

East Anglia ONE Offshore Windfarm

Great Bealings and Little Bealings

May 2012



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Appendix B Routing Alternatives Study

Chapter 1

Executive Summary

1 Executive Summary

- 1 East Anglia Offshore Wind (EAOW) has been through a thorough route selection process. This has resulted in a cable route which minimises impacts on the human, biological and physical environment.
- 2 In response to feedback from the communities of Little Bealings and Great Bealings, EAOW has commissioned a review of the route options around these villages. This review has concluded that the cable route which runs between Little Bealings and Great Bealings is preferable to alternative routes in the area.
- 3 EAOW is progressing detailed technical work in order to define construction methodologies for the cable route. The results of this work will be reported on in Part 2 of East Anglia's Phase 2 Consultation. The impacts of these construction methodologies will be reported on within the project Environmental Statement (ES).

Chapter 2

Introduction

2 Introduction

2.1 Background

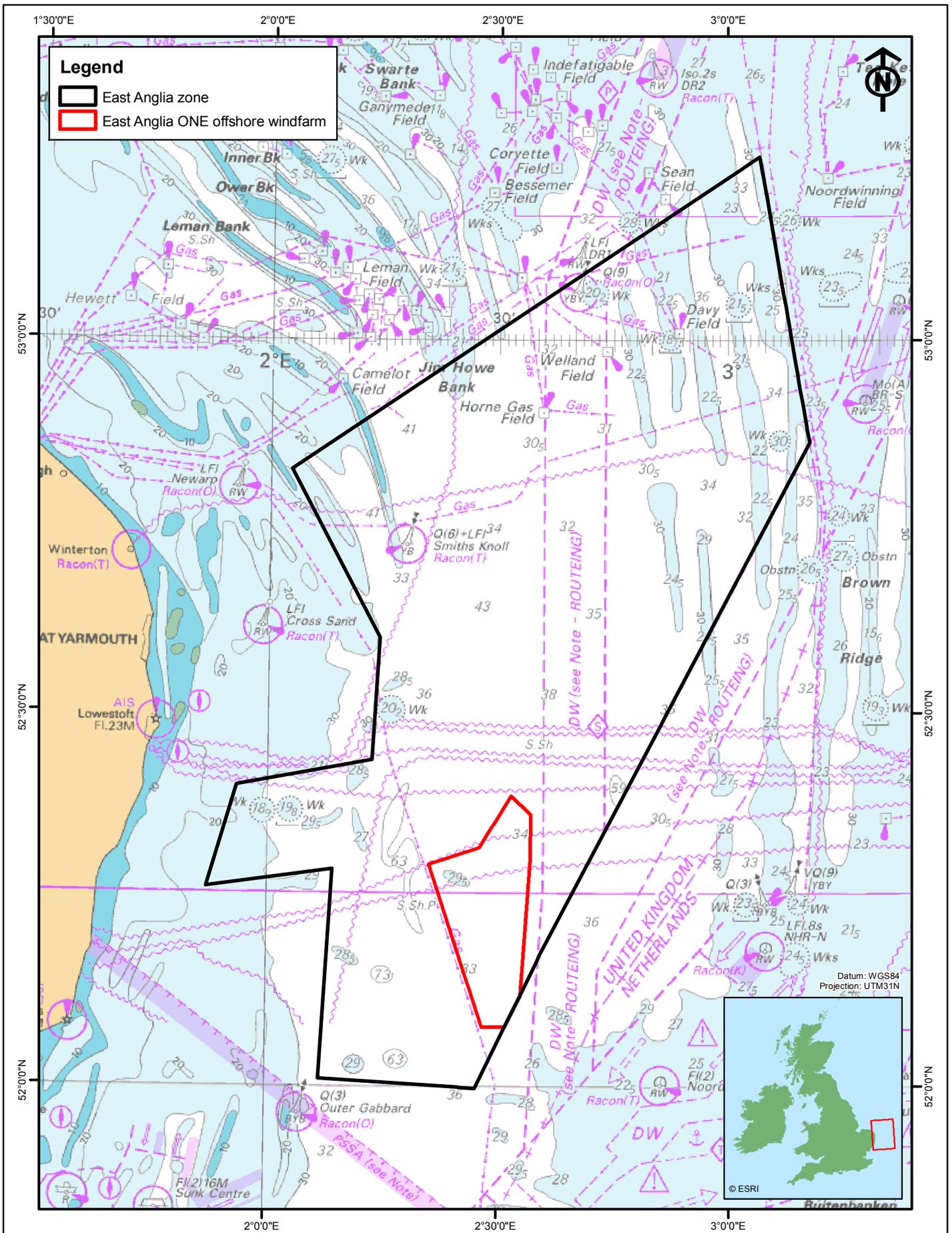
- 1 East Anglia Offshore Wind Limited (EAOW) has been awarded a licence by The Crown Estate to develop approximately 7,200MW of wind capacity off the coast of East Anglia, known as the East Anglia Zone, under the Round 3 Offshore Wind Licensing Arrangements.
- 2 The Zone will be developed as a number of individual windfarms, each dependent on securing the statutory consents and approvals. The first windfarm is proposed in an area within the south of the Zone and is known as East Anglia ONE (see Figure 1.1). EAOW have signed a grid connection agreement for 3.6GW of this zonal capacity (i.e. three projects) to connect into the transmission network at Bramford in Suffolk.
- 3 EAOW intends to submit an application for a Development Consent Order (DCO) for East Anglia ONE to the National Infrastructure Directorate (NID) in 2012. The DCO application will include the offshore windfarm as well as associated development deemed necessary for its construction and operation.
- 4 In order to reduce the issue of construction disturbance, and in response to consultation feedback, the East Anglia ONE application will also include the ducting necessary to connect two future projects within the East Anglia Zone to the national transmission system at Bramford.
- 5 The DCO will be accompanied by an Environmental Statement (ES) which will present the results of the Environmental Impact Assessment (EIA) for the project.
- 6 For further information on the East Anglia ONE, please see www.eastangliawind.com. A Preliminary Environmental Information Report (PEIR) was produced in February 2012, and is a useful reference for further details on the East Anglia ONE project. Chapter 6 of Volume 1 of the PEIR, is of particular interest in this regard, and is appended to this Report.

2.2 Purpose of this Document

- 7 This document deals with the route of the onshore electrical transmission works associated with the East Anglia ONE project. The report has three aims:

- to summarise the rationale behind the selection of the proposed route north of Ipswich
- to outline the rationale behind the selection of the proposed route in the Bealings area, and
- to indicate the next steps for design of the electrical transmission works.

8 This document was produced in response to concerns highlighted by the parishes of Little Bealings and Great Bealings during Phase 2 (Part 1) of community consultation on the East Anglia ONE project.



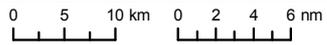



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East Anglia Offshore Wind

Location of East Anglia ONE offshore windfarm and East Anglia zone

Rev	Date	By	Comment
B	29/11/11	LM	Figure number amended
A	12/10/11	LM	First Issue.

Original A4 Plot Scale 1:750,000
 

Layout	Date	Rev	Dwg No.
N/A	12/10/2011	B	6115-525-PA-001

Figure 1.1

Ref: Z5_Zone_v03_100914rs_Z5_Project_v10_100914rs

Chapter 3

High Level Route Selection

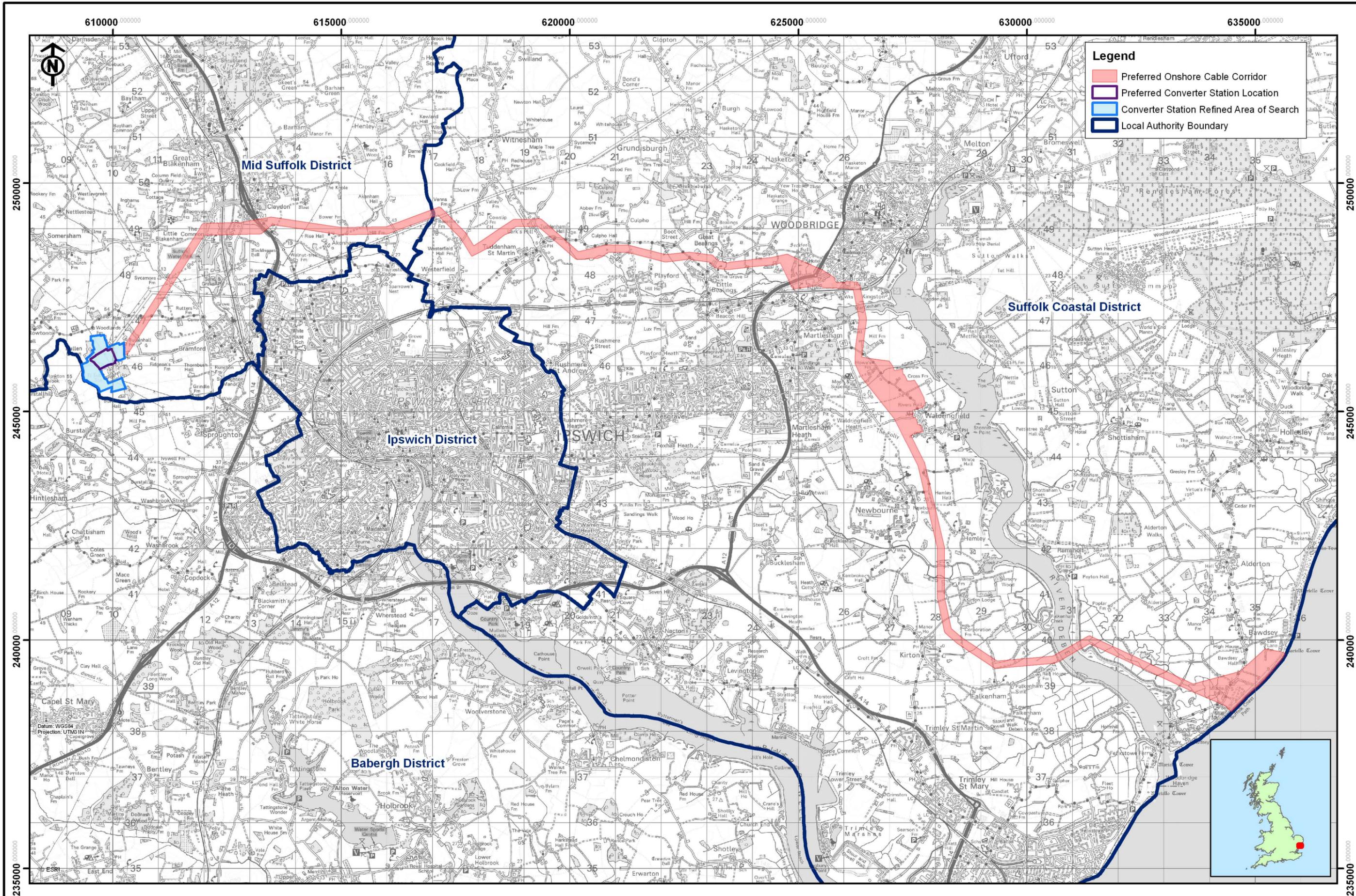
3 High Level Route Selection

3.1 Introduction

- 1 A connection offer was received from National Grid in August 2010 which named Bramford, Suffolk, as the connection point for East Anglia ONE. Following the allocation of this connection location, an exercise was undertaken in order to define a proposed route for onshore electrical works associated with the East Anglia ONE project (and, subsequently, ducts for future projects).
- 2 The detail of this route selection exercise is explained in the East Anglia One PEIR (Volume 1: Introduction). This chapter pulls out key details from the PEIR in order to highlight specifically the rationale for the selection of the proposed route north of Ipswich.
- 3 The chapter considers:
 - General principles of route selection process
 - Reasons for the landfall at Bawdsey
 - Reasons for the route North of Ipswich
 - Reasons for the route options at Woodbridge.
- 4 The current Preferred Onshore Cable Route is shown in Figure 3.1.

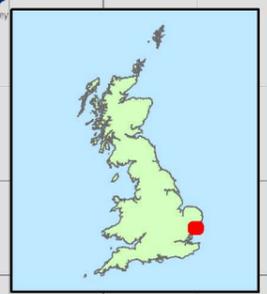
3.2 Route Selection Overview

- 5 The route selection exercise has been an iterative process of reviewing constraints in order to create a successively narrower route. After the identification of the grid connection point at Bramford, Suffolk, and a definition of a high level redline boundary, the process of cable route selection was led through the following stages:
 1. Definition of Indicative Cable Corridor Area
 2. Definition of Onshore Area of Search
 3. Definition of Preferred Onshore Cable Route
 4. Definition of Preferred Onshore Cable Corridor
- 6 Each stage has involved consultation, review of environmental constraints and review of engineering feasibility. More detail on each of the steps is available in the East Anglia ONE PEIR (Volume 1: Introduction). At a high level, the following were key factors throughout the route selection process:



Legend

- Preferred Onshore Cable Corridor
- Preferred Converter Station Location
- Converter Station Refined Area of Search
- Local Authority Boundary



Rev	Date	By	Comment
03	18/01/12	AJ	Corridor updated
02	05/01/12	AJ	Figure number update
01	28/11/11	AJ	Figure number update

Original A3 Plot Scale 1:75,000

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East Anglia Offshore Wind
Volume 1:
Figure 3.1 Local Authority Boundaries

Drg No	N/A
Rev	03
Date	18/01/12
Layout	N/A

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- The route onshore should be kept as short as practicable
- The route should be kept straight, where practicable
- Settlements should be avoided where possible
- Key international and national environmental constraints¹ should be avoided
- Key local environmental constraints (e.g. areas of mature woodland) should be avoided where possible
- Major services (e.g. gas pipelines and transmission circuits) should be routed around where possible
- Potential impacts on services and road users during construction should be minimised.

3.3 Landfall Selection

7 After identification of the Indicative Cable Corridor Area (ICCA), a review was undertaken of the whole ICCA in order to highlight areas of least environmental constraint for landfalls.

8 Three potential landfall points were identified: at Bawdsey (between the Martello Tower and Bawdsey Manor); between Felixstowe and Felixstowe Ferry; and south of Harwich near Little Oakley. During this process, the option of routing the cables up the Stour, Orwell or Deben Estuaries was also considered.

9 The following sections describe the reasons for ruling out each of the above options in favour of the proposed landfall at Bawdsey.

3.3.2 Landfall south of Harwich, near Little Oakley

10 This landfall was ruled out during the definition of the Onshore Area of Search. A review of constraints within the ICCA, and consultation with Harwich Harbour Authority, indicated that this landfall should be ruled out on the following grounds:

- The shipping channel into Harwich Harbour is extremely busy with commercial shipping and is regularly dredged, thus forming a barrier to cable laying.

1 _____

¹ These include: National Parks, Areas of Outstanding Natural Beauty, World Heritage Sites, Sites of Special Scientific Interest, RAMSAR sites, Special Areas of Conservation, Special Protection Areas, National Nature Reserves, Scheduled Monuments and Registered Parks and Gardens.

- There are plans for a major port development at Bathside Bay on the River Stour. There would therefore need to be guarantees that there would be no disruption to port operations during construction or operation of the cables.
- The River Stour is dredged as far as Parkeston Quay, forming a barrier to cable laying at appropriate depth.

11 As a result of these constraints, the landfall close to Little Oakley, south of Harwich, was discounted and the Onshore Area of Search was amended to follow the Essex/Suffolk border.

3.3.3 Landfall at Felixstowe

12 This landfall was ruled out during the definition of the Preferred Onshore Cable Corridor. A Landfall Report was commissioned, to compare the Felixstowe and Bawdsey landfall options. It concluded that the Felixstowe landfall should be ruled out on the grounds that:

- the only landfall sufficient to accommodate up to three projects from the East Anglia Zone was Bawdsey
- the sea off the Bawdsey landfall is relatively sheltered in comparison with the strong tidal movement around the mouth of the Deben close to the Felixstowe Ferry landfall
- fewer commercial activities are affected at the landfall at Bawdsey, and
- there is a species-rich wet grassland designated as a County Wildlife Site at the Felixstowe Ferry landfall.

3.3.4 Stour or Orwell Estuaries

13 A high level assessment of the installation challenges associated with the cabling up the Orwell, Stour and Deben estuaries was commissioned by EAOW. This report concluded that cable routing through these estuaries was not recommended due to environmental designations (Deben, Orwell and Stour) and conflicts with harbour requirements.

14 The conflicts around harbour requirements stemmed from the presence of commercial traffic and dredged channels in the Orwell and Stour, and conflicts with established tourist activity, particularly yacht moorings, in the Orwell and Deben. The width of the channels of all estuaries was also considered unsuitable for multiple parallel cable installations.

3.4 Crossing of the Orwell

- 15 During the definition of the Preferred Onshore Cable Route, the decision was made to rule out the crossing of the cable route through the Orwell River. A high level constraints review of the ICCA had indicated that there were two possible crossing points on the Orwell: one at Wade's Lane, and one at the Orwell Bridge.
- 16 On further detailed review, the crossing at Wade's Lane was discounted due to technical reasons. The crossing of the Orwell at this location was unlikely to be feasible given the length of the crossing, and also because of Environment Agency proposals to flood parts of this area to create new intertidal habitat.
- 17 The alternative crossing point of the Orwell at the Orwell Bridge was discounted due to the large number of environmental constraints east of the Orwell Bridge, including ancient woodland, County Wildlife Sites, the Orwell Country Park, woodland blocks and proximity to properties and caravan parks.
- 18 Given the landfall at Bawdsey and the constraints preventing routing across the Orwell River, the Preferred Onshore Cable Corridor was thus defined as north of Ipswich.

3.5 Route Options North of Ipswich

- 19 The review of the ICCA indicated two possible routes to the north of Ipswich. One route led to the south of Martlesham, with the other between Martlesham and Woodbrige.
- 20 The route south of Martlesham was discounted due to the presence of large areas of woodland around Walk Farm and the Martlesham plantation, and a County Wildlife site (heathland mosaic) east of the A12.

Chapter 4

Bealings Area

4 Bealings Area

4.1 Consultation on the Cable Route

- 1 The East Anglia ONE Statement of Community Consultation (SoCC) set out details on how EAOW would keep communities informed through the windfarm development process, and the means by which communities could comment on the project proposals.
- 2 In accordance with the SoCC, EAOW published the Electrical Transmission Works: Environmental Impact Assessment (EIA) Scoping Report in July 2011. This document provided high-level information on the proposed electrical transmission works required for East Anglia ONE. It also described survey works and EIA methodologies, in order to allow consultees to provide meaningful comments on the scope of the EIA for the electrical proposals. In terms of the cable route, this Scoping Report was based on the Indicative Cable Corridor Area (ICCA).
- 3 Following publication of the Scoping Report in July 2011, feedback on the ICCA was received. This feedback was considered alongside further constraints work and focused consultation, in order to identify a more defined cable route. This route was referred to as the Onshore Area of Search. The Onshore Area of Search was further refined, after yet more focused constraints work and consultation, to a Preferred Onshore Cable Route and then finally a Preferred Onshore Cable Corridor.
- 4 In February 2012, in accordance with the SoCC, EAOW published a Preliminary Environmental Information Report (PEIR) on the East Anglia ONE proposals. This PEIR contained a description of the project proposals, the baseline environmental information gathered to date, likely environmental effects and possible measures to mitigate those effects.
- 5 In respect of the onshore cable route, the PEIR presented both the Onshore Area of Search plus the further refined Preferred Onshore Cable Corridor. It outlined the method by which the Preferred Onshore Cable Corridor had been selected. Feedback was sought by EAOW on this PEIR. A number of organisations and individuals responded within the six week response period.

4.2 Consultation Responses from Little Bealings and Great Bealings

- 6 Responses to the PEIR were received from Little Bealings Parish Council and Great Bealings Parish Council regarding the section of the route
-

between Little Bealings and Great Bealings. Broadly speaking, these concerns may be summarised as follows:

- traffic disruption particularly between Great Bealings and Little Bealings during installation
- noise effects during installation
- landscape effects in respect of tree felling, the presence of jointing pits, in light of the designated Special Landscape Area
- effects on land drainage and water supplies for agriculture/private domestic use/recreational use
- safety concerns regarding proximity of cables to residences and high pressure gas mains
- duration and timings of the works

7 These concerns were expressed in regards to initial installation of cables for East Anglia ONE, and also subsequent phases of cable installation for further East Anglia projects. Great Bealings Parish Council specifically requested that ‘further consideration be given to finding an alternative route which will have minimal effect on our two communities and on the landscape of the Fynn and Lark Valleys’.

8 In early April 2012, representatives of EAOW met with representatives of both Little Bealings and Great Bealings Parish Councils, and Councillor Fryatt of Suffolk Coastal District Council, to discuss concerns raised through PEIR.

9 Thereafter, EAOW commissioned a review of routings options in the area surrounding the villages of Little Bealings and Great Bealings. The full review is appended to this report. The following sections aim to summarise the key findings of this review.

4.3 Scope of Study & Methodology

10 In April 2012, EAOW commissioned RSK to conduct an independent review of routing options around the villages of Little Bealings and Great Bealings (see Appendix 2: Routing Alternatives Study).

11 The study collated mapped environmental and technical constraint information held for the area west of Woodbridge, to examine whether there were any viable alternative routing options in the vicinity of the two villages.

- 12 The routing options were investigated using the Preferred Onshore Cable Corridor as a base. Using mapped information on environmental constraints and technical constraints two possible alternative routes were identified.
- 13 These alternatives were then subject to further review, in order to compare each on environmental and technical grounds. Recommendations were then made on which route would be preferred for development.

4.4 Results of Study

- 14 Figure 2 shows the original proposed cable route alongside the two potential alternative routes identified in the Routing Alternatives Study. Both routes leave the Preferred Onshore Cable Corridor at National Grid Reference 624885, 248340 and connect back with the Preferred Onshore Cable Corridor at National Grid Reference 621283, 248590. Alternative A routes north around Great Bealings, while Alternative B loops south around Little Bealings.
- 15 The two possible alternatives A and B were compared with the original Preferred Onshore Cable Corridor. Key environmental and technical considerations were as follows:
- ecological designations
 - landscape designations
 - woodland
 - length of cable corridor
 - road and rail crossings
 - rivers and water courses
 - floodplain
 - cultural heritage and archaeological sites
 - Public Rights of Way
 - Agricultural Land Classification.
- 16 Full details of the comparison of routes can be found in the report in the Appendix. In summary, the review concluded that the original proposed route was the best option for routing in the Bealings area. The Preferred Onshore Cable Corridor is the shortest option, is considered to have the least environmental impacts, and crosses lower grade agricultural land.
- 17 The preferred onshore cable corridor crosses fewer boundaries containing tree lines than option A and avoids areas where denser tree cover occurs. The preferred onshore cable corridor also only involves one main river crossing, and is routed further from housing than option B.

-
- 18 Where the preferred onshore cable corridor is in close proximity to housing (at the pinch point between Little Bealings and Great Bealings) measures to minimise disruption to local communities (for instance, trenchless technology or reduction of trench width) will be considered.

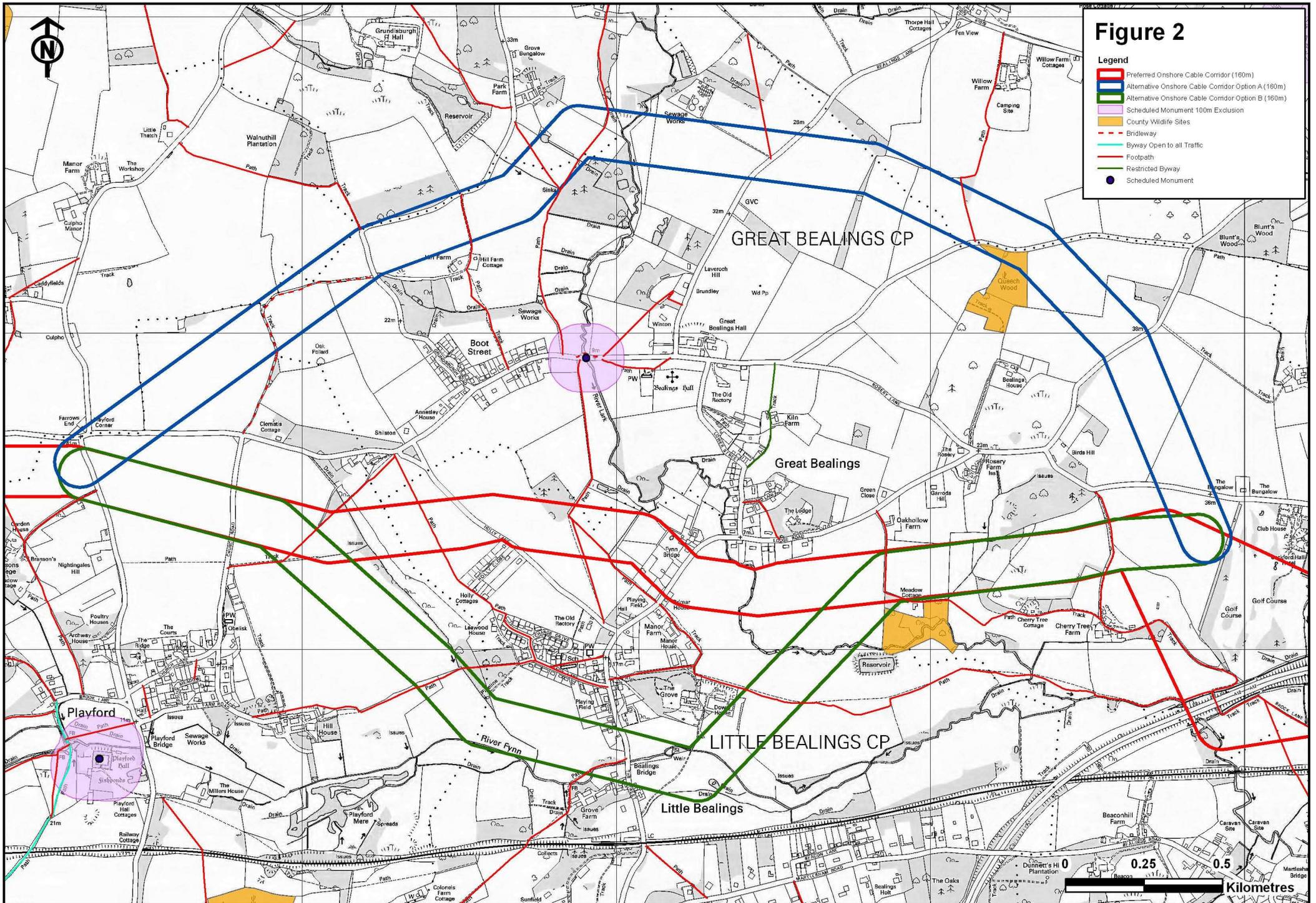


Figure 2

- Legend**
- Preferred Onshore Cable Corridor (160m)
 - Alternative Onshore Cable Corridor Option A (160m)
 - Alternative Onshore Cable Corridor Option B (160m)
 - Scheduled Monument 100m Exclusion
 - County Wildlife Sites
 - - - Bridleway
 - Byway Open to all Traffic
 - Footpath
 - Restricted Byway
 - Scheduled Monument

0 0.25 0.5
Kilometres

Chapter 5

Impacts and Mitigation

5 Impacts and Mitigations

- 1 The preceding chapters describe the process by which EAOW defined a cable route which minimises impacts on the biological, human and physical environments. Since publication of the PEIR, EAOW has been undertaking work to further define a narrower iteration of the Preferred Onshore Cable Corridor, and develop detailed construction methodologies for this narrower route.
- 2 The narrower iteration, the Onshore Cable Route, will constitute a 75m width route within the Preferred Onshore Cable Corridor. This 75m will represent a width allowing for laying three sets of cables/ducts, plus width for temporary construction and access works.
- 3 Both the narrower route and the construction methodologies will be reported on in June, as a second part of Phase 2 Consultation. The decision was taken to add a second stage to Phase 2 Consultation, over and above what was outlined in the SoCC, in order to address location-specific concerns such as those raised by the communities in the Bealings area.
- 4 Outline construction methodologies will be reported, giving information on the techniques for laying cables and ducts across open and constrained land. The methodologies will also give an overview of the duration and sequencing of construction works. While it will be possible to give substantial detail on these methodologies, it should also be noted that some detail is not possible to confirm in advance of EAOW placing contracts for construction.
- 5 The construction methodologies outlined above will be assessed for negative impact on the biological, human and physical environments. The results of this impact assessment will be reported on within the East Anglia ONE Environmental Statement (ES), alongside proposed mitigation measures in order to reduce negative impacts. Potential mitigation measures could include replacement of hedgerows, and targeting any open cut road crossings for periods of low traffic.

Chapter 6

Next Steps

6 Next Steps

1 The next steps for discussion of the Final Preferred Onshore Cable Route and impacts of the construction of the onshore cable route are:

- Publication of information report as Part 2 of Phase 2 Consultation – June 2012
- Public Information Days – July 2012
- Submission of application for DCO, accompanied by Environmental Statement – final quarter of 2012
- Application for DCO Examination Process – run by the National Infrastructure Directorate of Planning Inspectorate, from the end of 2012 onwards. .

6.2 Information Report and Public Information Days

2 In June 2012, EAOW will publish an information report as Part 2 of Phase 2 Consultation. As outlined in the previous chapter, this report will provide details on a narrower Onshore Cable Route, as well as detail on construction methodologies.

3 Public Information Days will be held at Woodbridge and Bramford (3rd and 4th July) and Bawdsey (date to be confirmed) in order to offer local communities the opportunity to discuss the proposals directly with the EAOW team.

6.3 Submission of DCO application and Examination Process

4 In the final quarter of 2012, EAOW will submit its application for a DCO to the National Infrastructure Directorate (NID) of the Planning Inspectorate. This application will be supported by an Environmental Statement, outlining the potential impacts of the proposals and mitigation measures proposed.

5 Following submission of this application, the NID will run an examination process considering the application. A recommendation will then be made to the Secretary of State who will take the final decision as to whether the scheme should be awarded consent.

Appendix A

PEIR – Volume 1 : Chapter 6

6 SITE SELECTION

6.1 ZONE 5 AND THE FIRST PROJECT

6.1.1 Identification of Zone 5

- 1 Zone 5 was identified by The Crown Estate as part of the Round 3 offshore wind licensing process and is located within an area of the southern North Sea.
- 2 The Crown Estate Round 3 zones have been the subject of an Offshore Energy Strategic Environmental Assessment (OESEA). This assessment was undertaken in 2008/2009. OESEA was prepared to assess the implications of further rounds of offshore windfarm leasing in the UK Renewable Energy Zone and the territorial waters of England and Wales, as well as the implications of other industry activities. It was clear from this strategic level analysis that the zones represent suitable 'areas of opportunity' for offshore wind projects, and have the ability to deliver the required capacity of offshore wind within acceptable environmental limits. It was recognised that there may be many local or regional constraints to the development of offshore wind projects within the zone boundaries.
- 3 Further information on the zone identification process can be found in *Section 3.6* of this volume.

6.1.2 Identification of the East Anglia ONE Site

- 4 The location of East Anglia ONE within the Zone was established by EAOW following a robust screening exercise, undertaken to gain an initial understanding of the consenting and technical risks within the Zone.
- 5 The first stage of this screening exercise involved a review of the Zone 5 characteristics using Geographical Information Systems (GIS) to map available data sets. This allowed areas within the Zone with the least consenting and technical risk to be identified. The Crown Estate's Marine Resource System (MaRS) data were utilised in this process,
- 6 The consenting information reviewed during this exercise included:
 - civil aviation radar;
 - military air defence radar;
 - commercial fisheries interactions;

- shipping and navigation in terms of designated and heavily used routes;
- Ministry of Defence (MoD) training and exercise areas (PEXA areas);
- landscape, seascape and visual resources;
- tourism and recreation, eg recreational sailing routes;
- oil and gas operations;
- cables and pipelines;
- aviation routing, in particular helicopter flight paths;
- disposal sites;
- nature conservation designations and protected habitats;
- fish spawning and nursery areas; and
- cumulative impacts with other windfarms.

7 The technical information reviewed included:

- distance to the nearest port;
- geological information and identification of distinct geological zones;
- geotechnical design parameters;
- identification of seabed risks such as gas blanking and seabed mobility; and
- known metocean information.

8 By reviewing these risks, a 'heat map' was produced which aggregated the constraints in order to facilitate identification of an area with the least consenting risk. An area in the southeast of the Zone was identified as the most favourable site in terms of known technical and consenting risk and therefore a suitable first project area.

9 The key reasons for selecting the location were because the site is:

- distant from Natura 2000 sites;
- outside any areas designated on the basis of ornithological activity and its distance offshore (more than 42km) reduces the potential for interaction with breeding and foraging bird species;
- located beyond 12nm from the shore, therefore reducing landscape and visual effects and the potential for interaction with inshore fisheries interests;
- outside the International Maritime Organisation (IMO) route and within an area of low density shipping in the context of the Zone;
- located outside any existing oil and gas infrastructure (wells) and licensed areas;

- outside any areas licensed for dredging and aggregate extraction;
- located outside any known Ministry of Defence (MOD) danger areas and outside the line of site of any known MOD Air Defence radars;
- outside the line of site of the National Air Traffic Services (NATS) radar at Cromer and over 30km from any known civilian airports and airfield;
- located such that it reduces the number of cable and pipeline crossings likely to be required and therefore third party agreements - in particular the western boundary of the project area has been clipped to the Zeebrugge to Bacton high pressure gas pipeline, plus a 500m buffer; and
- outside any known military PEXA areas and based on initial modelling was found to have minimal interaction with both Trimingham and Coltishall MOD radars.

10 The location of East Anglia ONE within Zone 5 is shown in *Volume 1, Figure 1.1*. The boundaries of East Anglia ONE are delineated to the west by the Zeebrugge to Bacton high pressure gas pipeline from which a setback distance of 500m has been applied and to the east by an IMO shipping route, from which a set back buffer of 1nm has been applied. To the south of the site, the boundary is constrained by a higher density shipping route (including the Harwich to Rotterdam cargo and passenger ferry routes). To the north the site boundary is constrained by line of sight from Trimingham Air Defence Radar and Cromer NATS en-route radar.

11 The Zone Appraisal and Planning (ZAP) process currently being completed will be used to validate the location of East Anglia ONE.

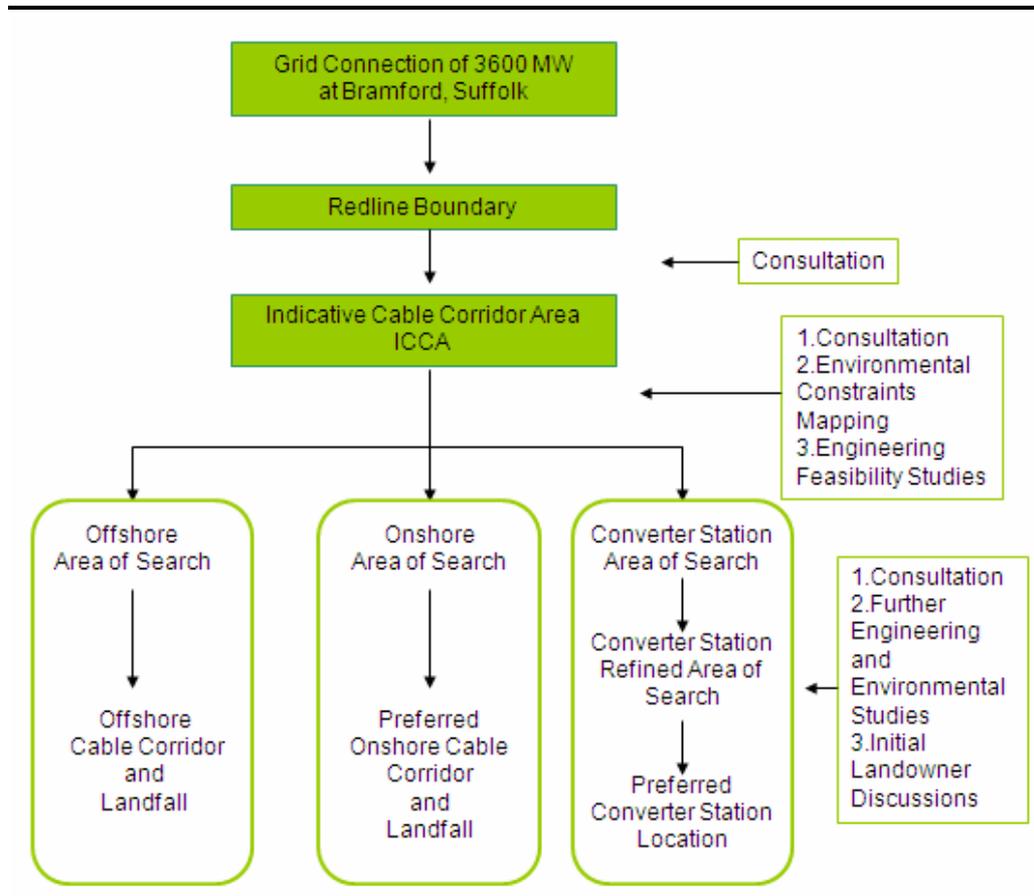
6.2 THE ELECTRICAL TRANSMISSION WORKS FOR EAST ANGLIA ONE

6.2.1 Introduction

1 A connection offer was received from National Grid in August 2010 which named Bramford, Suffolk, as the connection point for East Anglia ONE. Following the naming of this connection location, corridors for the offshore and onshore export cables and a potential onshore converter station location have been established. Identifying these areas involved a three staged process including environmental constraints mapping, engineering feasibility studies and preliminary landowner discussions. The process is described below and summarised in the flow chart

shown in *Diagram 6.1*. The preferred onshore cable corridor and development constraints are shown in *Volume 1, Figure 6.1* and *Figure 6.2* shows the offshore cable corridor and constraints.

Diagram 6.1 East Anglia ONE Electrical Transmission Works Site Selection Process



6.2.2 Indicative Cable Corridor Area for Offshore and Onshore Works

- 2 Following the grid connection offer from National Grid in August 2010 which named Bramford as a suitable connection point to the electricity transmission network, a red line boundary was formulated by EAOW, from Lowestoft in the north (along the River Waveney) to Harwich in the south, essentially reflecting local authority boundaries. Direct lines were then drawn offshore to the north and southern edges of East Anglia ONE. This boundary formed the basis for discussions regarding a suitable route for the electrical transmission works from East Anglia ONE.
- 3 During August and September 2010, meetings were held between EAOW, the relevant planning authorities (Suffolk County Council, Waveney District Council, Suffolk Coastal District Council, Babergh

District Council and Mid Suffolk District Council), Natural England and Suffolk Wildlife Trust to present and discuss this redline boundary.

- 4 During these meetings, it was agreed that the location of the landfall boundary should be moved south of Orford Ness as this is an area of highly unstable shingle bank covered by numerous environmental designations.
- 5 The planning authorities also expressed a preference for offshore cables to remain offshore as far as possible and asked whether laying cables up one of the local estuaries, the Deben, the Orwell or the Stour, would be feasible.
- 6 Following the meetings, the initial redline boundary was refined to provide an Indicative Cable Corridor Area (ICCA), included in the East Anglia ONE Scoping Report (September 2010). This area was defined as follows:
 - the area encompassed a wide area around Ipswich to allow onshore routeing to the southwest and northeast of the town;
 - the three estuaries, the Deben, Orwell and Stour, were included;
 - the northern boundary of the landfall was drawn at Hollesley to avoid the environmental designations of the Alde, Ore and Butley estuaries and Orford Ness / Shingle Street;
 - the southern boundary of the landfall was drawn east of Little Oakley to avoid the environmental designations of Hamford Water; and
 - a cone was drawn from the new landfall boundaries to the northerly and southerly tips of the western edge of East Anglia ONE.
- 7 Following further consultation, EAOW agreed to amend the southern boundary in line with the Essex / Suffolk border, as it became clear that no transmission works would be undertaken in Essex.
- 8 The revised Indicative Cable Corridor Area is shown in *Volume 1, Figure 6.3*. The area is centred around the town of Ipswich and the ports of Felixstowe and Harwich and includes the Orwell, Stour and Deben estuaries. The remaining land includes a mix of smaller towns and villages, arable farmland, marshland and woodland areas and a network of major and minor roads, railways and rivers.
- 9 The following sections outline the process by which EAOW has refined the high level indicative cable corridor originally identified to firstly a

broad area of search followed by a preferred cable corridor. These refinements have been informed by site works, consultation and desk study.

6.2.3 Offshore Export Cable

Consultation with Harwich Haven Authority

10 Following the formulation of the initial Indicative Cable Corridor Area, EAOW met with Harwich Haven Authority (HHA) (Harwich Harbour, 22nd November 2010). HHA expressed major concerns regarding routing up the Orwell and Stour estuaries due to potential disruption to port activities. Felixstowe is Britain's largest container port, and there were concerns about the feasibility of cable burial in areas subject to regular maintenance dredging. In relation to offshore routes, HHA also raised the following issues:

- the sandbanks around the mouth of the Deben are relatively mobile and possibly unsuitable for cable burial;
- there is a large amount of shipping traffic in the area between Harwich Harbour and the North Shipwash buoy up the Shipway, an area which may be suitable for deepening in the future; and
- if a landfall was chosen to the south of Harwich Harbour, the dredged channel could not be crossed inshore due to high shipping densities and the dredged channel in the harbour entrance.

11 HHA suggested routing through the Sledway and along the northern part of the Indicative Cable Corridor Area. This would keep activities away from the main densities of shipping traffic en route to Harwich Harbour and utilise relatively stable areas of seabed. The meeting with HHA has strongly influenced the final choice of landfall and offshore cable corridor.

12 The results of the meeting were included within the constraints mapping exercise explained below.

Constraints Mapping and Engineering Feasibility

13 Constraints within the offshore section of the Indicative Cable Corridor Area, ie to Mean High Water Spring (MHWS), were mapped using publicly available data, and heat maps were produced showing undevelopable, heavily constrained and constrained areas of sea.

- 14 The main constraints to cable installation were highlighted as being:
- existing and potential aggregate dredging areas;
 - areas associated with port operations, such as named and unnamed anchorage areas and deep water channels;
 - a disused explosives' dumping ground; and
 - existing and proposed cables and pipelines.
- 15 Much of the inshore section of the Indicative Cable Corridor Area is covered by the Outer Thames Estuary SPA, however this designation affects all potential routes equally.
- 16 Environmental data from the Thames Regional Environmental Characterisation (REC) study were also reviewed to highlight specific biological and geological features within the area. Features included potential *Sabellaria reef* at three locations, a geogenic piddock reef running through the centre of the area, palaeochannels throughout the southern half of the area indicating an increased likelihood of archaeological finds, and the presence of large sandwaves in the deeper waters of the area, close to the windfarm.
- 17 In parallel with the constraints study, the engineering feasibility of routeing cables within the Indicative Cable Corridor Area was also evaluated. This included a review of water depth, seabed topography and tidal currents to assess the ease of both installation and maintenance within the area. The study also included information on required cable separation distances, both for technical reasons and to provide sufficient space for installation and maintenance. The potential to route cables for up to three projects in Zone 5 was also considered.
- 18 Using the environmental constraints map as a baseline, potential offshore cable route options were developed according to the following criteria:
- avoidance of key environmental constraints;
 - development of the shortest routes possible to minimise cable length and therefore cost;
 - avoidance of / minimizing route length in areas which could present extreme technical difficulties for installation and/or maintenance, eg sandbanks, shallow waters;
 - avoidance of areas where there is an increased risk of cable damage, eg anchorage and dredging areas; and

- separation from, or right angle crossings of, existing cables and pipelines.

Offshore Area of Search

- 19 Consultation, constraints mapping work and the engineering feasibility study have allowed the Indicative Cable Corridor Area to be refined to the offshore Area of Search shown in *Volume 1, Figure 6.4*.
- 20 This offshore Area of Search was formulated as follows:
- 1500 m buffers were applied to potential cable route options to allow room for up to twelve cables (up to four from each of three potential projects) and to provide flexibility for micro-siting;
 - landfall options south of Harwich were removed to reduce disruption to port activities;
 - the Shipway and the area to the northeast of the Shipway was avoided to remove conflicts with port activities, named anchorages, aggregate dredging areas, a potential piddock reef structure and palaeochannels;
 - the explosives dumping ground was excluded from the Area of Search, but options to route north or south of it were retained;
 - the width of the area at its eastern end was aligned with potential converter station locations within the windfarm, ie within the middle third, and was made sufficient to allow for routing through the large bedforms in this region; and
 - sufficient width was maintained where the Galloper and Greater Gabbard windfarm cables bisect the area to allow for potentially complex crossing arrangements.
- 21 The final offshore Area of Search encompassed an area from potential landfall points at Bawdsey and Felixstowe, through the Sledway, with options to route north or south of the explosives dumping ground. This area was presented within the Electrical Transmission Works Scoping Report (July 2011) and used as the basis for Phase 1 consultation (July 2011).

Offshore Cable Corridor

- 22 Following Phase 1 consultation and utilising information from the scoping process and advice from specialists, the Area of Search was further refined to provide an offshore cable corridor suitable for up to

four cables from East Anglia ONE, and with the potential for a further eight export cables from up to two future projects within the East Anglia Zone.

- 23 The consultation process revealed no clear preferences for a corridor north or south of the explosives dumping ground. Information provided by marine and archaeological specialists showed that, although micro-siting around specific features may be required, there were no known major constraints to either option other than those already identified during initial constraints mapping. The northernmost option was therefore chosen as the most direct. During further discussions, HHA (Harwich, 22nd July 2011), indicated that this corridor, avoiding the Shipway and the harbour entrance, would address their key concerns.
- 24 During the process of refining the Area of Search, the potential for a Marine Conservation Zone to be designated across the corridor south of the explosives dumping ground, east of the Greater Gabbard and Galloper windfarm cables, was highlighted. This supported the choice of the northern corridor as direct conflict with a potential designated area could be avoided.
- 25 For the purposes of defining a cable corridor, the potential northern route was buffered by 1150m either side. The following adjustments were then made:
- the width of the corridor was increased to provide routeing flexibility within the area southwest of the Sledway to avoid anchored vessels;
 - a 500 m buffer around the Bawdsey and Cork anchorages was included to avoid interference with shipping;
 - the width of the corridor where it crosses the Greater Gabbard and Galloper windfarm cables was maximised to allow routeing flexibility in this area; and
 - the width of the corridor at its eastern end was retained from the Area of Search to allow for connection to the offshore converter stations and to facilitate routeing through the large bedforms in this area.
- 26 The offshore cable corridor is shown in *Volume 1, Figure 4.4*.

Further Work Required

- 27 A geophysical survey of the offshore cable corridor is scheduled for completion in the first quarter of 2012 and information from this will be available following the publication of the PEIR. This survey will provide

data on depth, seabed topography, shallow geology and magnetometry which will be utilised during the EIA.

28 The results of consultation to date, identification of known constraints and preliminary engineering design work have enabled the production of an offshore cable corridor sufficient for up to four cables from East Anglia ONE, and potential for a further eight cables from two additional projects within Zone 5. Information gathered during Phase 2 consultation and the results of the geophysical survey will be used to provide indicative cable routes, micro-sited as required around specific features identified. The potential impacts of the indicative routes will be assessed for the purposes of EIA.

29 Precise routeing will be decided post-consent during the detailed design phase following the collection of geotechnical information and further review of the geophysical data.

6.2.4 Landfall Location

30 Early consultation with local authorities identified that potential landfall locations were restricted by designations of the Alde Ore and Butley estuaries and Orford Ness-Shingle Street in the north and Hamford Water in the south.

31 As with the offshore corridor, constraints at or near the shoreline were mapped and areas were assigned a rating based on their developability. Constraints included:

- presence of infrastructure, eg housing and coastal defences;
- European, national and local ecological designations; and
- landscape and cultural heritage designations, eg archaeological sites.

32 Following this process, three likely landfall locations were identified: the area between Bawdsey Martello Tower and Bawdsey Manor, the area between Felixstowe Ferry and Felixstowe, and the area east of Little Oakley south of Harwich.

33 Following consultation with Harwich Haven Authority on 22nd November 2010, it was clear that routeing across the approaches to the harbour would not be acceptable due to the high densities of shipping traffic en route to Harwich and Felixstowe and the dredged area in the harbour entrance. The landfall close to Little Oakley was therefore discounted.

- 34 Landfalls north and south of the Deben Estuary were included within the Electrical Transmission Scoping Report (July 2011) and used as the basis for Phase 1 consultation.
- 35 Further consultation with Natural England and local planning authorities raised a number of issues around the choice of landfall site. These included concerns regarding erosion along the coast, affecting both landfalls, and strong currents near shore around the Deben Estuary entrance, affecting the Felixstowe to Felixstowe Ferry landfall area. These issues affected the final choice of landfall. The presence of subterranean World War II infrastructure at Bawdsey was also highlighted, although sites had been chosen to avoid proximity to these areas.
- 36 An engineering feasibility study was commissioned to review the landfall options in terms of construction and cost. This included a review of beach and seabed geology, tides and currents, fishing and anchorage interactions, potential access for cable vessels and cable protection requirements. This study concluded that the only landfall sufficient to accommodate up to three projects from the East Anglia Zone was Bawdsey.
- 37 In order to assess in detail the movement and stability of the shoreline and shallow subtidal areas, and the effects of coastal management plans over the next 50 years, a cable landfall coastal assessment was also commissioned. This study showed that the coast north and south of the Deben is eroding and that erosion rates are likely to increase over time due to sea level rise and increased storminess. Management policies to 2060 are 'Hold The Line' at Felixstowe Golf Course and 'No Active Intervention' at Bawdsey Cliffs. The study also highlighted the instability of the sandbanks at the mouth of the Deben Estuary.
- 38 Using the information from both reports, the landfalls were evaluated. A preferred landfall location between Bawdsey Martello Tower and Bawdsey Manor has been identified and shown in *Volume 1, Figure 4.1*. This landfall has been chosen for the following reasons:
- this landfall is sufficient to accommodate ducts for up to three projects;
 - the sea off the Bawdsey landfall is relatively sheltered in comparison with the strong tidal movement around the mouth of the Deben close to the Felixstowe Ferry landfall;

- routeing through Felixstowe Golf Club is the least preferred option in terms of disruption, and there is also species-rich wet grassland designated as a County Wildlife Site at this location; and
- assuming HDD is feasible, impacts on the SSSI designation at Bawdsey Cliffs could be avoided.

39 Coastal stability studies showed that erosion rates at Bawdsey would need to be factored in to the engineering design and that cable burial depths would need to allow for erosion to ensure cables do not become exposed over the lifetime of the proposed project.

Further Work Required

40 In order to assess the feasibility of HDD at the Bawdsey Cliffs, further geotechnical investigations are proposed, the results of which will be presented in the ES. Further consultation with the Environment Agency is also required regarding the coastal defences and planned works in this area.

6.2.5 Onshore Export Cable

Constraints Mapping and Engineering Feasibility

41 High level constraints within the onshore section of the Indicative Cable Corridor Area, ie from Mean High Water Spring (MHWS), were mapped using publicly available data and heat maps showing undevelopable, heavily constrained and constrained areas of land.

42 The main constraints to onshore routeing which were highlighted were ecology and nature conservation designations, landscape and cultural heritage designations, the presence of infrastructure, eg roads and railways and land uses (eg housing, lakes, rivers and farmland).

43 The heat mapping exercise concluded that:

- the built up area of Ipswich should be avoided;
- areas between the Deben and Orwell, the Orwell and the Stour, and the north and west of Ipswich were relatively unconstrained;
- the area south of the Stour would be constrained by the need for cables to cross Harwich Harbour and so a landfall south of Harwich should be discounted; and
- routeing under estuaries using HDD should be considered as this would open a number of additional routeing possibilities.

44 Key pinch-points for onshore routeing were identified between Martlesham and Woodbridge, at the Orwell Bridge and at Cattawade on the Stour.

Option to Route up the Estuaries

45 Early meetings with the local planning authorities had raised the possibility of routeing the cable up one of the three estuaries in an attempt to reduce disruption onshore.

46 A meeting was held with Harwich Haven Authority (HHA) (Harwich, 22nd November 2010) to discuss this option. HHA expressed the following concerns regarding routeing up the Orwell or the Stour estuaries:

- Felixstowe Port is Britain's largest container port. There are continuing harbour works in Felixstowe and Harwich, together with plans to develop a new £300 million container terminal at Bathside Bay on the River Stour. There would therefore need to be guarantees that there would be no disruption to port operations during construction or operation of the cables.
- Dredging to accommodate larger vessels is a continuous operation. When deciding cable burial depth, EAOW will need to consider dredging operations over the lifetime of the project, as the required cable burial depths may be impracticable. Future deepening in other areas in the approach to the ports may also be required.

47 A high level engineering review of the potential installation challenges associated with the cabling up the Orwell, Stour and Deben estuaries was also commissioned. This report concluded that cable routeing through these estuaries was not recommended due to conflicts with harbour requirements, ie presence of commercial traffic and dredged channels (Stour and Orwell only), conflicts with leisure activities, particularly along the Orwell and Deben which contain a large number of yacht moorings, and environmental designations. The width of the estuaries was also considered unsuitable for multiple parallel cable installations.

48 The option to route up the estuaries was therefore removed from further consideration.

Onshore Area of Search

49 Detailed constraints mapping work within the Indicative Cable Corridor area was then used to further refine the search area.

- 50 Key international and national environmental constraints sourced from the public domain were mapped at 1:50,000 scale. These included National Parks, Areas of Outstanding Natural Beauty, World Heritage Sites, Sites of Special Scientific Interest, RAMSAR sites, Special Areas of Conservation, Special Protection Areas, National Nature Reserves, Scheduled Monuments and Registered Parks and Gardens. Local environmental constraints were then identified including areas of mature woodland. Potential route corridors, based on environmental constraints, were identified.
- 51 In parallel, an engineering feasibility study considered how cables could, in practice, route around, through or under existing infrastructure. Potential route corridors, based on engineering feasibility, were then identified using the following criteria:
- ease of installation and type of terrain;
 - installation methods required, eg the need for directional drilling;
 - availability of working area required for construction and installation;
 - presence of other major services, eg gas pipelines and transmission circuits;
 - number of obstacle crossings, eg rivers, railways and pipelines, and crossing methods; and
 - potential impact on services and road users during construction.
- 52 Site walkovers at specific locations, by environmental and engineering specialists, were undertaken to assess cable route feasibility, including areas for construction compounds, construction hardstanding, site access tracks and passing places, and watercourse, rail and road crossings.
- 53 The identification of potential route corridors allowed the Indicative Cable Corridor Area to be refined to an onshore Area of Search. The onshore Area of Search was formulated as follows:
- broad 1km corridors were drawn to provide routeing flexibility;
 - specific designated areas, including an area of ancient woodland and an SSSI, were removed from the Area of Search;

- a number of villages, hamlets and Suffolk Water Park were removed from the area of search;
- areas were added east and west of the existing Bramford substation to provide options for locating the converter station location;
- the site of the north Orwell crossing was widened to increase routeing flexibility in this area;
- an area close to Suffolk Showground was added to incorporate the road verge of the A14; and
- the landfall area was widened north of the Deben Estuary to match the offshore area of search.

54 The onshore Area of Search is shown in *Volume 1, Figure 6.5*. This area was presented within the Electrical Transmission Works Scoping Report (July 2011) and used as the basis for Phase 1 consultation. The onshore Area of Search included corridors north and south of Ipswich and allowed for a number of crossing points of the Deben and Orwell estuaries.

Preferred Onshore Cable Corridor

55 On 12th July 2011, following the publication of the Scoping Report, a meetings was held with Babergh District Council, Suffolk County Council, Mid Suffolk District Council, Suffolk Coastal District Council, NE, RSPB and Suffolk Wildlife Trust (SWT) to discuss the Area of Search with a particular focus on potential routes options and constraints. This meeting yielded detailed information on the potential issues within the onshore Area of Search (including converter station locations) and areas to avoid. The discussions in this meeting were key to the final choice of a preferred onshore cable corridor.

56 During this meeting, there was a clear preference from the statutory consultees to identify a preferred onshore cable corridor which was not only sufficient for up to four cables as required for East Anglia ONE, but would also accommodate ducting for the two future projects from Zone 5 to also connect in at Bramford. This strategic approach would reduce the level of disruption, particularly in key areas such as the landfall and the area between Martlesham and Woodbridge.

57 The broad onshore cable corridor options within the Area of Search were then reviewed in terms of technical and environmental constraints and cost.

58 The broad options reviewed were:

- Bawdsey, east of the Deben, Woodbridge / Martlesham, north of Ipswich to Bramford;
- Felixstowe / Bawdsey, west of Deben and east of Newbourne, Woodbridge / Martlesham, north of Ipswich to Bramford;
- Felixstowe / Bawdsey, west of Deben and west of Newbourne, Woodbridge / Martlesham, north of Ipswich to Bramford;
- Felixstowe, crossing at Orwell Bridge, north to Bramford (east or west of Westbrook); and
- Felixstowe, crossing Orwell at Wade's Lane, north east to Belstead, north to Bramford (east or west of Westbrook).

59 Using the available technical and environmental information, and guided by feedback from statutory consultees, a preferred onshore cable corridor has been identified and is presented as *Volume 1, Figure 4.2*, showing the corridor within the onshore area of search for historical reference. The corridor is 160 m wide (including buffer) and is based on the worst case working width for cables from East Anglia ONE and ducts for two further projects (approximately 84m), plus a buffer on each side for ecological surveys.

60 The key issues affecting selection of the preferred onshore cable corridor are as follows.

- Local authorities and conservation bodies consulted provided strong guidance that routing north of Ipswich would be preferable to avoid major estuary crossings.
- Assuming a landfall at Bawdsey, the environmental preference is to cross the Deben as quickly as possible to route away from the AONB and avoid marshland and bird overwintering areas. The archaeological relevance of this area (close to Sutton Hoo) is also a concern. The option to route west of the Deben to Woodbridge has therefore been chosen as preferred.
- Assuming a route north of Ipswich, a route east of Newbourne is seen as preferable as this is more direct, thereby reducing disruption, and avoids an SSSI.
- A route immediately to the south of Woodbridge is the preferred route as this avoids any areas of woodland and County Wildlife sites.

- A route west of Suffolk Water Park is considered preferable to the route east as it avoids a potentially contaminated land site (a former fertiliser factory) and a landfill.

- 61 A potential route through the north end of Martlesham has been discounted due to the presence of large areas of woodland around Walk Farm and the Martlesham plantation, and a County Wildlife site (heathland mosaic) east of the A12.
- 62 A potential route across the Orwell close to Wade's Lane has been discounted due to Environment Agency proposals to realign the estuary walls and create new intertidal habitat in this area.
- 63 The alternative crossing point of the Orwell at the Orwell Bridge has been discounted due to the large number of environmental constraints east of the Orwell Bridge, including ancient woodland, County wildlife sites, the Orwell Country Park, woodland blocks and proximity to properties and caravan parks.
- 64 The preferred onshore cable corridor has been adjusted to enable routeing around an area of ancient woodland and to increase separation from a conservation site and a listed building (Seckford Hall).
- 65 Due to the distance from the landfall to the converter station at Bramford, the preferred onshore cable corridor includes a number of major routeing constraints. These include the Deben Estuary close to Red House Farm, Martlesham Creek, the East Suffolk Line at Woodbridge, the A12 west of Woodbridge, the A14 north of Ipswich, the River Gipping and the Ipswich to Ely Line north of Ipswich.

Further Work Required

- 66 The results of detailed environmental baseline surveys will be used to refine the preferred onshore cable corridor to a preferred onshore route. A final working width (approximately 84m) will be set for the purposes of EIA. This width will be sufficient for the cables required for East Anglia ONE and ducts for two further projects.

6.2.6 Converter Station Location

Converter Station Area of Search

- 67 When considering the area of search for the converter station, land adjacent to the existing substation at Bramford, within the existing onshore Area of Search, was reviewed. It was also decided to explore potential brownfield sites around the substation on the basis that

locating the converter station in industrial areas could provide a reduced environmental, particularly visual, impact. A search area of 5km from the Bramford substation was used as this is the maximum length of cable between a converter station and the substation which would not require additional significant infrastructure at Bramford.

- 68 The onshore Area of Search, including the 5km brownfield search area, is shown in *Volume 1, Figure 6.5*. This area was discussed in the Electrical Transmission Works Scoping Report (July 2011) and in the material provided during Phase 1 consultation.

Review of Potential Brownfield Sites

- 69 Three potential brownfield sites were identified on the outskirts of Ipswich within the 5km brownfield search area. All sites fulfilled three basic criteria - the land needed to be available, of sufficient size to accommodate at least one converter station required for East Anglia ONE and up to three for further projects from Zone 5, and there was a possible route for the outgoing connection to Bramford. Following an initial desk review, two sites were discounted due conflicts with long term planning allocations. A disused British Sugar factory near Sproughton was considered to be a possible site and was therefore subject to further environmental review.
- 70 The environmental review showed that the British Sugar site was very close to a flood zone, the presence of bunding around the site suggested that the site itself is prone to flooding. The review also revealed the potential for soil and groundwater contamination and ground gas due to historical commercial operations. In addition, its location, 3.5km south of Bramford, would require additional cabling, and therefore disruption. This site was discounted from further consideration.
- 71 During a meeting with local authorities held on 12 July 2011, a former factory site at Paper Mill Lane near Bramford was highlighted as a potential location. Following further review, the factory building was found to be listed and therefore not appropriate for housing the required infrastructure.
- 72 It was therefore concluded that there were no suitable brownfield sites suitable for the converter station(s) required.
- 73 Sites close to the existing substation were then reviewed in more detail. Locating the converter station site adjacent to the existing substation has the following positive effects:

- proximity to the existing substation means a reduced amount of outdoor AC infrastructure;
- EAOW has committed to undergrounding the onshore cables and locating the converter station adjacent to the existing substation ensures that no long stretches of overhead lines will be needed; and
- advice from local authorities and feedback from Parish Council meetings has indicated that, if land around Bramford is to be used, the preference is for the converter station to be located as close as possible to the existing substation.

Converter Station Refined Area of Search

74 A desk based assessment and a site visit, in June 2011, were undertaken covering the land around the existing Bramford substation. Potential site options were sought that would have the minimum environmental impact and would be feasible in terms of engineering requirement. The criteria used were that it must have sufficient area to accommodate the convertor station, and that it should avoid:

- designated environmental areas;
- designated heritage and archaeological sites;
- woodland and hedgerows (but with due consideration of woodland to provide screening);
- areas of sensitive land use;
- areas of flood risk and groundwater source protection zones;
- existing and future development areas;
- close proximity to existing services;
- centres of population and occupied buildings;
- areas that are not suitable for safe access for construction;
- severe slopes and difficult ground conditions; and
- landfill or contaminated sites.

75 Based on this assessment, a converter station Refined Area of Search was identified and is presented in *Volume 1, Figure 6.6* along with the onshore cable route, shown within the onshore Area of Search for historical context. Within this area, four site options were defined, two to the north, one to the east and one to the west of the substation. Option 3, west of the substation, was subsequently discounted as a badger sett had been relocated here as part of the Bramford substation extension works.

76 The remaining three sites were then evaluated in detail. All sites were considered feasible, however Site 2 has been chosen as the preferred

converter station location for East Anglia ONE due to its proximity to the existing substation.

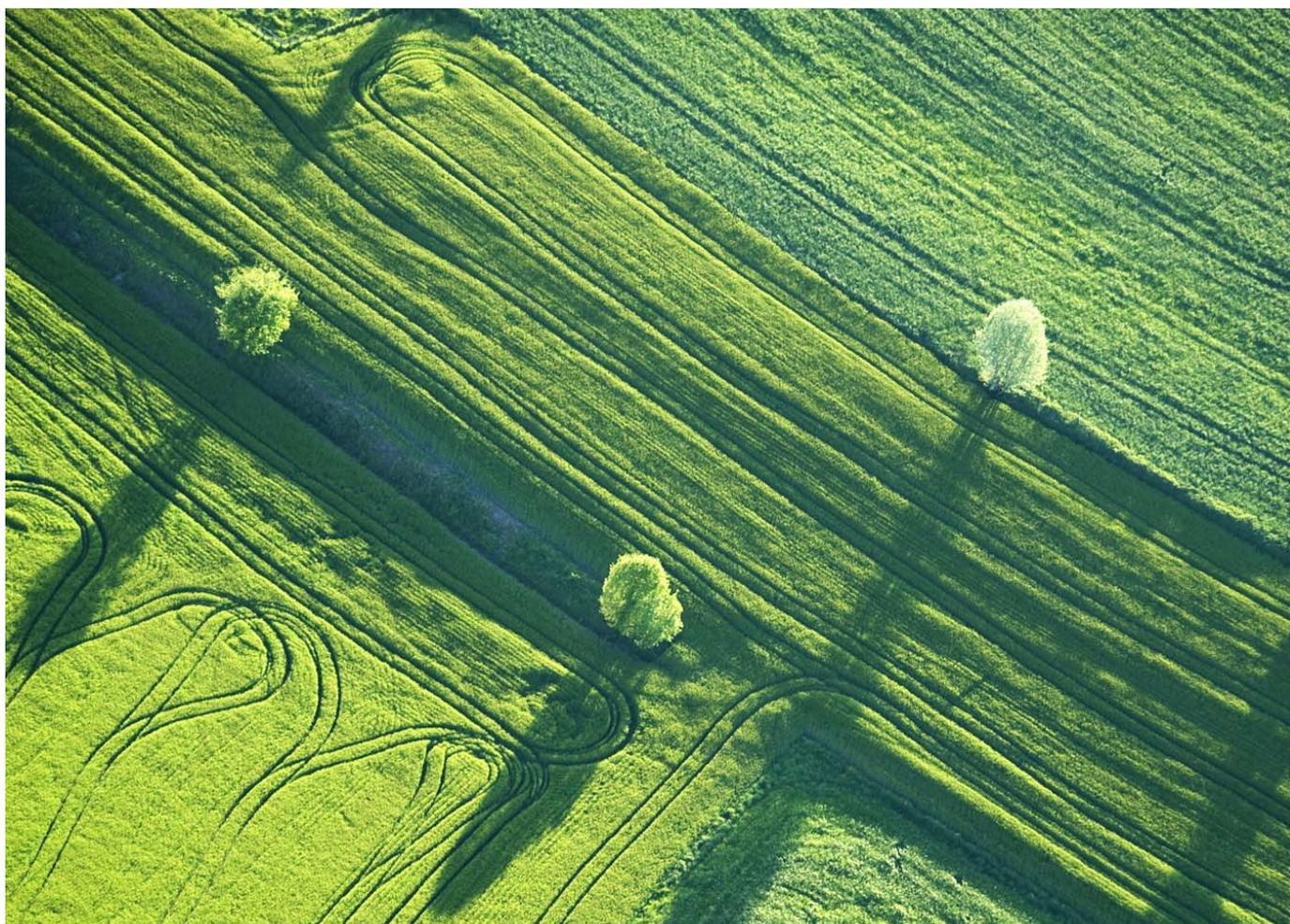
Further Work

77

The preferred converter station location and surrounding area will be subject to detailed environmental surveys for the purposes of EIA.

Appendix B

Routing Alternatives Study



ScottishPower Renewables & Vattenfall Wind Power Limited

East Anglia ONE Offshore Windfarm

Routing Alternatives Study- West of Woodbridge

P41388

MAY 2012





RSK GENERAL NOTES

Project No.: P41388

Title: East Anglia ONE Offshore Windfarm
Routing Alternatives Study- West of Woodbridge

Client: ScottishPower Renewables & Vattenfall Wind Power Limited

Date: 22nd May 2012

Office: Helsby

Status: Rev 02

Project manager	 <u>Sally Rotherham</u>	Technical Reviewer	 <u>Wendy Hogben</u>
Date:	<u>22nd May 2012</u>	Date:	<u>22nd May 2012</u>

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.



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1 INTRODUCTION

1.1 Purpose of the Study

This report has been prepared to examine potential routing options to the west of Woodbridge, primarily to identify ways in which the Preferred Onshore Cable Corridor could be located away from the villages of Great Bealings and Little Bealings.

1.2 Overview of Cable Corridor Routing

In common with other types of linear development, the effect that a cable may have on the environment largely depends on the route chosen. Consequently, careful selection of a route is of prime importance in avoiding wherever possible, and thereafter minimising, potential adverse environmental effects.

It is for this reason that the 160m wide Preferred Onshore Cable Corridor (as shown within the Preliminary Environmental Information (PEI) Report) has been established following a series of studies which have become progressively more focused to establish an optimum corridor to be taken forward.

A systematic route selection process has been utilised, consisting of the following stages:

- Identification of a **large Area of Search** encompassing potential landfall points and grid connection. This was made large enough to consider potential routing options to the north and south of Ipswich and include the Stour, Orwell and Deben Estuaries in response to a clear preference from the local authorities to minimise onshore impacts. However the Area of Search was restricted to the north due to the environmental designations of the Alde – Ore Estuary and restricted to the south due to the environmental designation of Hamford Water.
- Following a review of key high-level constraints with the Area of Search, **broad potential route corridors** were identified (these formed the focus of the Environmental Scoping Report produced in June 2011). Onshore, the main development constraints were urban conurbations and the need to reduce the numbers of rail, road and estuary crossings. The areas between the Deben and Orwell, the Orwell and Stour and north and west of Ipswich were identified as relatively unconstrained, with Ipswich and the area north of the Deben identified as the most heavily constrained areas. Potential landfall locations were identified as either between Bawdsey Martello Tower and Bawdsey Manor or between Felixstowe and Felixstowe Ferry.
- Following this a Route Corridor Investigation Study was undertaken to select a **Route Corridor**. A corridor to the north of Ipswich was selected due to constraints in the south, including the River Orwell, its floodplain and associated statutory ecological designations, Area of Outstanding Natural Beauty and the frequency of Schedule Monuments.

- Within the Route Corridor a 160m wide survey corridor was selected (known as the **Preferred Onshore Cable Corridor**). This was the focus of the PEI report.
- Defining a **working width** suitable for cable construction (this has yet to be undertaken); and
- Identification of the **final route** during the conceptual and detail design stages of the project, based on the results of increasingly detailed surveys, studies and consultations with environmental advisory bodies and landowners.

This report focuses on the justification of the Preferred Onshore Cable Corridor to the west of Woodbridge only and does not attempt to assess routing prior to this point. This has already been fully explored within the Route Corridor Investigation Study.

1.3 Study Methodology

Due to ongoing environmental investigations, the project team holds a wealth of environmental information for this area. This study aims to collate all mapped environmental constraint information held for the area to the west of Woodbridge to examine whether there are any viable alternative routing options in the vicinity of the villages of Great Bealings and Little Bealings.

Routing options have been investigated leaving the Preferred Onshore Cable Corridor at National Grid Reference 624885, 248340 and connecting back with the Preferred Onshore Cable Corridor at National Grid Reference 621283, 248590.

2 POTENTIAL ROUTING OPTIONS

2.1 The Preferred Onshore Cable Corridor

The Preferred Onshore Cable Corridor was selected in this area due to the large open fields providing a direct route through an existing gap within settlements and vegetation.

It is anticipated that mitigation measures could be put in place to minimise disruption caused by crossing Lodge Road (which connects Little Bealings and Great Bealings).

Routing in this area was constrained by the settlement of Grundisburgh and woodland cover in the north and the railway line, and the River Fynn (and its associated floodplain) in the south. The settlement of Little Bealings itself posed a constraint to routing in the south as the aforementioned constraints and the space required during construction would mean routing the cable within private gardens.

The Preferred Onshore Cable Corridor is 3.61km in length, nearly 0.5km less than the alternatives considered below.

2.2 Alternative Onshore Cable Corridor A

Alternative Onshore Cable Corridor A diverts from the Preferred Onshore Cable Corridor to the west of Seckford Hall. From here it is routed north west to the east of Birds Hill, Bealings House and across the edge Queech Wood. The cable crosses the unnamed road to the north of Queech Wood. The cable diverts west to make use of existing tree gaps (where possible) before crossing Bealings Lanes. The cable passes to the south of the sewage works and crosses the River Lark (Main River and tributary to a reservoir) before turning south west crossing two ordinary watercourses. Hill Farm is bypassed on the east of the cable corridor. The cable corridor crosses Grundisburgh Road before connecting back into the preferred onshore cable corridor to the south of Playford Corner.

Alternative Onshore Cable Corridor A is 4.51km in length, nearly 420m more than Alternative B below and 900m more than the Preferred Onshore Cable Corridor.

2.3 Alternative Onshore Cable Corridor B

Alternative Onshore Cable Corridor B diverts from the Preferred Onshore Cable Corridor to the east of Little Bealings and south of Lodge Road. The cable corridor has been routed south west to skirt around the southern end of Little Bealings. The cable crosses the River Lark and passes to the east of Dower House. The cable will need to undergo two crossings of the River Fynn to avoid properties on The Street to the north of the river. This will involve works within the floodplain of the River Fynn near Bealings Bridge. This is the only available gap between the properties and the railway line. To return north, there may be an impingement onto the private gardens of those properties on the western side of The Street. The cable corridor travels north west avoiding a band of woodland on the east. The cable crosses two ordinary watercourses which are



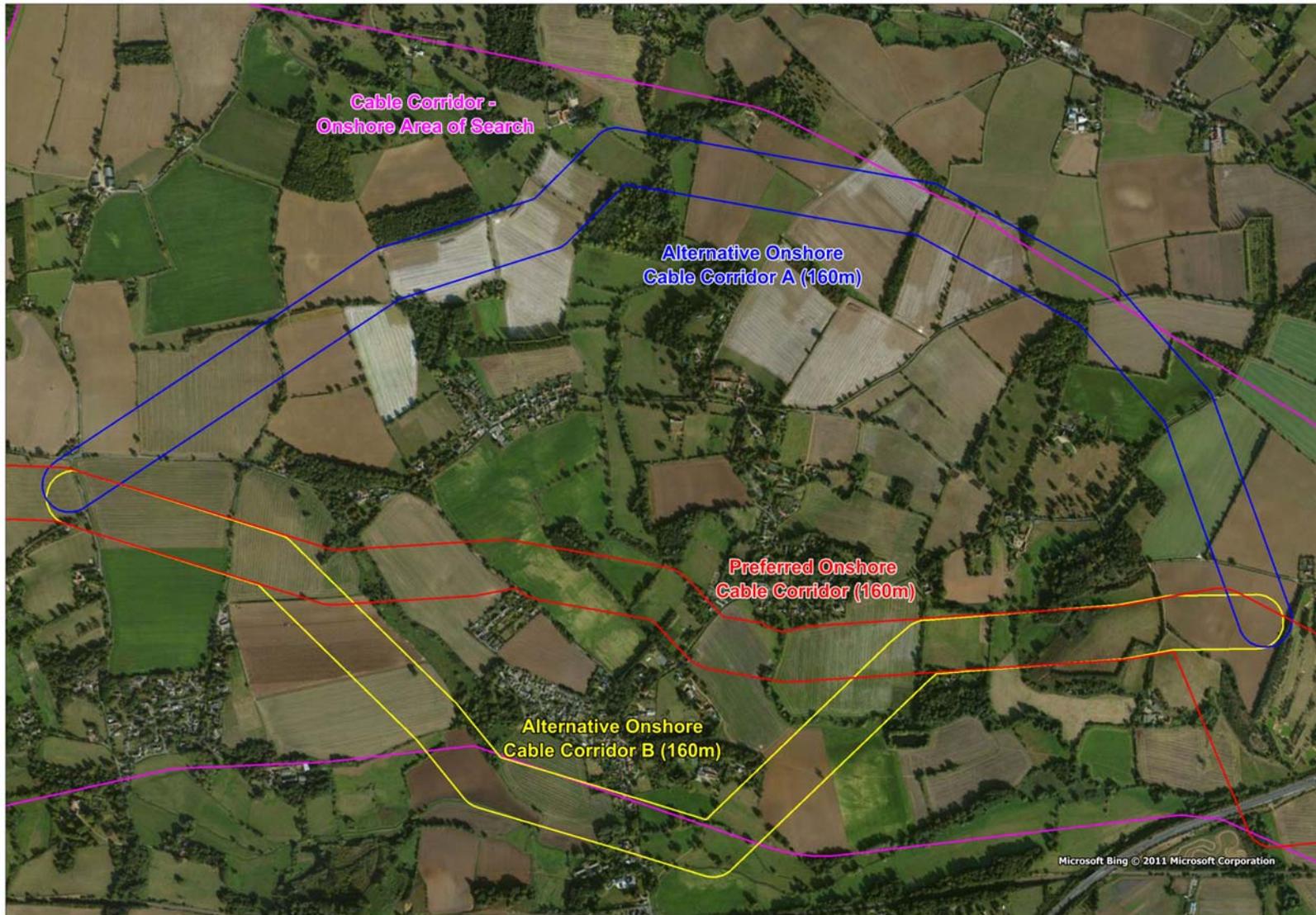
tributaries to the River Fynn, before connecting back within the Preferred Onshore Cable Corridor on the western side of Church Street.

This corridor may be further constrained by the presence of other utilities. This is made evident on 1:5000 scale O/S base mapping as a short stretch of pipeline is indicated within a track to the south east of Sandy Lane; this should be investigated further.

It should also be noted that parts of this cable corridor are located outside of the Cable Corridor Onshore Area of Search as this is the only viable option for routing south of Little Bealings.

Alternative Onshore Cable Corridor B is 4.09km in length; 480m longer than the Preferred Onshore Cable Corridor.

Figure 1: Route Alternatives



3 SUMMARY OF CONSTRAINTS

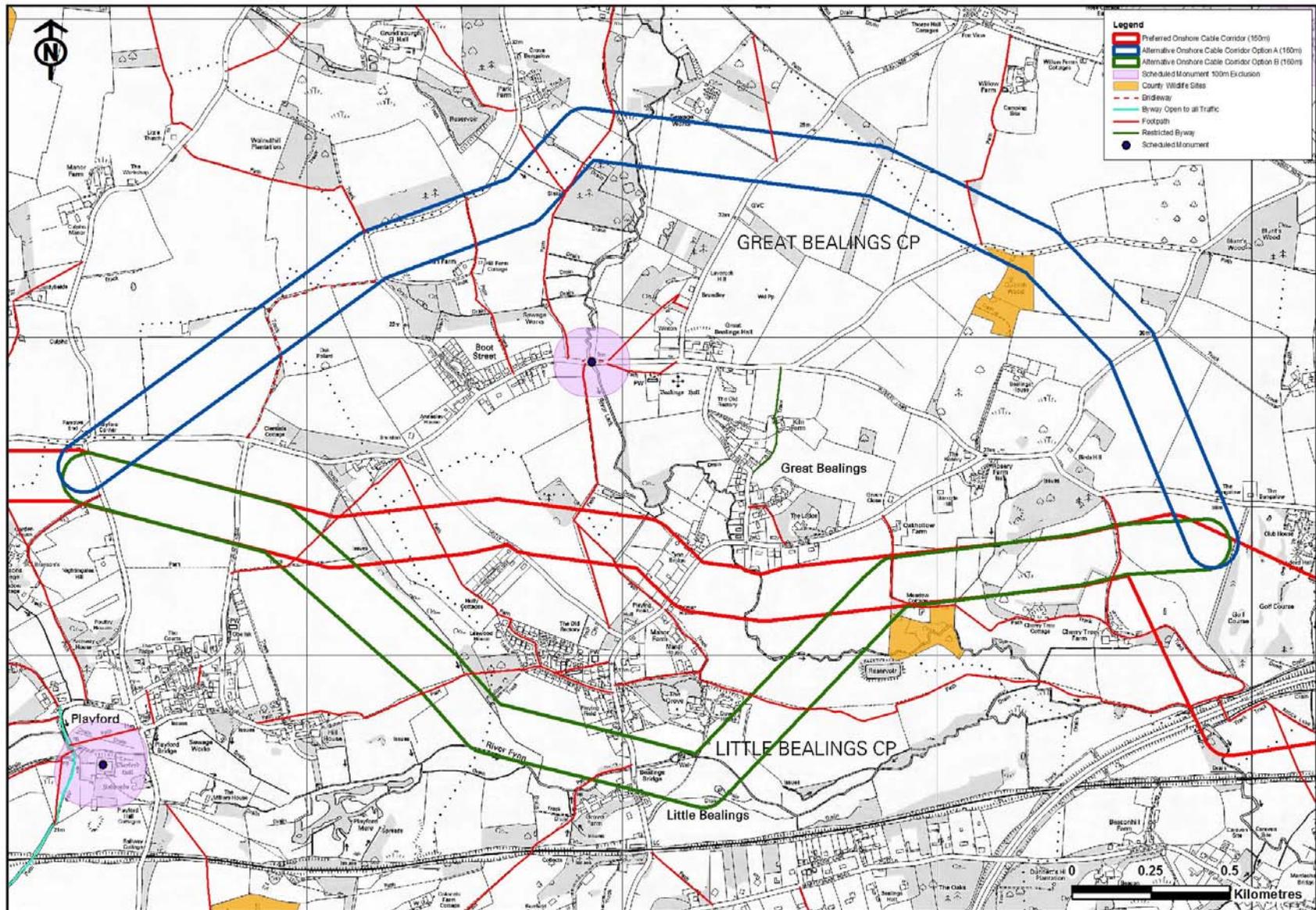
Table 1: Summary of Environmental Constraints

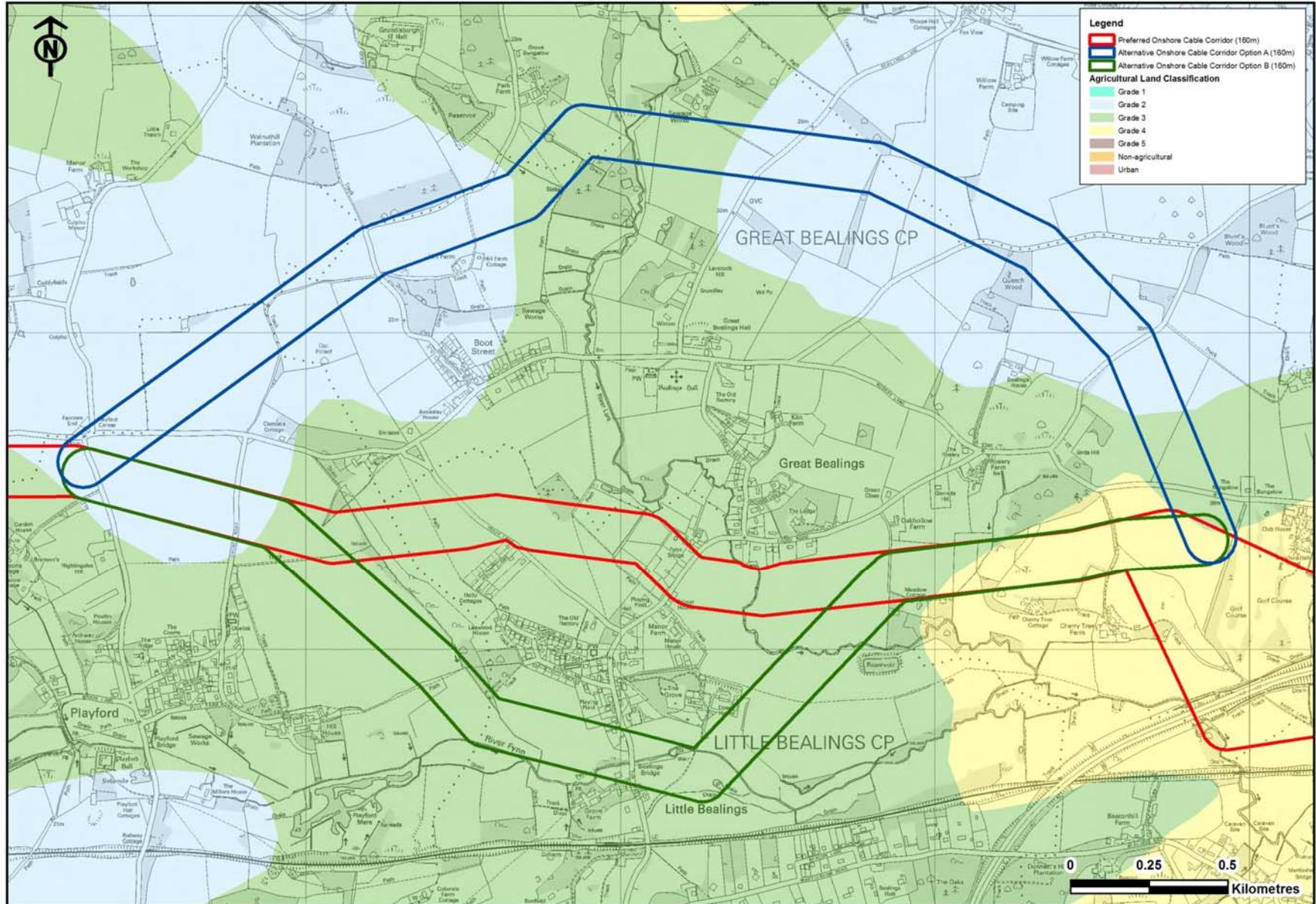
Feature	Preferred Onshore Cable Corridor	Alternative Onshore Cable Corridor A	Alternative Onshore Cable Corridor B
Length of Cable Corridor	3.61km	4.51km	4.09km
Statutory Designated Ecological Sites (Ramsar, SAC, SPA, SSSI, NNR, LNR)	None affected	None affected	None affected
Areas of Outstanding Natural Beauty	None affected	None affected	None affected
Ancient Woodland	None affected	Queech Woodland	None affected
World Heritage Sites	None affected	None affected	None affected
County Wildlife Sites	None affected (although site close to route)	Crosses 1 county wildlife site (Queech Wood)	None affected (although site close to route)
Conservation Areas	None affected	None affected	None affected
Heritage Coast	None affected	None affected	None affected
Country Park	None affected	None affected	None affected
Historic Parks & Gardens	None affected	None affected	None affected
Registered Battlefields	None affected	None affected	None affected
Listed Buildings	None affected	None affected	None affected
Conservation Areas	None affected	None affected	None affected
Scheduled Monuments	None affected	None affected	None affected
Public Rights of Way	7	7	6
Open Access Land	None affected	None affected	None affected
Registered Common Land	None affected	None affected	None affected
National Trails	0	0	2 crossings of the Fynn Valley Walk
Agricultural Land Classification	Approximately 25% of the route corridor traverses grade 2, 50% traverses grade 3 and 25% traverses grade 4	Approximately 70% of the route corridor traverses grade 2 and 30% traverses grade 3	Approximately 20% of the route corridor traverses grade 2, 60% traverses grade 3 and 20% traverses grade 4
Environmentally Sensitive Area	Entirely within an ESA	Approximately 1673m of the route corridor traverses an ESA	Entirely within an ESA
Environmentally Sensitive Area Agreements	Approximately 700m of the route corridor traverses an area with Agreements in place	Approximately 338m of the route corridor traverses an area with Agreements in place	Approximately 1000m of the route corridor traverses an area with Agreements in place

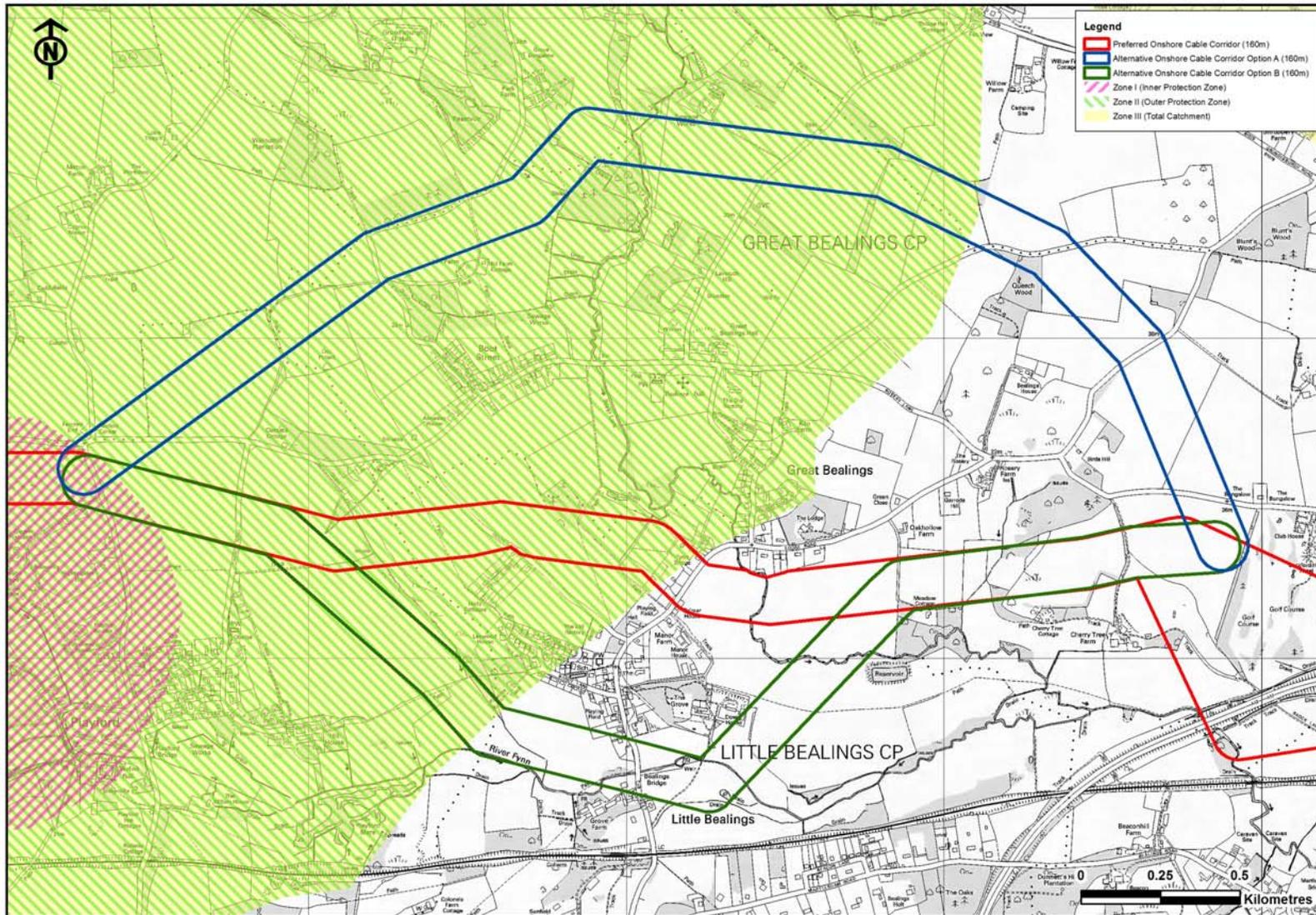


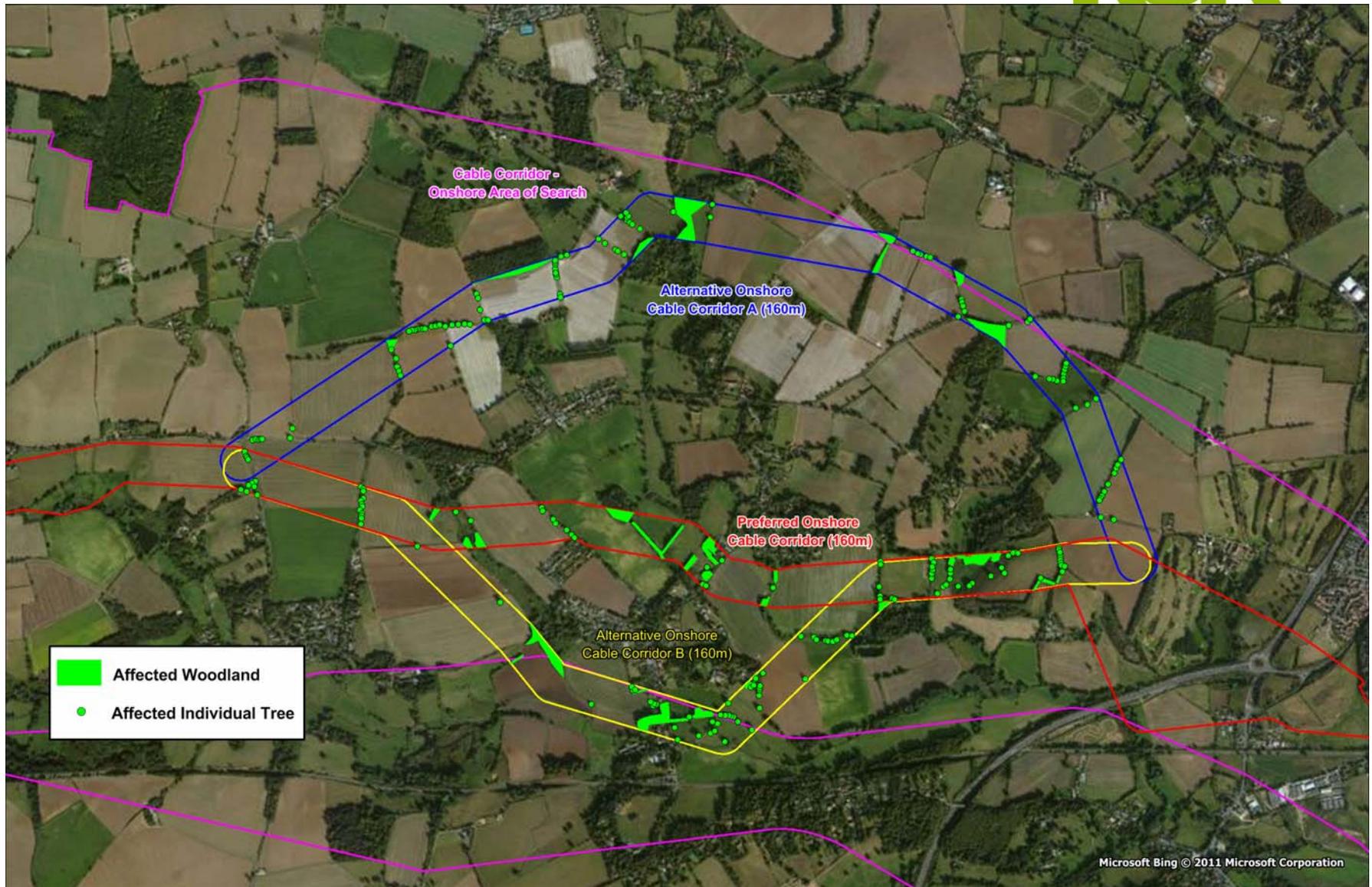
Environmental Stewardship Agreements	Approximately 866m of the route corridor traverses an area with Entry Level Stewardship Agreements in place	Approximately 3054m of the route corridor traverses an area with Entry Level Stewardship Agreements in place	Approximately 134m of the route corridor traverses an area with Entry Level Stewardship Agreements in place
Countryside Stewardship Agreements	None affected	Approximately 415m of route corridor traverses an area with Agreements in place	None affected
Source Protection Zones	Zone II & III= 1.94km Zone I= 170m	Zone II & III= 3.2km Zone I= 87m	Zone II & III= 1.54km Zone I= 170m
Woodlands	Crosses approximately 10 boundaries containing approximately 75 individual trees and crosses approximately 2.65ha of isolated tree cover, although much of this could be avoided by micro routing.	Crosses approximately 15 boundaries containing approximately 104 individual trees and crosses approximately 2.95ha where dense tree cover occurs that could not be avoided.	Crosses approximately 9 boundaries containing approximately 103 individual trees and crosses approximately 2.73ha of woodland that could not be avoided.
Road Crossings	6	8	5
Railway Lines	None affected	None affected	None affected
Main Rivers	Crosses 1 Main River at National Grid Ref 623436, 248190	Crosses 1 Main River at National Grid Ref 623048, 249591	3 Main River crossings at National Grid Ref 623532, 247982, 623325, 247657 and 622924, 247598
Ordinary Watercourses	2	3	3
Private Water Supplies	None affected	Data not available	Data not available
Floodplain	Floodplain surrounding the River Lark	Floodplain surrounding the River Lark	Floodplain surrounding the River Lark and 2 crossings of the River Fynn
Mineral Extraction Sites	None affected	Data not available	Data not available
Landfill Sites	None affected	Data not available	Data not available

Figure 2: Constraints Mapping









4 CONCLUSIONS

4.1 General Conclusions

No statutory designated sites have been identified on any of the cable corridor options. The constraints identified relate mainly to river crossings (and their associated flood plains), the presence of Sources Protection Zones, impacts to the Queech Wood county Wildlife Site, woodland and tree loss, the proximity of the route to properties, the presence of the best and most versatile agricultural land (and associated agri-environment schemes), road crossings and Public Rights of Way.

From the constraints identified, the following conclusions have been drawn:

4.2 Alternative Onshore Cable Corridor A

4.2.1.1 *Route Length*

Alternative Onshore Cable Corridor A is almost a kilometre longer than the Preferred Onshore Cable corridor. It is best practise to choose the shortest available route unless significant issues have been identified and need to be avoided. Selecting the shortest route reduces environmental impacts by reducing the area affected (and the associated environmental receptors) by construction activities.

4.2.1.2 *Agricultural Land Classification (ALC)*

Alternative Onshore Cable Corridor A traverses mainly agricultural land classified as grade 2. ALC provides a method for assessing the physical quality of farmland so that the best and most versatile agricultural land can be protected through the planning system.

The best and most versatile land is defined as Grades 1, 2 and 3a in the National Planning Policy Framework (NPPF, 2012). This is the land that is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals. The NPPF states that “local planning authorities should take into account the economic and other benefits of the best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of a higher quality.”

Other corridors examined, although they do in part affect grade 2 land, largely affect agricultural land of grade 3 and 4.

4.2.1.3 *County Wildlife Site*

Alternative Onshore Cable Corridor A crosses the Queech Wood County Wildlife Site. The site is listed in Natural England’s Ancient Woodland Inventory and is surrounded by a ditch and bank which is typical of most ancient woods. The tree canopy is dominated by mature ash with frequent oak and field maple and a dense scrub layer is provided by hazel, blackthorn, rose and elder. Tangles of honeysuckle and ivy in the trees are

widespread. Dog's-mercury and nettle dominate the ground flora, although a number of more uncommon woodland plants are also present; wood spurge, violet, sanicle and hairy St John's-wort. The wood is mainly used as a cover for game birds. It would be preferable to avoid routing through this site as any tree loss will have significant impacts as described in section 4.2.1.4 below.

4.2.1.4 *Woodland and Tree Cover*

As well as impacting on Queech Wood County Wildlife Site, Alternative Onshore Cable Corridor A is constrained by other areas of woodland and dense tree cover. The development of Corridor A would unavoidably result in some loss of woodland/dense tree cover.

Woodland/dense tree cover loss has landscape and visual impacts and impacts to ecological receptors, particularly where the trees to be lost are mature trees and/or are part of a woodland area. This is because;

- Any mature trees lost will be replaced with younger stock that will take many years to mature;
- Restrictions imposed on the proximity within which certain tree species can be planted to the cable route will inevitably mean a change in the structure of the woodland around the cable route;
- The importance of trees to the landscape character is recognised within the Suffolk landscape character assessment;
- Mature trees can support bats and bat roosts, both of which are legally protected;
- Woodland is recognised as a nationally important habitat under the UK Biodiversity Action Plan;
- Mixed Broadleaved Woodland and Plantation are listed as Priority Habitats on the Suffolk Biodiversity Action Plan.

4.2.1.5 *Conclusion*

Due to:

- Alternative Onshore Cable Corridor A being almost 1km longer than the preferred route;
- Impacts to grade 2 ALC;
- Impacts to Queech Wood County Wildlife Site; and
- The unavoidable loss of woodland/dense tree cover associated with this alternative.

Alternative Onshore Cable Corridor A is not considered to be a better option than the Preferred Onshore Cable Corridor.

4.3 Alternative Onshore Cable Corridor B

From the constraints identified, Alternative Onshore Cable Corridor B is considered to be the least favourable for the following reasons:

- It involves a crossing of the River Lark and two crossings of the River Fynn;
- It involves significant works within the floodplains of the above watercourses;
- The cable will be routed closer to houses within the settlement of Little Bealings and will be in close proximity to houses within the settlement of Little Bealings for a greater length than the Preferred Onshore Cable Corridor;
- There is the potential for greater disruption to residents of Little Bealings, including the potential need to cross private gardens;
- There is the potential to encounter other utilities;
- There will be an unavoidable loss of woodland/dense tree cover;
- This route is 480m longer than the Preferred Onshore Cable Corridor.

4.4 The Preferred Onshore Cable Corridor

The Preferred Onshore Cable Corridor is the shortest option and is considered to have the least environmental impacts.

The preferred onshore cable corridor crosses less boundaries containing tree lines than option A and avoids areas where more dense tree cover occurs. The preferred onshore cable corridor also only involves one main river crossing, and is routed further from housing than option B. Where the route is in close proximity to housing (at the pinch point between Little Bealings and Great Bealings) it is anticipated that mitigation measures could be put in place in order to minimise disruption to the local communities.

In summary it can be concluded that the preferred onshore cable corridor is considered the best option for routing the cable in this area.