.5km in length. The corridor width extends to over 1km in places, although constraints in other areas reduce its width to tens of metres. The corridor offers the opportunity for a number of alignments to be considered should this option be taken forward.

Route Description in Relation to Environmental Constraints

Elmsett/Aldham

- 8.53 This corridor leaves Bramford Substation at a similar point to the existing Bramford to Pelham overhead line, before immediately taking a western direction to the north of Burtstallhill, with the existing line taking a south western direction. The corridor is initially identified by avoiding the settlements of Flowton to the north and Burstall to the south where it crosses Flowton/Belstead Brook. The corridor then continues over relatively open land defined by Elmsett Airfield to the north and Hintlesham Woods (Wolves Wood) to the south.
- 8.54 Scattered individual properties and blocks of woodland (particularly in the vicinity of Aldham Hall) are included within the corridor, however its width is considered sufficient to enable separation to be achieved between possible alignments and sensitive receptors.

Hadleigh to Boxford

- 8.55 The southern boundary of the corridor is formed by the A1071 and the northern extent by the settlement edge of the village of Kersey and blocks of woodland. The corridor includes a sand and gravel extraction site to the north of Hadleigh. The corridor crosses the River Brett in the vicinity of the A1141. The corridor continues to the north of the A1071 defined by small villages and hamlets scattered throughout the area.
- 8.56 Corridor 3 narrows in the vicinity of Groton and Boxford to avoid these settlements and woodland before splitting to negotiate the linear development of Sherbourne Street. These corridor sub-options then rejoin to the west of Boxford in the vicinity of the River Box.
- 8.57 This section of the corridor runs through a more complicated smaller scale landscape and is tightly constrained in places by village and hamlet settlements and woodlands, limiting the potential alignments available. Potential alignments would also seek to avoid the existing extraction site to the north of Hadleigh.

Boxford to Assington

- 8.58 To the west of the River Box the landscape opens and the corridor assumes a greater width as it crosses higher ground to the west of Newton in the vicinity of the A134/A1071 junction. The corridor is bounded by Newton and Little Cornard to the north and west, and the substantial Assington Thicks woodland and settlement to the east and south.
- 8.59 This part of the corridor is largely open although it includes small numbers of individual properties and blocks of woodland which are considered to be avoidable in identifying alignments within the corridor. The identification of alignments would seek to avoid potential cumulative effects which could arise from routeing in close proximity to the existing overhead line and masts already present on this area of higher ground.

Little Cornard to Twinstead

- 8.60 From here the corridor narrows between woodland and development at Little Cornard to the north and the settlement at Workhouse Green to the south. It drops in elevation towards the River Stour valley where it crosses the B1508, the railway and River Stour close to the flat valley floor. It then takes to slightly higher ground to approach Twinstead Tee 2km to the west.

- 8.61 The scale of the landscape, particularly the Stour valley, together with scattered properties and woodlands result in this section of route corridor being more constrained and probably limiting the potential alignments available. The existing 400kV overhead line is also present in this section, reducing opportunities for a separate route corridor where the two lines would not be seen in parallel. The Stour Valley Path and St Edmonds Way also pass to the north and east of Twinstead Tee.
- 8.62 A summary of the key environmental issues identified in relation to Corridor 3 is included in Table 8.1 and a comparison of the corridors follows in Chapter 9.0.

Corridor 4 – New Route Corridor (Northerly Option)

Overview

- 8.63 Corridor 4, as Corridor 3, has been considered as a potential option to avoid paralleling the existing overhead line to the south of Hadleigh and to avoid the installation of a further overhead line through the northern section of the Dedham Vale AONB.
- 8.64 Corridor 4 takes a less direct route than Corridor 3 in order to address some of the issues of environmental constraint identified in Corridor 3. It takes a more northerly route to largely avoid the Special Landscape Areas defined in the Local Plan. Photographs of this general area are shown on Figure 15.
- 8.65 As for other corridors considered, the proposed overhead line would use towers of a new design, which are likely to be around 47m high. This corridor is approximately 30km in length. The corridor width extends to over 2km in places, although constraints in other areas narrow it to tens of metres. The corridor offers the opportunity for a number of alignments to be considered should this option be taken forward.

Route Description in Relation to Environmental Constraints

Elmsett/Flowton

- 8.66 This corridor runs in a northwest direction from the substation at Bramford. The corridor splits to avoid the settlement with Flowton, with the western option defined by the settlements of Elmsett and Flowton, and the eastern option following the alignment of the existing 132kV overhead line to the north of Somersham Park woodland. The corridor rejoins and runs westwards through open land between Naughton and Whatfield.
- 8.67 The corridor is approximately 1.5km wide at this point and comprises generally open land with occasional scattered properties and small woodlands. The corridor width is considered sufficient to enable possible alignments to achieve separation between constraints of woodlands and properties.

North of Kersey

- 8.68 Settlements primarily define the extent of the corridor in this area. The settlements of Nedging, Chelsworth and Monks Eleigh restrict the extent of the corridor to the north, with Whatfield, and Lindsey Tye restricting the corridor to the south. The settlement of Semer, and associated woodland along the River Brett, forms a constraint within this broad corridor and has necessitated the corridor splitting to the north and south of Semer.

- 8.69 Much of the corridor is open with large scale field patterns enabling separation between woodlands and scattered dwellings. Route alignments would seek to minimise effects on the area around the River Brett where the landscape pattern is more intimate with settlements and vegetation are concentrated in the valley.

Milden/Edwardstone

- 8.70 Further development along the B1115 at Little Waldingfield, Great Waldingfield and Newton define the northern and western extent of the corridor. To the east the corridor is limited by the village of Edwardstone. The corridor splits in the vicinity of Park Wood where constraints of woodland and settlement along the River Box require corridors to pass to the east and west of Park Wood.

- 8.71 The corridor is up to 1.5km wide and comprises generally open land with occasional scattered properties and small woodlands. Parts of Milden Thicks SSSIs are included in the corridor (Long Wood, Hazel Wood, Hall Wood and Walding Wood), however these are considered to be discrete woodlands which are not physically linked. Alignments could be achieved in this corridor which would avoid the woodlands and not affect the integrity of the SSSI.

Newton to Assington

- 8.72 To the south west of the River Box the landscape opens and allows the corridor to increase in width as it crosses higher ground to the west of Newton in the vicinity of the A134/A1071 junction. The corridor is bounded by Newton and Little Conard to the north and west, and the substantial Assington Thicks wood and settlement to the east and south. At this point it merges with Corridor 3 described above.

- 8.73 This part of the corridor is largely open with small numbers of properties and woodlands considered to be avoidable in identifying alignments. The existing overhead line and masts present on this area of higher ground require consideration.

Little Conard to Twinstead

- 8.74 From here the corridor narrows to the south of Sudbury between woodland and development at Little Conard to the north and the settlement at Workhouse Green to the south. It drops in elevation towards the River Stour valley where it crosses the B1508, the railway and River Stour close to the flat valley floor. It then takes to slightly higher ground to approach Twinstead Tee 2km to the west.

- 8.75 The scale of the landscape, particularly the Stour valley, scattered properties and woodlands result in this section being more constrained limiting the potential alignments available. The existing 400kV overhead line is also present in this section again reducing the opportunity for routes to be seen as separate. The Stour Valley Path and St Edmonds Way pass to the north and east of Twinstead Tee.

- 8.76 A summary of the key environmental constraints identified in relation to the proposed corridors is presented in Table 8.1. Chapter 9.0 presents TEP's analysis of the route corridors against the environmental constraints, topography and landscape.

TABLE 8.1 ASSESSMENT OF CORRIDORS AGAINST ENVIRONMENTAL CRITERIA

CORRIDORS → ENVIRONMENTAL CRITERIA ↓	CORRIDOR 1 (Approximate Length 26km)	CORRIDOR 2 (Approximate Length 28.5km)	CORRIDOR 3 (Approximate Length 26.5km)	CORRIDOR 4 (Approximate Length 30km)
Areas of Outstanding Natural Beauty	3km of corridor passes within Dedham Vale AONB parallel to two existing overhead lines (400kV and 132kV).	3km of corridor passes within Dedham Vale AONB parallel to the existing 400kV overhead line along the route of the existing 132kV line which would be removed.	Does not pass through AONB. Closest point approximately 1.25km distant.	Does not pass through AONB. Closest point approximately 3km distant
Sites of Special Scientific Interest	Existing OHL passes through Hintlesham Woods SSSI. Close paralleling would lead to alignment through SSSI. Potential to deviate from close paralleling to avoid effect on SSSI.	Option A runs <0.5km to the south of Hintlesham Woods SSSI Option B follows the existing 400kV OHL which passes through Hintlesham Woods SSSI. Close paralleling would lead to alignment through SSSI. Potential to deviate from close paralleling to avoid effect on SSSI.	Hintlesham Woods SSSI (Wolves Wood) < 100m to south of corridor. Considered avoidable in identifying alignments.	Milden Thicks SSSI within corridor Edwardstone Woods SSSI excluded from although surrounded by corridor Individual woodlands considered avoidable in identifying alignments
Special Protection Areas	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.
Ramsar sites	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.	No direct effect. Review of existing bird record data does not indicate a link between the study area and the SPA.
Scheduled Monuments	No direct effect. Existing overhead lines within 2km of 2 SMs. Effect on setting requires consideration in detailed alignment stage	No direct effect. Existing overhead lines within 2km of 2 SMs. Effect on setting requires consideration in detailed alignment stage	No direct effect. 7 SMs within 2km of corridor. Effect on setting requires consideration in detailed alignment stage	No direct effect 11 SMs within 2km of corridor. Effect on setting requires consideration in detailed alignment stage
Historic Buildings Listed I and II*	4 Listed Buildings within 500m To be avoided in identification of alignments. Effect on setting to be considered.	5 Listed buildings within 500m To be avoided in identification of alignments. Effect on setting to be considered.	8 Listed Buildings within 500m To be avoided in identification of alignments. Effect on setting to be considered.	13 Listed Buildings within 500m To be avoided in identification of alignments. Effect on setting to be considered.
Conservation Areas	No direct effect. 2 Conservation Areas within 1km of corridor (Hadleigh and Polstead). Effect of overhead lines on setting minimised due to location of Conservation area within settlement boundaries.	No direct effect. 2 Conservation Areas within 1km of corridor (Hadleigh and Polstead). Effect of overhead lines on setting minimised due to location of Conservation area within settlement boundaries.	No direct effect. 3 Conservation Areas within 1km of corridor (Hadleigh, Kersey and Boxford). Effect of OHL on setting minimised due to location of Conservation area within settlement boundaries.	No direct effect 4 Conservation Areas within 1km of corridor (Little Waldingfield, Monks Eleigh, Chelsworth and Naughton) Effect of OHL on setting minimised due to location of Conservation area within settlement boundaries.
Woodlands	Existing overhead line crosses (or is very close to) approximately 15 woodlands. Woodland avoidance more difficult in achieving close synchronised paralleling to existing overhead lines.	Existing overhead line crosses (or is in very close to) approximately 15 woodlands. Woodland avoidance more difficult in achieving close alignment to existing overhead line.	Corridor includes 20 small woodlands. Woodlands considered to be avoidable in identifying detailed alignments.	Corridor includes 16 small woodlands. Woodlands considered to be avoidable in identifying detailed alignments.

CORRIDORS → ENVIRONMENTAL CRITERIA ↓	CORRIDOR 1 (Approximate Length 26km)	CORRIDOR 2 (Approximate Length 28.5km)	CORRIDOR 3 (Approximate Length 26.5km)	CORRIDOR 4 (Approximate Length 30km)
Settlements	Existing overhead line avoids passing through settlement centres. Burstallhill, Burstall, Hintlesham, Hadleigh, Upper Layham, Lower Layham, Polstead Heath, Whitestreet Green, Assington, Workhouse Green and Twinstead within 1km. Detailed alignment stage will seek to minimise effects on views.	Existing overhead line avoids passing through settlement centres. Burstall, Hintlesham, Chattisham, Hadleigh, Upper Layham, Lower Layham, Polstead Heath, Polstead, Whitestreet Green, Leavenheath, Assington, Workhouse Green and Twinstead within 1km. Detailed alignment stage will seek to minimise effects on views.	The corridor has excluded settlements and has sought to achieve least effect on settlements, however it passes in closely between Groton, Boxford and Sherbourne Street. Burstall Hill, Flowton, Elmsett, Hadleigh, Kersey, Groton, Boxford, Edwardstone, Newton, Little Conard, Assington, Workhouse Green and Twinstead within 1km. Detailed alignment stage will seek to minimise effects on views.	Corridors exclude settlements and have sought to achieve route of least effect on settlements. Burstall Hill, Flowton, Elmsett, Somersham, Naughton, Whatfield, Nedging, Semer, Chelsworth, Monks Eleigh, Milden, Edwardstone, Newton, Little Conard, Assington, Workhouse Green and Twinstead within 1km. Detailed alignment stage will seek to minimise effects on views.
Individual Properties	Scattered farmsteads and dwellings throughout area. Detailed alignment stage will seek to minimise effects on views.	Scattered farmsteads and dwellings throughout area. Detailed alignment stage will seek to minimise effects on views.	Scattered farmsteads and dwellings throughout area. Detailed alignment stage will seek to minimise effects on views.	Scattered farmsteads and dwellings throughout area. Detailed alignment stage will seek to minimise effects on views.
Housing and Open Space Allocations	No effects.	No effects.	No direct effect. Detailed alignment stage will seek to minimise effects on views.	No direct effect. Detailed alignment stage will seek to minimise effects on views.
Minerals	Crosses Popes Green Farm extraction site. Existing 400kV and 132kV lines already pass through this area. Detailed alignments will seek to minimise effects.	Crosses Popes Green Farm extraction site. Existing 400kV and 132kV lines already pass through this area. Detailed alignments will seek to minimise effects.	Sand and gravel pit at Peyton Hall Farm included within corridor. Detailed alignments will seek to avoid this mineral extraction site.	Corridor excludes Lynns Hall Pit extraction site. No anticipated effects.
Airfields/airstrips	No airfields in close proximity.	No airfields in close proximity.	Elmsett Airfield less than 0.5km to north of corridor. Consultation required at alignment stage.	Elmsett Airfield less than 1km to south of corridor. Wattisham Airfield approximately 2km to north of corridor. Consultation required at alignment stage.
Topography	Relatively level plateau dissected by the River Stour, River Box, River Brett and Flowton/Belstead Brook valleys. Crosses higher plateaus between rivers. More pronounced valley topography than more northerly options.	Relatively level plateau dissected by the River Stour, River Box, River Brett and Flowton/Belstead Brook valleys. Crosses higher plateaus between rivers. More pronounced valley topography than more northerly options.	Relatively level plateau dissected by the River Stour, River Box, River Brett and Flowton/Belstead Brook valleys. Crosses higher plateaus between rivers. Crosses river valleys further upstream than corridors 1 and 2. River Stour and River Brett valleys still pronounced, but remaining topography more evenly undulating around 70mAOD.	Relatively level plateau dissected by the River Stour, River Box, River Brett and Flowton/Belstead Brook valleys. Less pronounced river valleys. Crosses river valleys further upstream than corridors 1 and 2. River Stour and River Brett valleys still pronounced, but remaining topography more evenly undulating around 70mAOD.
Landscape Character	Crosses 4 river valley character areas comprising river and valley farmlands and 4 areas of intervening plateau (interfluves) Most complex landscape.	Crosses 4 river valley character areas comprising river and valley farmlands and 4 areas of intervening plateau (interfluves). Most complex landscape.	Crosses 4 river valley character areas comprising river and valley farmlands and 4 areas of intervening plateau (interfluves). Moderately complex landscape.	Crosses 2 river valley character areas comprising river and valley farmlands and 2 areas of intervening plateau (interfluves). Least complex landscape.
Special Landscape Areas (SLA)	Crosses SLA at Belstead, Brett and Stour valleys. Passes through AONB at Box valley.	Crosses SLA at Belstead, Brett and Stour valleys. Passes through AONB at Box valley.	Crosses SLA at Flowton, Brett, Box and Stour valleys.	Seeks to avoid SLA. Seeks to cross SLA along River Brett at narrowest section where complete avoidance not possible.
Historic Landscape Characterisation	Predominantly pre 18 th Century enclosure, with areas of post 1950's agricultural change. Increasing 18 th century and later; post 1950's and horticulture influences to west of River Box.	Predominantly pre 18 th Century enclosure, with areas of post 1950's agricultural change. Increasing 18 th century and later; post 1950's and horticulture influences to west of River Box.	Predominantly pre 18 th Century enclosure, with areas of post 1950's agricultural change. Increasing 18 th century and later; post 1950's and horticulture influences to west of River Box.	Predominantly pre 18 th Century enclosure, with areas of post 1950's agricultural change. Increasing 18 th century and later; post 1950's and horticulture influences to west of River Box.

9.0 COMPARISON OF CORRIDORS

- 9.1 Chapter 8.0 described the corridors with reference to the environmental criteria which define them followed by a summary in Table 8.1. This Chapter provides a comparison of the corridors in relation to each other. It represents TEP's assessment in relation to environmental factors.
- 9.2 The corridors are assessed below in terms of their effect on environmental constraints, the influence of topography and on their effect on the landscape.

Environmental Constraints

Dedham Vale AONB

- 9.3 The Dedham Vale AONB is a significant constraint to routeing within this study area. It covers a large area of land and has effectively limited the southern extent of the study area.
- 9.4 The existing 400kV and 132kV overhead lines pass through the AONB for a distance of approximately 3km. Corridors 1 and 2 have been identified as 'opportunity corridors' as they utilise the existing line routes which already pass through the AONB. Corridor 1 would result in an additional line in the AONB, and Corridor 2 a line with taller towers compared to the existing 132kV line. Corridors 1 and 2 would therefore have an effect on this AONB designation which recognises the areas nationally important landscape value.
- 9.5 Corridor 3 avoids the AONB, however it runs within 1.25km of the AONB boundary in the vicinity of Boxford. The potential for effects on views from within the AONB is considered to be limited however this would require further detailed consideration in respect of alignments should this option be taken forward.
- 9.6 Corridor 4 avoids the AONB, however it runs within 3km of the AONB boundary in the vicinity of Newton. The potential for effects on the designated landscape and on views from within the AONB is considered to be the least with Corridor 4 although these issues would require further consideration at a detailed alignment stage should this option be taken forward.
- 9.7 National Grid seeks to avoid AONBs when siting new infrastructure. As Corridors 3 and 4 avoid the AONB, this implies the AONB poses least constraint to those corridors as compared to Corridors 1 and 2. Ranked in order of likely effects on the AONB, the corridor likely to have least effect on the AONB would be Corridor 4, due to its greater distance from the AONB, followed by Corridor 3, Corridor 2, and finally Corridor 1. Corridor 1 would have the greatest effect on the AONB as it would introduce an additional structure into the AONB as compared to Corridor 2's effective replacement of the 132kV overhead line with a new 400kV overhead line.
- 9.8 National Grid's policy is that due to the very high relative costs of underground transmission, it reserves detailed consideration of its use instead of overhead lines for 'exceptionally constrained areas' which include areas designated for their national landscape value such as National Parks and AONBs. If consideration of possible alignments in a preferred corridor which passes through the Dedham Vale AONB resulted in a preference for undergrounding whilst in the AONB, this would remove the direct effect of another overhead line in the AONB. There would however remain the risk of indirect adverse effects of permanent loss of landscape features such as

woodland, orchard, trees and hedgerows to a cables easement, together with risk of adverse effects on archaeological and ecological resources from ground disturbance. The siting of the sealing end compound structures at either end of the cabled sections would require careful consideration as they would likely be close to the AONB boundary.

SSSIs/SPAs/SACs/Ramsar Sites/NNRs

- 9.9 There are no sites of international or European nature conservation value (SPAs, SACs, Ramsar Sites) or National Nature Reserves in close proximity or directly affected by any of the route corridors. Any indirect effects are considered to be equal to all corridors due to the distance from the study area. These constraints have not proved to be factor distinguishing between the corridors.
- 9.10 SSSIs in the study area comprise small discrete unlinked areas, often woodlands. SSSIs have been avoided in the identification of corridors, or included within corridors where there is certainty they can be avoided at an alignment stage. The exception to this is Hintlesham Wood as the existing 400kV overhead line already crosses this woodland. Further effects on this woodland would be considered at an alignment stage should Corridors 1 or 2 be taken forward.

Woodlands

- 9.11 There are numerous small woodlands and as noted above some are also designated SSSIs. Larger woodlands have been avoided in identifying corridors, with smaller woodlands included within corridors where there is confidence that alignments can be identified which can avoid direct effects on them. All corridors perform similarly in respect of woodlands.

Scheduled Monuments

- 9.12 SMs are generally more widespread to the north of Hadleigh. Corridors 3 and 4 have sought to avoid the known SMs with distance from corridors to SMs maximised wherever possible. No direct effects would be anticipated from alignments associated with any route corridor, potential alignments would seek to minimise the effect on setting.

Settlements, Housing Allocations, Individual Properties, Conservation Areas and Listed Buildings

- 9.13 The route corridors have sought to exclude all settlements and sites allocated for housing, maximising the distance between corridors and settlements where other constraints allow. The majority of settlements contain historic cores, many of which are designated as Conservation Areas. Detailed consideration of the effect on the setting of Conservation Areas would be required when identifying an alignment within a route corridor particularly where Conservation Areas extend beyond the centres of settlements.
- 9.14 Scattered dwellings (including some Grade 2 Listed Buildings) are included within corridors where it is considered that sufficient separation between possible alignments and receptors can be achieved to avoid unacceptable adverse effects on amenity. There are no Grade 1 or 2* Listed Buildings within the identified corridors, however the identification of alignments would seek to minimise the effect on the setting of these important historic buildings.

Mineral sites

- 9.15 Four mineral sites have been identified within the study area. Corridors 1 and 2 run through the site at Popes Green Farm to the east of Polstead Heath adjacent the existing overhead lines. Detailed alignments would seek wherever possible to minimise the effect on this site.
- 9.16 Corridors 3 and 4 run close to known mineral sites, however there is potential for alignments to be identified which avoid these areas.

Airfields

- 9.17 Corridors 1 and 2 are distant from existing airfields and are not considered likely to have an effect on any of the airfields identified.
- 9.18 Corridors 3 and 4 are in close proximity to Elmsett Airfield (a private airfield) with Wattisham army airfield to the north. There are no direct effects on these airfields and alignments would seek to address any flight path restrictions.

Overview

- 9.19 The environmental constraints (other than the AONB) are fairly evenly scattered throughout the study area with little clustering and few areas without constraint. Route corridors have been identified through these environmental constraints which offer scope for a number of alignments to be identified for consideration. Corridor 3 runs closest to settlements; Corridors 1 and 2 offer least potential to avoid woodland in detailed alignments; and Corridors 3 and 4 have greatest potential to have an effect on the setting of SMs. Generally however, there is little material distinction between route corridors with regard to environmental constraints other than the AONB.
- 9.20 The environmental constraint which offers distinction between the corridors is the Dedham Vale AONB where Corridors 1 and 2 would have direct effects and Corridors 3 and 4 avoid the designation. Corridor 4 would have least effect on the AONB, followed by Corridor 3, 2 and 1.

Topography

- 9.21 The topography in the study area is defined by the river valleys, with lower ground within the valleys and higher intervening plateaus or 'interfluves'. The river valleys generally run in a northnorthwest to southsoutheast direction culminating in the Dedham Vale AONB to the south.
- 9.22 It is considered good practice (in accordance with Holford Rules 4 and 5) to use landform where possible to screen/background overhead lines and to avoid skylines and ridges. Due to the nature of the river patterns in relation to Bramford Substation and Twinstead Tee it is not possible to identify a corridor which utilises only the lower ground of the study area. These lower lying areas also include the most valued landscape and so would not be preferred in any case.
- 9.23 All corridor options have to cross the grain of the topography and landscape, crossing areas of higher ground. However these higher areas are broad plateaus, gradually rising to the north and northwest, rather than sharp ridges. Topography does not particularly assist in distinguishing preference between route corridors.

Landscape

Landscape Character

- 9.24 As noted above in considering topography, any route corridor for a connection between Bramford Substation and Twinstead Tee crosses the grain of the landscape. All route corridors must cross the River Stour, River Box, River Brett and Flowton/Belstead Brook. However anticipated effects are different depending where each corridor crosses these watercourses.
- 9.25 The value of these river valley landscapes is recognised in landscape designations both at a national and local level. The Dedham Vale AONB extends along the River Stour with local level Special Landscape Area designations extending out from this along the Rivers Stour, Box, Brett and Flowton/Belstead Brook.
- 9.26 All of the route corridors identified have to cross the Stour Valley in the same area due to the location of the intended connection at the Twinstead Tee with built development, woodland and the existing overhead lines constraining where this crossing can be made.
- 9.27 Corridor 3 and to a greater extent Corridor 4 have sought to minimise effects on the other valleys by taking a more northerly alignment. This would reduce the effect on the river valley landscapes by crossing them at higher reaches where the characteristic lowland river valley landscape is less pronounced.
- 9.28 The size and scale of the landscape increases on the 'interfluvial' areas between river valleys with larger arable fields, amalgamated in places, and less undulation. This larger scale landscape character potentially offers greater capacity to accommodate the scale of a 400kV overhead line.
- 9.29 During consultation with officers of the local planning authorities and statutory consultees it was noted that there is high value in the areas of undesignated landscape. The landscape has 'ancient qualities' which have been untouched by modern development. It was advised that the Historic Landscape Characterisation for Suffolk should be consulted.

Suffolk Historic Landscape Characterisation

- 9.30 The south Suffolk landscape is generally considered to be an 'ancient landscape'. The study area is predominantly pre 18th Century random enclosure within which there are areas of more recent post 1950s agricultural change, primarily comprising hedgerow removal and field amalgamation. To the west of the River Box there is an increase in later enclosure (from the 18th Century and later) together with areas of post 1950s change and horticultural influences (orchards). This is consistent for all four of the corridors identified.
- 9.31 There is little differentiation between the four corridors, all of which pass through a predominantly 'ancient landscape' with more recent influences to the west.
- 9.32 The key difference in terms of the landscape is that the existing 132kV and 400kV overhead lines are features which are present in the landscape to the south of the study area.

Visual Assessment

- 9.33 The existing 400kV and 132kV overhead lines run close to each other between Bramford and Twinstead and have been identified as 'opportunity corridors.' Photographs of these existing overhead lines are presented on Figures 10 and 11. Masts are also present on higher ground to the south of Newton which can add to 'confusion' from numbers of structures together in the landscape.
- 9.34 Corridors 1 and 2 propose to closely parallel the existing 400kV overhead line corridor. Closely synchronised paralleling is generally preferred when running two overhead lines of similar voltage and size together. This has been used for the existing two double circuit 400kV overhead lines between Sizewell and Bramford which are each of same design and have similar tower types in adjacent positions for the entirety of their length. This was achieved as they were built simultaneously within a single corridor comprising two immediately adjacent wayleaves/easements. Photographs of these existing overhead lines are presented on Figure 12. This high degree of synchronicity between the lines assists in reducing the overall effect of the two lines in parallel to its minimum. From the limited numbers of vantage points immediately alongside each tower, the other is screened. In the majority of views there is an order and symmetry to the relative positions of each line, notwithstanding the appreciable effect of two double circuit 400kV overhead lines alongside each other.
- 9.35 It would not be possible to accurately replicate this effect if installing another overhead line adjacent the existing 400kV line as the new line would use different tower types to the existing line. The presence of two different tower types parallel has potential to draw attention to rather than minimise the combined effect of the parallel lines. Additionally, the position of the existing line would make it very difficult for an additional line to closely parallel and achieve appropriate distances from environmental constraints including woodland and properties. This would require diversions taking the second line to varying distances from the existing line which again would be likely to draw attention to the absence of symmetry in the alignments. Photographs of paralleling using different tower types are presented on Figure 13.
- 9.36 Corridor 1 would result in three entities with regular structures in the landscape: two 400kV overhead lines imperfectly paralleled and a generally adjacent 132kV overhead line. If detailed consideration of the AONB in accordance with National Grid's undergrounding policy resulted in an alignment that includes underground cables in the Dedham Vale AONB, the paralleling effects would be experienced for the majority of the route in the landscape outside of the AONB.
- 9.37 Corridor 2 proposes to use part of the route of the existing Bramford to Pelham 132kV overhead line route, seeking to minimise the scale of change caused by the new 400kV line in the landscape by effectively replacing the 132kV overhead line. The approximate height of the 132kV overhead line's standard tower is 26.5m and a standard tower on the new 400kV overhead line would be 47m. (This is comparable to the height of the standard tower of the existing Bramford to Twinstead 400kV overhead line which is 50m high).

- 9.38 The scales of the 400kV and 132kV towers appear very differently in a variety of views:
- In close views when viewed with the 132kV line towers nearest the viewer, the structures appear more similar in scale.
 - In close proximity views when viewed with the 400kV line towers nearest the viewer, the difference in heights of the structures is more pronounced.
 - In medium distance views, say at distances of around 1km, the difference in tower heights is more pronounced and topography and vegetation have a notably greater effect in providing both screening and backgrounding for the 132kV line. Both the towers and conductors are more visually prominent on the 400kV lines in these views, with the towers appearing linked (in the case of 400kV) rather than as isolated structures (often in the case of 132kV at this distance where the conductors are not noticeable).
 - In longer distance views, say at distances of over 2km and greater, the lower voltage 132kV line is not perceptible in some views with topography and vegetation very effective in providing both screening and backgrounding for the 132kV lines. Topography and vegetation play an important part in minimising the effect of higher voltage lines in the landscape, but require more marked variation in the landscape or greater distances between the viewer and the line as compared to similar effects on the smaller 132kV overhead line.
- 9.39 Corridor 1 proposes to build a new 400kV line adjacent to the existing 400kV and 132kV overhead lines, which would result in a scale of change in many views including a cumulative effect. Corridor 2 proposes to use the existing 132kV overhead line route rather than introduce a new line adjacent the existing 400kV and 132kV overhead lines. Corridor 2 would give rise to a lower scale of effect on landscape and views than Corridor 1, however building a new 400kV overhead line on the 132kV route adjacent the existing 400kV overhead line would still give rise to notable effects.
- 9.40 Corridor 3 runs to the north of Hadleigh and would avoid an alignment running closely parallel to the existing lines. However, it runs 2-3km distant along its length, and, although topography, vegetation and built form would assist greatly in reducing the perception of proximity, there would likely be intervisibility between the existing and the new overhead line in places.
- 9.41 Corridor 4 runs further north up to 7km distant from the existing overhead lines. This distance and the intervening topography, vegetation and built form are likely to combine to play a greater role in minimising intervisibility for the majority of the route. The exception would be the inevitable concentrations of overhead lines at each of the connection points which are common to any route corridor between them.

Zone of Visual Influence Mapping

- 9.42 Indicative Zone of Visual Influence (ZVI) maps have been prepared to consider the visual implications of each of the corridors. This process allows digital modelling to be used to illustrate the extent from which proposals would be visible. The use of this tool is widespread at a more detailed stage in project development and its usefulness at this early stage is limited. The following assumptions should be noted:
- The corridors are up to 2km wide in places. For the purposes of preparing the ZVI maps the centre line of each corridor has been used. In reality the detailed alignment studies would take account of local features and topography and the centre line would be unlikely to be the alignment proposed for a corridor.
 - The ZVI mapping does not indicate the extent of the overhead line which is visible. For example the mapping shows no differentiation between an open view where the full height of a number of towers is clearly visible as compared to a view where only the top portion of a single tower is visible over intervening vegetation.
 - The cut off for visibility has been set at 10km, with fading to the outer edges to indicate a more distant view. From distances over 5km it may be possible to discern the overhead line on a clear day, however it would not form a prominent part of the view.
 - Woodlands and larger settlements have been factored into the modelling process, however no account has been taken of smaller areas of woodland or hedgerows or smaller areas of built development which can have a significant effect in filtering views.
- 9.43 Despite the above assumptions and limitations, the ZVI mapping provides useful information on the visibility of the proposed corridors in relation to each other. Figure 16 shows the ZVI of the existing situation comprising the existing 400kV and 132kV overhead lines in grey. This grey base case situation is replicated on Figures 17-19 with Figure 17 also showing the ZVI for Corridor 2 in green; Figure 18 showing the ZVI for Corridor 3 in blue; and Figure 17 showing the ZVI for Corridor 4 in purple.
- 9.44 Generally the ZVI mapping shows that the zone over which Corridor 2 would be seen would be very similar to the area from which the existing 400kV and 132kV lines can be seen. This area would extend slightly to the south, due to the replacement of the 132kV towers with taller 400kV towers, and the intensity of the views within this area would increase due to the scale of the structures, particularly in medium distance views. Corridor 2 would lead to a change in views from some viewpoints within the AONB.
- 9.45 Corridor 3 is located 2-3km to the north of the existing overhead lines and extends the ZVI to the north by 2-3km. Corridor 4 is located up to 7km from the existing overhead lines and similarly extends the ZVI to the north by up to 7km. Although the ZVI for Corridors 3 and 4 extends to the north, it should be noted that the density of colour is reduced from that shown for Corridor 2 where the visual effects of two overhead lines are concentrated over a smaller geographic area. There is effectively a less concentrated effect over a larger area. Also there is less of a change to views from within the AONB for Corridor 4 and to a lesser extent Corridor 3.
- 9.46 The effect topography has on visibility can be seen from the ZVI mapping. More views are possible from the higher plateau areas, and views from the lower lying river valleys are restricted.

- 9.47 Detailed visual impact assessment would be undertaken during the alignment stage and subsequent EIA of the preferred route to ensure the visual effects of the proposed overhead line are fully considered and minimised where possible.

Iconic Views

- 9.48 During consultation with local planning authorities and statutory consultees reference was made to several 'iconic' views within the study area which need to be carefully considered. These include views around Boxford and Sherbourne Street; views towards Semer and Kersey, particularly from the around Hadleigh; views from the areas around Whatfield, Ash Street, Semer; Lynsey Tye and Milden; views over the Stour Valley; and views south into the AONB from Whitestreet Green.
- 9.49 The zones of visual influence give an indication as to how important views may be affected by possible route corridors although the limitations of the usefulness of this information have been explained. The possibility of producing photomontages has been considered but at this stage these would have extremely low validity and would be misleading. The variables that may affect tower positioning within corridors mean that the final alignment selected could result in a very different view of the overhead line than would be shown on a representation based on an indicative alignment prepared at this stage. A representation of an effect on a view could show the wires of the line only whereas the eventual alignment could see one or more overhead line towers in the view and vice-versa. The ZVI plans, although indicative and with limitations on their validity, give the most accurate representation available at this stage as to how views may potentially be affected.

Conclusions

- 9.50 The assessment and comparison of corridors has been described with reference to environmental constraints only. It does not take account of technical or economic factors which would also need to be taken into consideration before a preferred corridor is identified.
- 9.51 The corridors have been described with reference to environmental constraints, topography and landscape. The key influences are effects on the Dedham Vale AONB and the wider landscape. The effects of each of the corridors are summarised below.

Corridor 1

- 9.52 This option would parallel the existing 400kV overhead line and is the shortest option under consideration at 26km. Although with the benefit of its shorter length, this corridor would result in three closely located overhead lines in the landscape, partly within the Dedham Vale AONB. Closely aligned synchronised paralleling would be preferable, however this would be difficult to achieve due to the 'mismatch' of tower types and because close paralleling along its full length would be prevented due to the close proximity of the existing line to environmental constraints including woodland and dwellings.
- 9.53 This corridor does not avoid the AONB as National Grid's guidance advises and it would not 'conserve and enhance the natural beauty' of the AONB which is the purpose of its designation.

Corridor 2

- 9.54 This option proposes using the route of the existing 132kV overhead line and would not result in any additional overhead lines in the landscape. The lower 132kV voltage line effectively would be replaced by a higher voltage 400kV line, partly within the Dedham Vale AONB. It would lead to an increase in the size and scale of the towers and conductors, although there would be fewer towers required. There would be a perceptible scale of change in views in the local area, including within the AONB, however these effects would be concentrated into an area which already has overhead lines within views.
- 9.55 The requirement to closely align with the existing overhead line to minimise visual effects, means that other environmental constraints such as vegetation and dwellings, may be subject to greater scale of effects than in a corridor with a greater width which offers greater flexibility in terms of the alignment options available.
- 9.56 The different tower type required for the proposed overhead line compared to the towers of the existing line also pose issues for synchronicity, where they may appear 'mismatched'.
- 9.57 This corridor does not avoid the AONB as National Grid's guidance advises and it would not 'conserve and enhance the natural beauty' of the AONB which is the purpose of its designation.
- 9.58 This option also requires additional works to be undertaken to continue to supply the local distribution electricity network arising from removal of the existing 132kV overhead line. This would likely require a new substation the west of Twinstead.

Corridor 3

- 9.59 This corridor offers a relatively direct alternative route between Bramford and Twinstead to the north of Hadleigh. It seeks to avoid the key environmental constraints identified and it avoids the AONB. It does however pass close to some settlements.
- 9.60 It runs approximately 2-3km distant from the existing lines and although it does not run parallel there would be areas with intervisibility between lines.

Corridor 4

- 9.61 This corridor takes a more northerly route between Bramford and Twinstead and it is the longest route at 30km. However this option presents the greatest separation from the AONB and the existing 400kV line which minimises intervisibility. The corridor runs through a more open larger scale of landscape whose landscape character potentially offers a greater capacity to accommodate the scale of a 400kV line.
- 9.62 This corridor avoids areas subject to national planning policy protection (Dedham Vale AONB) and to a large extent local planning policy (SLA) for their landscape value. It would however introduce a new overhead line into an area regarded locally as high quality landscape, albeit undesignated, where there is presently no existing infrastructure.
- 9.63 The relatively wide corridor which has been defined which would enable a variety of alignments to be considered to seek to minimise other effects on the environment.

- 9.64 National Grid has confirmed that it is prepared to build any of the four corridor options outlined in this feasibility report, with little differentiation in terms of cost or technical achievability.
- 9.65 The AONB is the area of greatest constraint in the study area. If no overhead lines were already present in the area, then overhead line routeing practice (in accordance with planning policy) would seek to avoid this designation and would indicate a route to the north of the AONB. The presence of the existing 132kV and 400kV lines running through the AONB present an opportunity to reduce the scale of change a new overhead line would bring.
- 9.66 National Grid is now entering a period of public consultation on the route corridor study which will be factored into the decision-making process. National Grid will then put forward its preferred corridor after considering consultation responses.