

Hornsea 4

Ørsted



Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 4, Annex 3.3: Selection and Refinement of Onshore Infrastructure

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Glossary

Term	Definition
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.
Electrical Infrastructure Study Area	The study area between the onshore substation and offshore array area
Export cable corridor (ECC)	The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Project Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Onshore substation / OnSS	Located as close as practical to the NGET substation at Creyke Beck and will include all necessary electrical plant to meet the requirements of the National Grid.
Ørsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four offshore wind farm;
Maximum design scenario	The maximum design parameters of each Hornsea Four asset (both on and offshore) considered to be a worst case for any given assessment.

Acronyms

Acronym	Definition
AfL	Agreement for Lease
BAP	Biodiversity Action Plan
BRAG	Black, Red, Amber, Green (Assessment Criteria)
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
Coxx	Commitment (followed by number)
CPA	Closest Point of Approach
CPO	Compulsory Purchase Order

Acronym	Definition
DBA	Desk Based Assessment
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EISA	Electrical Infrastructure Study Area
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
MHW	Mean High Water
MLW	Mean Low Water
MoD	Ministry of Defence
MWLS	Mean Low Water Spring
NSIP	Nationally Significant Infrastructure Project
OnSS	Onshore Substation
OS	Ordnance Survey
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
RPSS	Route planning and site selection
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCI	Site of Community Importance
SoCC	Statement of Community Consultation
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
TCE	The Crown Estate
TJB	Transition Joint Bay
UK	United Kingdom

Units

Unit	Definition
km	Kilometre(s)
m	Metre(s)

1 Introduction

1.1 Background

1.1.1 Overview of Hornsea Four Approach

1.1.1.1 The Hornsea Four route planning and site selection (RPSS) process has followed an iterative approach to ensure the most appropriate solution was identified efficiently, with due consideration of environmental, technical and commercial matters. The five key stages are shown in [Table 1](#).

Table 1: Hornsea Four Route Planning and Site Selection Stages

Stage	Associated Document
Stage 1: Identification of the AfL and Grid Connection	Volume 1 Chapter 3
Stage 2: Identification of an Electrical Infrastructure Study area	Volume 1 Chapter 3
Stage 3: Identification of the Landfall	Volume 4 Annex 3.1
Stage 4: Identification of the Onshore Substation (OnSS) site	Volume 4 Annex 3.3
Stage 5: Identification of the Offshore and Onshore Export Cable Corridor (ECC)	Volume 4 Annex 3.2 and Annex 3.3

1.1.1.2 The Hornsea Four Electrical Infrastructure Study Area (EISA) is largely defined by the AfL (location of the wind farm array) and grid connection point at Creyke Beck (location of the OnSS). These two locations formed the eastern and western extents of the EISA.

1.1.1.3 The EISA has been used to structure the RPSS reporting format, with:

- Landfall covered in Annex 3.1,
- all Hornsea Four offshore infrastructure east of landfall covered in Annex 3.2; and
- all Hornsea Four onshore infrastructure to the west detailed in Annex 3.3.

1.1.1.4 This is shown in [Figure 1](#).

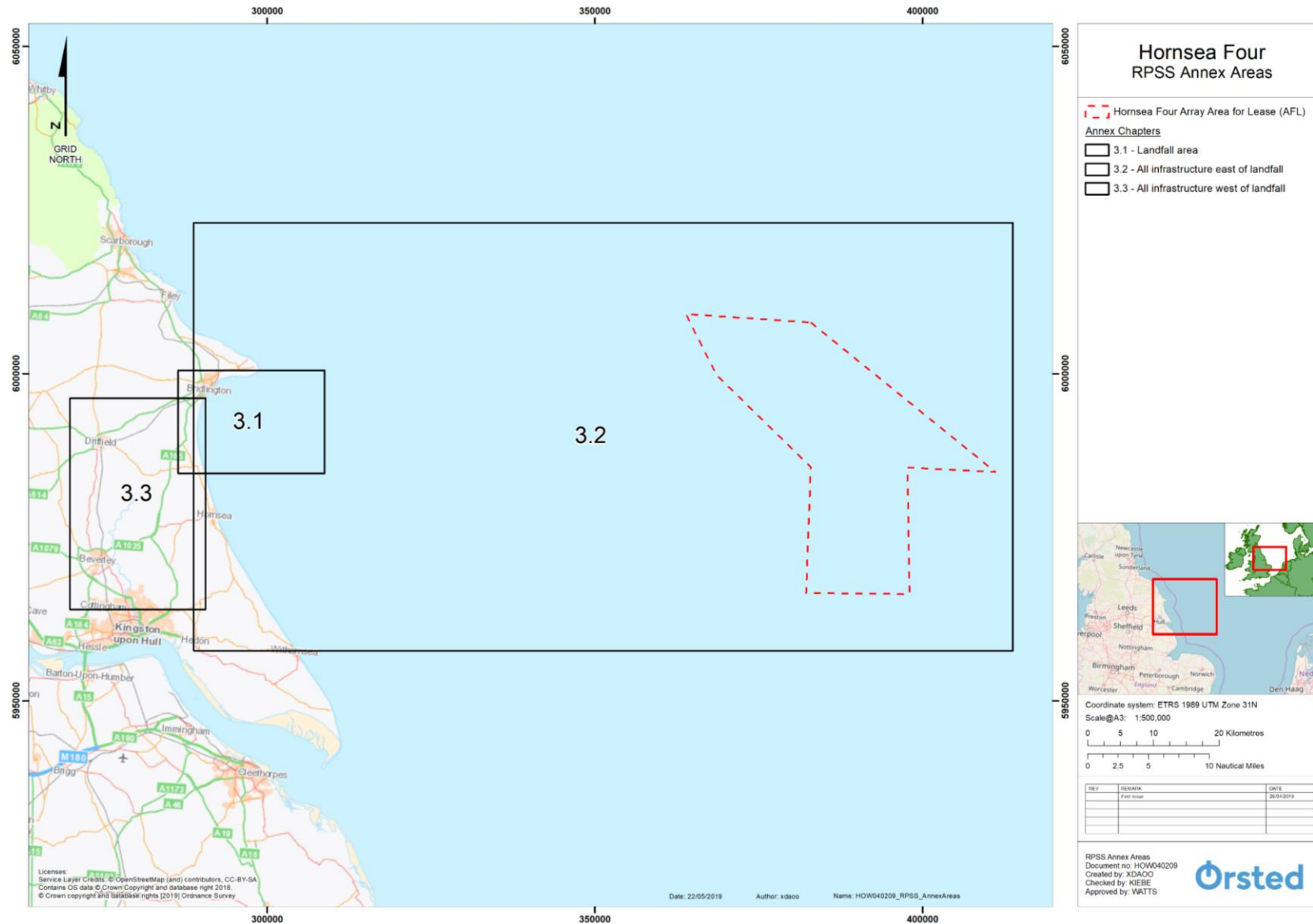


Figure 1: Hornsea Four RPSS reporting (not to scale).

1.1.2 Hornsea Four Programme and Timeframes

1.1.2.1 The RPSS process has been structured incrementally, with early and frequent stakeholder engagement prioritised, through public consultation, landowner liaison and regular stakeholder correspondence. This is set out in [Table 2](#).

1.1.2.2 The RPSS process specific to onshore infrastructure is shown in [Figure 2](#). The figure is split into two, with the OnSS and EBI site selection shown at the top, and the onshore ECC shown at the bottom.

Table 2: Hornsea Four RPSS Programme.

Stage	Description
EIA Scoping October 2018	<ul style="list-style-type: none"> 2,000 m onshore ECC scoping boundary and indicative 200 m permanent ECC and 700 m temporary works area. Onshore Substation (OnSS) search area. Landfall search area. 3,000 m offshore ECC scoping boundary.
Scoping – PEIR consultation	<ul style="list-style-type: none"> Feedback and comments from informal public consultation events, landowner liaison and stakeholders on the scoping report and scoping boundary.
PEIR July 2019	<ul style="list-style-type: none"> 80m onshore ECC inclusive of permanent and temporary works areas with indicative construction access points. Compounds: logistics, Horizontal Directional Drilling (HDD) and/or storage compounds outside of the permanent cable corridor for auxiliary works. Access: Area required for access (temporary or permanent) to the construction and/or operation and maintenance activities. OnSS site. Two landfall options. 1,500 offshore permanent ECC with 500m temporary works areas buffer either side of ECC).
Section 42 and 47 consultation	<ul style="list-style-type: none"> Feedback from stakeholders and members of the public upon receipt of more detailed environmental assessment work will further inform the RPSS process.
DCO Application Q2 2020	<ul style="list-style-type: none"> Onshore ECC (80m) which will contain all permanent (electrical cables and Transition Joint Bays (TJBs)) and temporary works for construction works and soil storage. The details of which will be developed during detailed design. Compounds: logistics, Horizontal Directional Drilling (HDD) and/or storage compounds outside of the permanent cable corridor for auxiliary works. Access: Area required for access (temporary or permanent) to the construction and/or operation and maintenance activities. OnSS: preferred site within the onshore substation search area. Landfall: preferred site within the landfall search area. Offshore ECC (1,500 m): the area within which the export cable route and temporary works area (500m buffer either side of ECC) are planned to be located.

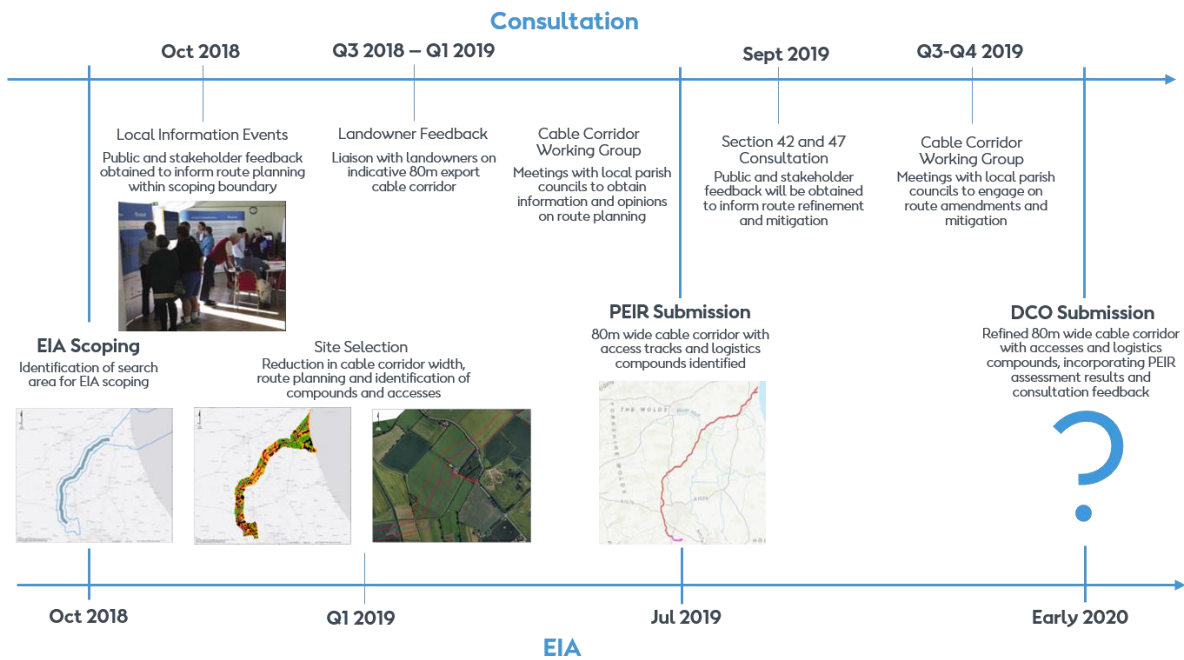
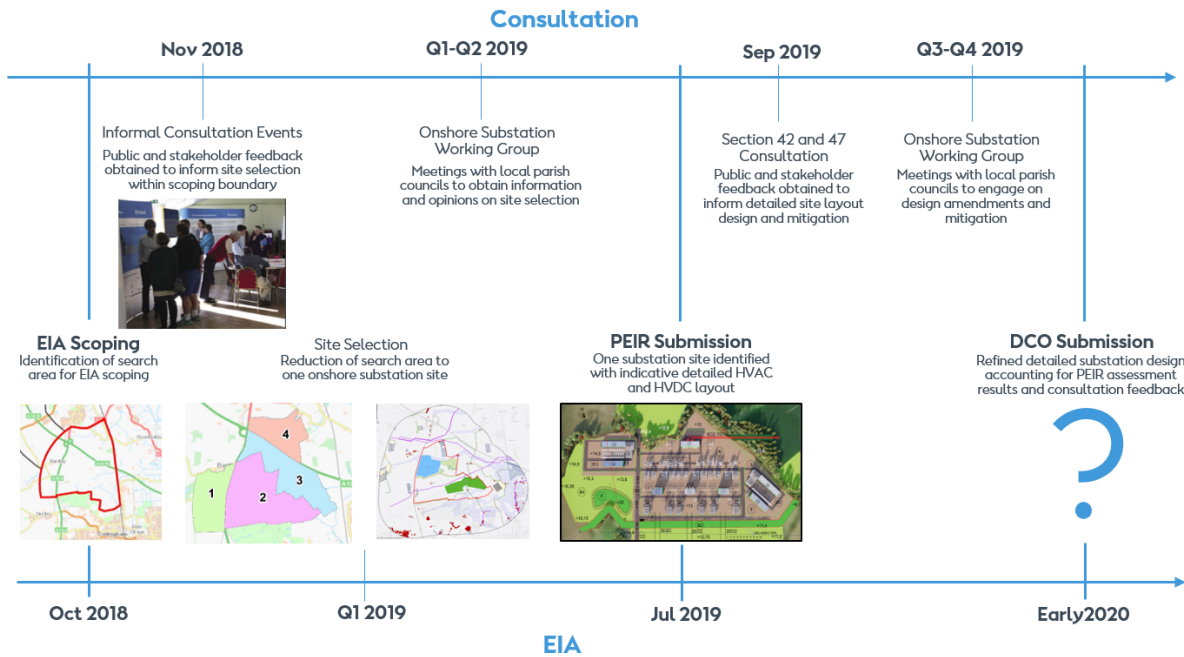


Figure 2: Onshore infrastructure RPSS Timelines.

1.2 Purpose of the Annex

1.2.1.1 This Annex has been produced by Ørsted Hornsea Project Four Ltd (the Applicant) to document the decision making behind the refinement of the onshore infrastructure since identification of the Electrical Infrastructure Study area up to submission of the Preliminary Environmental Information Report (PEIR). The onshore project element comprises all infrastructure landward of the landfall (as shown in [Figure 1](#)). This Annex documents the following project elements:

- Stage 4 – Identification of the OnSS site; and
- Stage 5 – Identification of the Onshore ECC.

1.2.1.2 Prior to submission of the PEIR Hornsea Four has engaged with a range of stakeholders with regards to the progress of the project and emerging project design matters. Stakeholders that were consulted as part of the ongoing RPSS process, from project inception to PEIR submission, included:

- The Planning Inspectorate;
- East Riding District Council;
- The Environment Agency;
- Natural England;
- Highways Agency;
- The Wildlife Trust;
- Landowners;
- Parish Councils; and
- Members of the public at local information events held in East Riding and surrounds during October 2018 (see Statement of Community Consultation (SoCC): REF).

1.3 Project Elements

1.3.1.1 The OnSS site selection was undertaken based on a 155,000 m² permanent footprint (inclusive of OnSS and Energy Balancing Infrastructure (EBI)) and a 130,000 m² temporary works area.

1.3.1.2 The onshore ECC site selection was undertaken based on incrementally decreasing parameters, from 700m width (permanent and temporary works) at EIA scoping refined down to an 80 m wide ECC used for PEIR, inclusive of permanent and temporary works areas.

2 Onshore Substation Site Selection

2.1 Background

2.1.1.1 The OnSS will contain the electrical components for transforming the power supplied from the offshore wind farm to 400kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National grid. If a HVDC system is used it will also house equipment to convert the power from HVDC to HVAC.

- 2.1.1.2 Hornsea Four will incorporate EBI to provide valuable services to the electrical grid; such as importing, storing and exporting energy to meet the grid needs and improve stability and reliability. All energy balancing equipment will be housed wholly within the footprint of the onshore substation
- 2.1.1.3 This section describes the site selection process for the OnSS undertaken since the identification of the grid connection at the National Grid Energy Transmission (NGET) station at Creyke Beck. The identification and refinement of the OnSS area is detailed, culminating in the selection of the preferred site for PEIR submission.

2.2 Substation Search Area

2.2.1 Establishing EIA Scoping Boundary

- 2.2.1.1 Prior to submission of the EIA Scoping Report, a process of refinement was undertaken to reduce the redline boundary used to inform the EIA scoping process and allow focussed consultation. This process comprised of three versions of the OnSS search area (illustrated in [Figure 3](#)):

Version 1 – 3km Radius (Panel 1 of Figure 3)

- 2.2.1.2 To commence site selection, a 3 km radius was drawn surrounding the NGET substation at Creyke Beck. This radius was used to minimise the length of the 400kV AC connection linking the new OnSS and the grid connection point. Minimising this distance is necessary to reduce cable reactive power issues, mitigate transmission losses, and minimise adverse effects on economic efficiency. The 3 km radius was selected based on previous project experience.

Version 2-3 – EIA Scoping Boundary (Panel 2 and 3 of Figure 3)

- 2.2.1.3 The 3 km search area was refined to remove heavily constrained areas comprising:
- settlements and other highly or more populated areas (the south of Beverley and north of Cottingham); and
 - two golf courses (Cottingham Parks and Skidby Lakes).
- 2.2.1.4 Further site selection work determined that one of the onshore ECC routes under consideration was unsuitable. The onshore ECC route, which would approach the OnSS search area from the east, lacked a suitable crossing point on the Woodmansey Road that satisfied Hornsea Four's criteria. Further details of the onshore ECC refinement process are provided in [Section 3.4](#). As a result, the area to the east of the Hull – Scarborough railway line was removed from the search area, reducing the OnSS search area by approximately 50%.

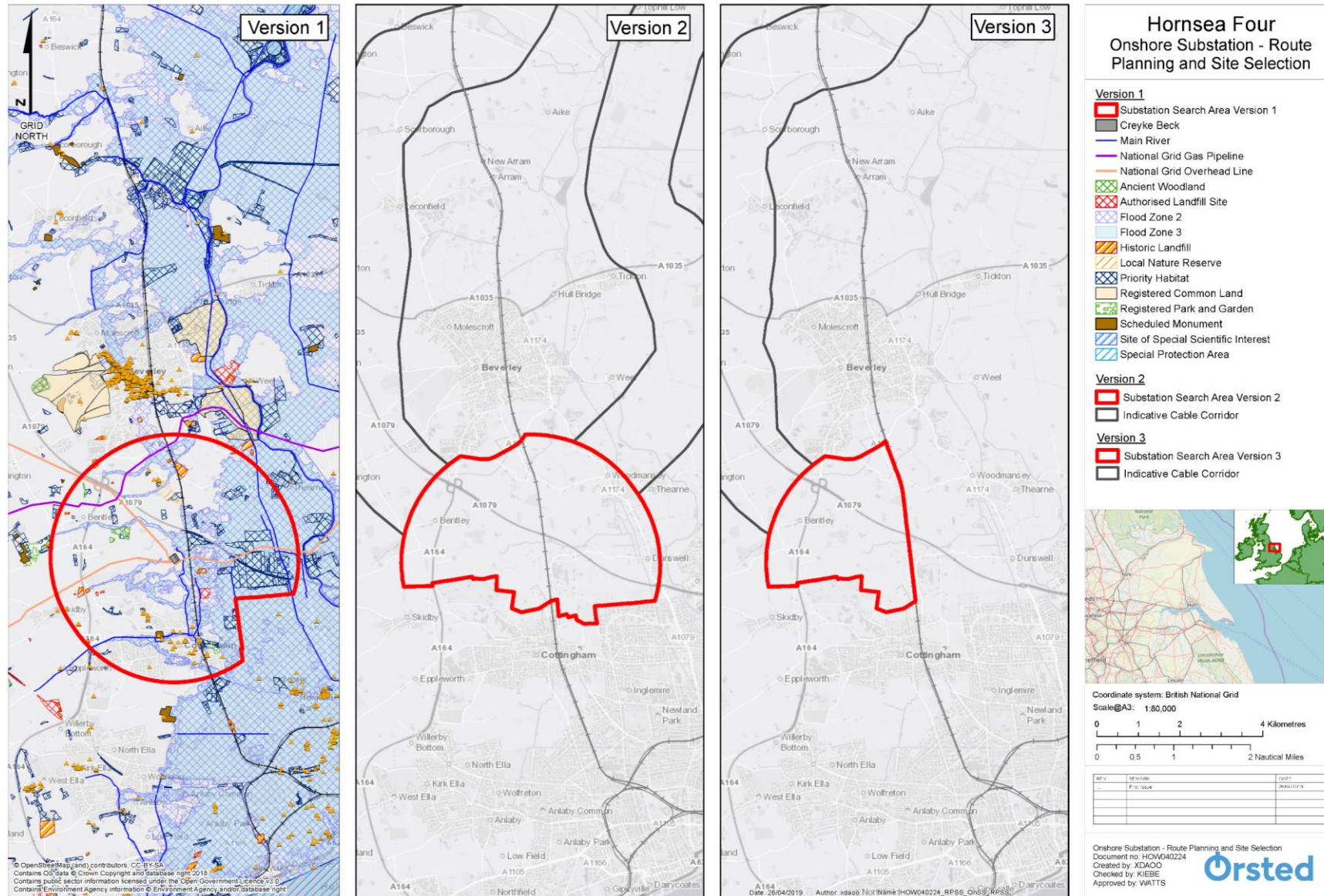


Figure 3: Establishing OnSS Scoping Boundary (not to scale).

2.2.2 Post-Scoping Search Area Refinement

Heat Mapping Exercise

2.2.2.1 After establishing the scoping boundary an initial constraints-based heat mapping exercise utilised the following datasets to identify areas that could be excluded from consideration and/or indicate the least environmentally constrained locations within the search area:

- Residential receptors;
- Utilities;
- Topography;
- Flood Risk Zone 3 areas;
- Proximity from the NGET substation at Creyke Beck;
- Priority Habitat and Ancient Woodland Inventory; and
- Road network.

2.2.2.2 The heat mapping results (shown in [Figure 4](#)) were created to provide early context to the OnSS search area and were used to promote dialog at the upcoming informal consultation events.

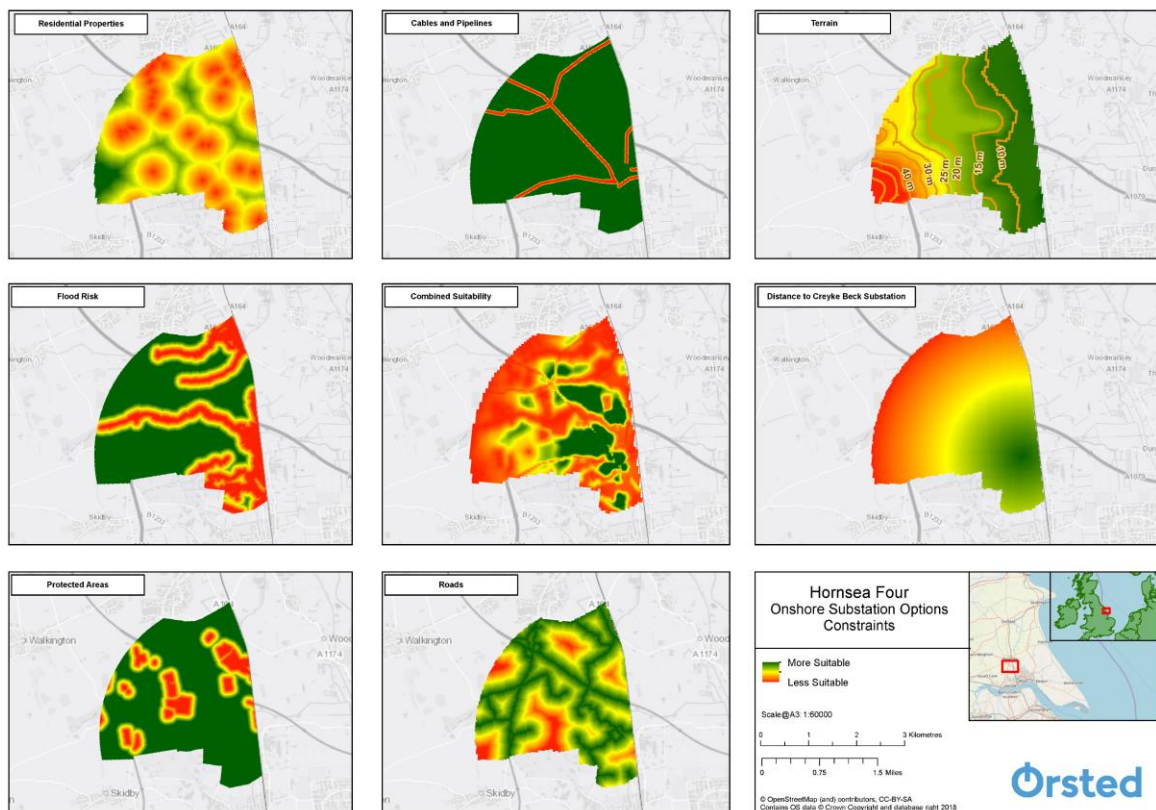


Figure 4: OnSS Scoping Boundary Heatmapping Exercise (not to scale).

Informal Local Information Events

- 2.2.2.3 Hornsea Four held a series of informal consultation events during the week commencing 22 October 2018. Residents and landowners within the ONSS EIA scoping boundary and an additional 0.5km boundary were notified and invited to an event held on 27 October at Woodmansey Village Hall. The consultation events were supported by information previously outlined within the EIA Scoping Report, in addition to the heat mapping exercise.
- 2.2.2.4 Feedback from the Woodmansey Village Hall event, which was attended by a focussed group of landowners and local residents, identified that the OnSS should be located:
- as close to the NGET substation at Creyke Beck as possible;
 - to the east of the A164; and
 - to the south of the A1079.

Version 4 - Creation of OnSS Search Zones

- 2.2.2.5 The OnSS scoping boundary was subjected to a detailed review to identify areas that did not contain land parcels of a suitable size to accommodate the technical parameters of the OnSS identified within [Section 1.3](#). This exercise was also informed by the heatmapping results ([Figure 4](#)), and removed areas within the north, north-east, east, south-east and north-west (shown in [Figure 5](#))
- 2.2.2.6 The remaining search area was divided into four zones:
- Zone 1 comprises arable land intersected by Dunflat Road, bounded by Bentley and Copleflat Lane to the north, the A164 to the east, and arable land to the south and west;
 - Zones 2 and 3 comprises arable land and a low density of residential dwellings, located between the A1079 to the north, Creyke Beck NGET substation to the east, Cottingham Parks and Skidby Lakes golf clubs to the south, and the A164 to the west; and
 - Zone 4 comprises arable land, with small-scale agricultural tracks and highways infrastructure associated with the A1079 in the west. It was bound by arable land to the north and east, the A1079 to the south, and A164 to the west.
- 2.2.2.7 The zones were devised using established field boundaries and existing highway infrastructure.

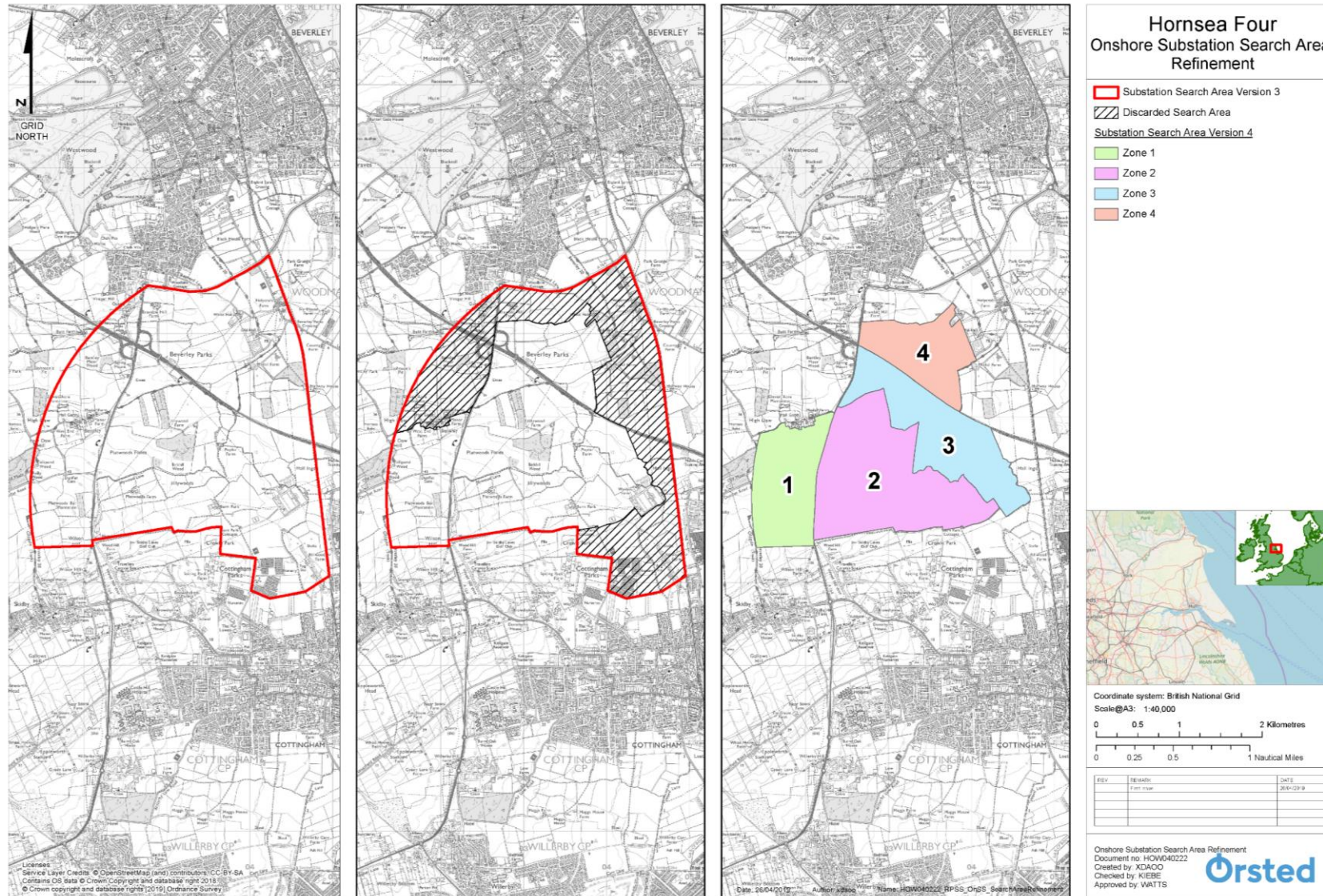


Figure 5: Creation of OnSS Site Selection Search Zones (not to scale).

RAG Appraisal of Zones

2.2.2.8 Suitability of zones 1-4 for the siting of the OnSS was determined through a high-level Red, Amber, Green (RAG) appraisal. The RAG appraisal focussed only on environmental considerations and was undertaken based on five key criteria. The datasets used for this appraisal comprised:

- Local planning policy outlined in the ERYC Local Plan, ERYC Policies map, ERYC Allocations Document; and
- Consented developments from the ERYC database.

2.2.2.9 The RAG ratings are defined in [Table 3](#).

Table 3: RAG Appraisal Rating.

Rating	Summary
Red	High constraint to development within zone
Amber	Medium constraint to development within zone
Green	Low constraint to development within zone

2.2.2.10 Red constraints are critical in determining whether a zone is appropriate for development and would generally remove a zone from further consideration if identified. Amber and green constraints are those that may be more readily minimised or managed by employing appropriate mitigation measures.

2.2.2.11 Agricultural productivity was originally included within the criteria; however, all land within the OnSS search area is classified as Grade 2 and as such, the criteria was removed as it was not contributing to the appraisal.

2.2.2.12 As shown in [Table 4](#) and [Figure 6](#), the RAG appraisal identified red constraints within Zone 1, 3 and 4, removing them from further consideration. Zone 2 was considered acceptable based on the RAG appraisal and was retained for a detailed site selection exercise.

Table 4: RAG Criteria – Zones.

Criteria	Zone 1	Zone 2	Zone 3	Zone 4
<p>Planning policy and guidance:</p> <p>Red: Existing consented development or site allocations for future development within local policy that would significantly constrain development.</p> <p>Amber: N/A</p> <p>Green: No significant consented development or site allocations for future development that would impact development.</p>	No significant consented development or designated sites within local planning policy.	No significant consented development or designated sites within local planning policy.	No significant consented development or designated sites within local planning policy.	Located within 500-600m of the southern boundary of Beverley, which is anticipated to be further developed to the south, as per local planning policy.
<p>Landscape and Visual:</p> <p>Red: Located within a landscape designation or a location that is highly visible from settlements in the locality</p> <p>Amber: Not located within a landscape character area, but highly visible from settlements in the locality</p> <p>Green: Not located within a landscape character area or highly visible from settlements in the locality</p>	<p>Set within the eastern extent of the regionally designated Yorkshire Wolds Important Landscape Area.</p> <p>Elevated position of the zone means development would be visible from parts of Beverley and the top of Beverley Minster. The site would also be in close proximity to the Risby Hall Registered Park and Garden.</p>	Not located within a landscape character area or highly visible from settlements in the locality	Not located within a landscape character area or highly visible from settlements in the locality	Closest zone to Beverley with open views towards the site attainable from houses along the settlement edge. Views of development within the site are likely from the top of Beverley Minster.
<p>Residential:</p>	Not located near an urban area.	Northern extent of Cottingham located within 1.5 km.	Not located near an urban area.	Located within 1km of Beverley.

Table 4: RAG Criteria – Zones.

Criteria	Zone 1	Zone 2	Zone 3	Zone 4
<p>Red: 'Urban area' within 1km (settlement with >10,000 population)</p> <p>Amber: 'Urban area 1-1.5km distant (settlement of >10,000 population)</p> <p>Green: Urban area 1.5+km distant (settlement of >10,000 population)</p>				
<p>Biodiversity:</p> <p>Red: Large presence of internationally or nationally designated sites within zone</p> <p>Amber: Medium presence of internationally or nationally designated sites within zone</p> <p>Green: Low presence of internationally or nationally designated sites within zone</p>	One priority habitat located within zone. This comprises a low presence within the zone.	Two areas of priority habitat and a large area of ancient woodland are present. This forms a medium presence within the zone.	One priority habitat located within the zone. This comprises a low presence within the zone.	No designated sites located within the zone.
<p>Utilities:</p> <p>Red: High pressure gas pipeline or overhead powerlines running through majority of zone leaving no sites of suitable size.</p> <p>Amber: High pressure gas pipeline or overhead powerline present within</p>	No high-pressure gas pipelines or overhead powerlines within zone	Overhead power lines running through zone leaving suitable sites.	High pressure gas pipeline runs through the entirety of zone, resulting in no available sites of an appropriate size.	No high-pressure gas pipelines or overhead powerlines within zone

Table 4: RAG Criteria – Zones.

Criteria	Zone 1	Zone 2	Zone 3	Zone 4
zone but sites of suitable size available with appropriate buffer Green: No high-pressure gas pipelines or overhead powerlines within zone				
Conclusion	Zone removed from further consideration due to potential impact on local landscape character.	Zone retained for further consideration.	Zone removed from further consideration due to high pressure gas pipeline.	Zone removed from further consideration due to proximity to urban area

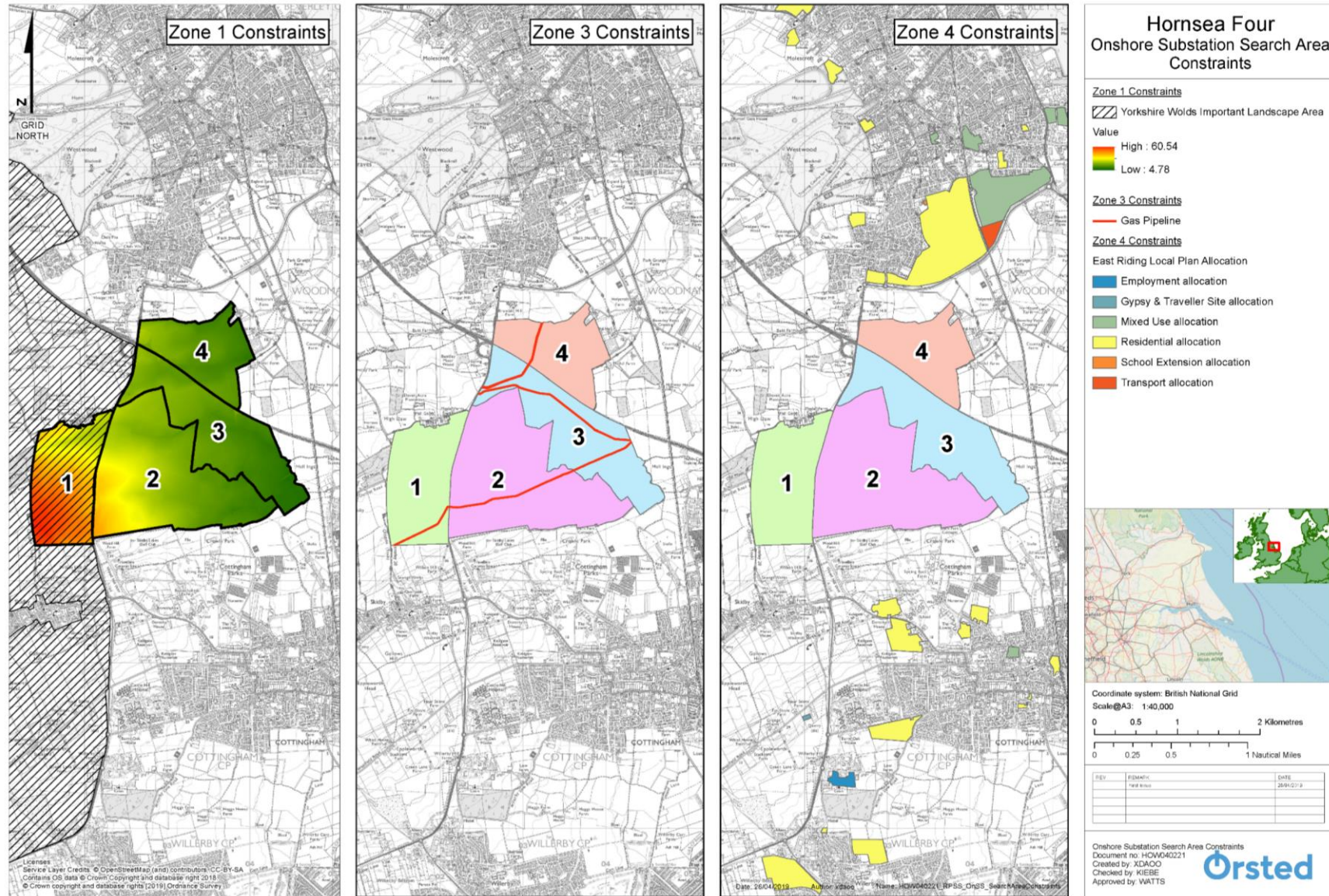


Figure 6: OnSS Zone RAG Appraisal (not to scale).

OnSS Access Appraisal

2.2.2.13 Alongside the RAG appraisal, Hornsea Four explored OnSS access options. This was undertaken with feedback from the informal local information events, that expressed local concerns associated with construction traffic routing through Cottingham and turning off the A164. A local transport consultancy, Local Transport Projects Ltd (LTP), was appointed to analyse five potential access and egress points, shown in [Figure 7](#). LTP's appraisal aimed to establish whether suitable access and egress points existed within the surrounding highway network, and comprised:

- an assessment of the local highway network near the proposed accesses;
- an examination of construction vehicle routing options;
- Swept Path Analysis (SPA) of both the construction routes and construction access junction utilising the largest vehicle likely to be used to support construction activities;
- a Visibility Assessment of the existing access junctions on the A164; and,
- a strengths, weaknesses, opportunities, threats (SWOT) analysis of the five access options.

2.2.2.14 The SWOT analysis identified that Access Option 4 (A1079, via the existing northbound layby) provides the most suitable option from those considered for providing construction access to both Zones 2 and 3.

Presentation of OnSS Zone and Access Appraisal to ERYC

2.2.2.15 The OnSS search area refinement methodology and access appraisal were presented and discussed at a meeting with ERYC planning and highways officers on Wednesday 21 November 2018.

2.2.2.16 During the meeting, it was agreed in principle (and based on available information) that Zone 2 was the preferred area to locate the OnSS. It was also agreed that Access Option 4 offered the best overall solution for construction access to Zone 2, through the utilisation of the existing northbound layby on the A1079. Concern was raised by ERYC in respect of taking access from the A164, which experiences high levels of traffic.

OnSS Working Group

2.2.2.17 A OnSS working group was held on 12 March 2019 with parish council representatives from Rowley, Skidby, Walkington, Cottingham and Woodmansey. The principles of the construction access and identification of Zones 2 and 3 were presented and discussed. Feedback from the working group indicated that Access Option 4 was supported and that the OnSS site should be located as close to the NGET substation at Creyke Beck as possible. A second working group was held on 21 May 2019, which confirmed the approach taken was appropriate, with attendees agreeing that Zone 2, as close to Creyke Beck NGET substation was the optimal solution.

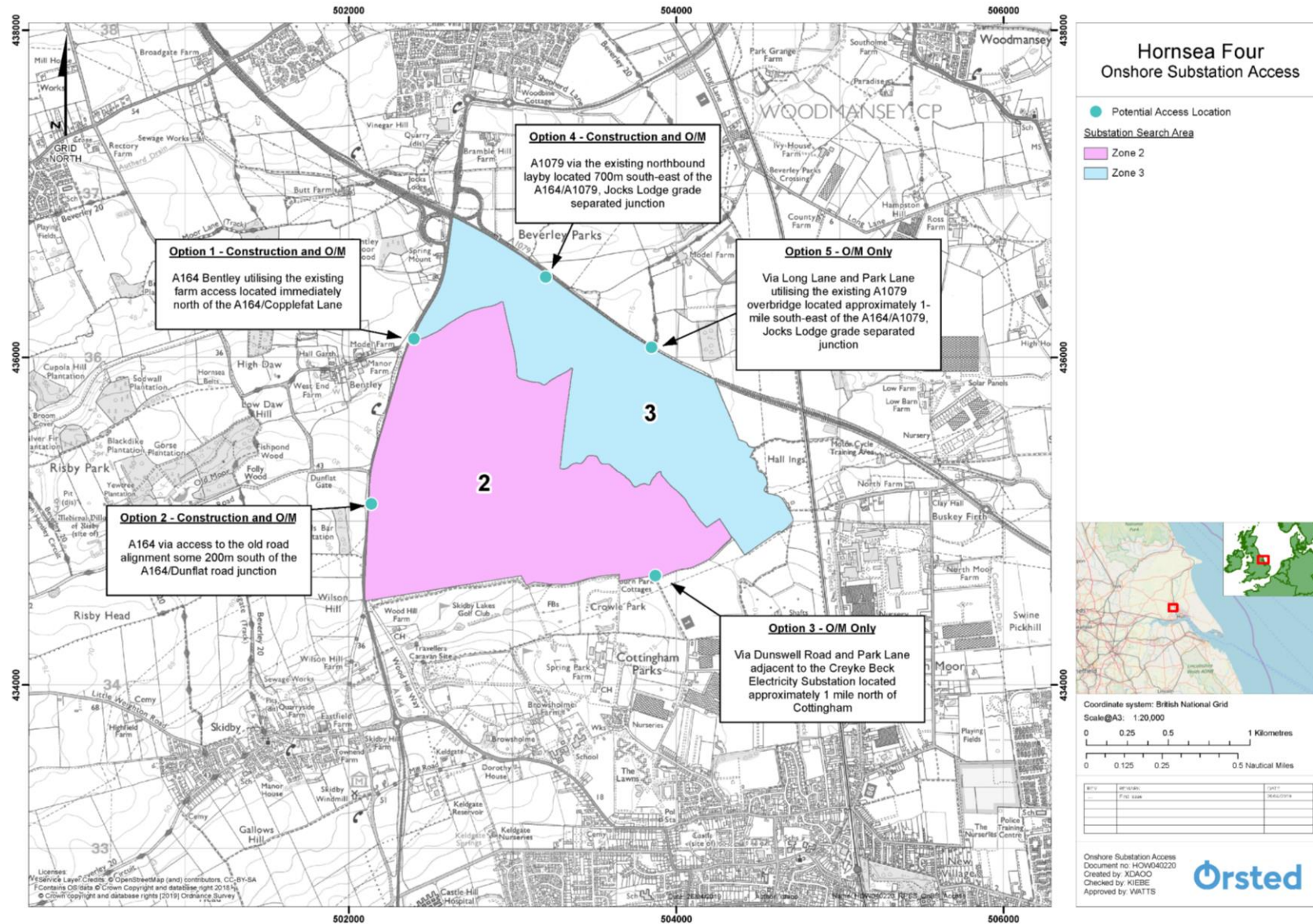


Figure 7: OnSS Zone 2 and Zone 3 Access Appraisal (not to scale).

2.3 Site Selection

2.3.1.1 Once Zone 2 had been identified as the most suitable area for OnSS siting and a feasible access point had been established, the search area had been suitably refined to enable a detailed site selection exercise. This section outlines the design assumptions and parameters used when conducting the search, the methodology for appraising potential sites once identified, and the results of the appraisal and subsequent selection of the preferred location identified within the PEIR.

2.3.2 Version 5 - Identification of Potential Sites

2.3.2.1 Following the initial constraints exercise, access appraisal, consultation with ERYC, OnSS working groups, and feedback from informal consultation events, Hornsea Four undertook an exercise to identify potential sites within Zone 2. The specific design principles used in identifying the potential site options are shown in [Table 5](#).

2.3.2.2 Two potential site options were identified within Zone 2, which had due consideration for the mandatory and preferred parameters where practical. These options are shown in [Figure 8](#).

Table 5: OnSS Design Principals for site selection.

	OnSS site selection principle
Mandatory	Permanent land uptake of up to 155,000 m ² to the Hornsea Four OnSS
	Temporary land uptake of 130,000 to support construction works
	Access from the A1079 during construction
Preferred	Use established field boundaries to establish site boundaries
	Avoid siting under 400kV overhead lines
	Locate as close to the NGET substation at Creyke Beck and other nearby industrial infrastructure as possible
	Use existing natural screening, where feasible
	Avoid nationally or international designated ecological receptors, where possible
	Avoid residential properties

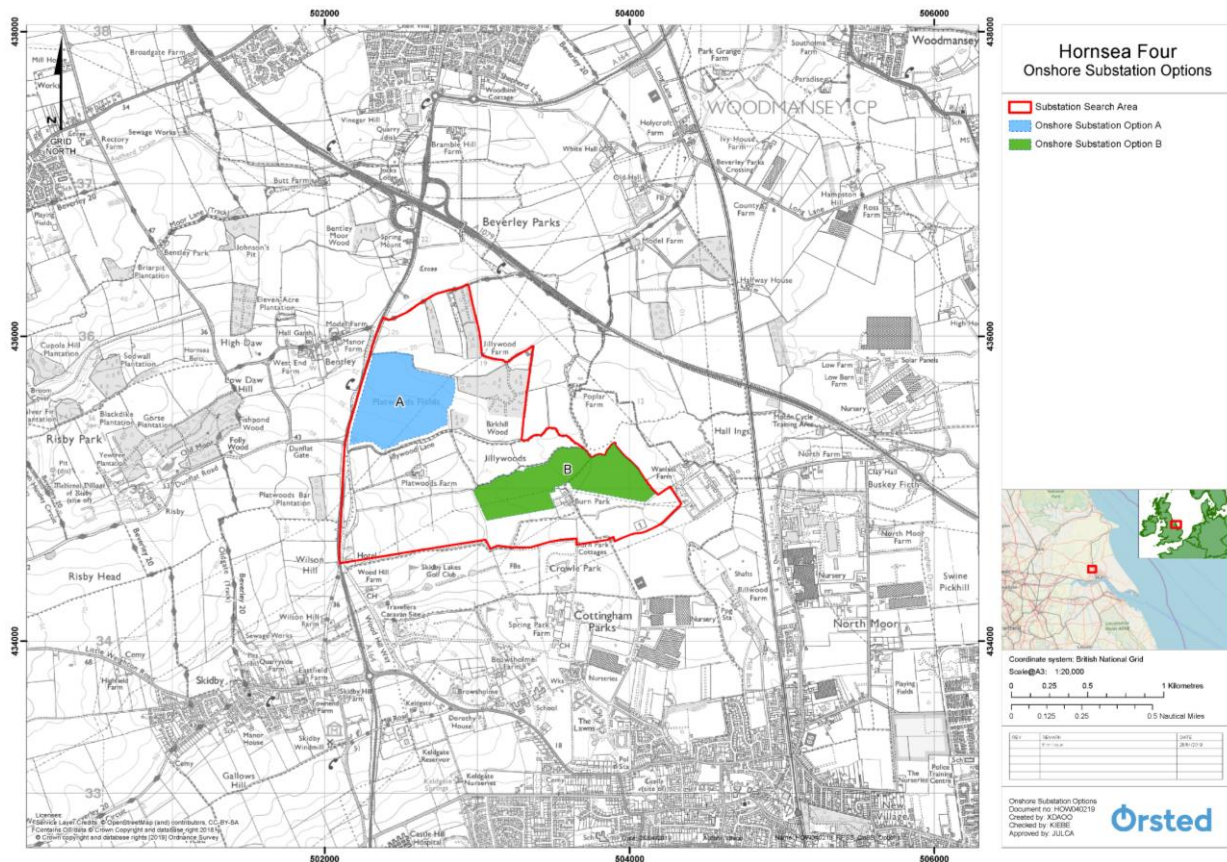


Figure 8: Identification of Potential OnSS Sites in Zone 2 (not to scale).

2.3.3 Aim and Methodology

2.3.3.1 The two identified sites within Zone 2 were rated against a Black, Red, Amber and Green (BRAG) criteria, which has been applied based on a qualitative assessment and expert judgement. The ranking is defined in [Table 6](#):

Table 6: OnSS BRAG Rating.

Rating	Summary
Black	Potential showstopper to development
Red	High potential to constrain development
Amber	Intermediate potential to constrain development
Green	Low potential to constrain development

2.3.3.2 Black and red constraints are critical in determining features that should be avoided wherever possible to avoid consenting risk, reduce EIA complexity and reduce the cost of mitigation. Amber and green constraints are those that may be more readily minimised or managed by employing appropriate mitigation measures.

2.3.3.3 The BRAG criteria identified key technical, consenting and commercial constraints based on available information. These are outlined below:

2.3.4 Version 6 - BRAG Appraisal Results

2.3.4.1 The BRAG appraisal for both potential sites is presented in [Table 7](#). Key constraints identified of relevance are presented in [Figure 9](#).

2.3.4.2 The following criteria was considered during the BRAG appraisal but omitted from the final version presented in this annex due to a tied score and no differentiation between the two sites:

- **Geotechnical conditions** – no intrusive investigations have been undertaken to inform site selection;
- **Prior land use** – Both sites have a similar recent history of agricultural use;
- **Land owners** – Both sites are under the ownership of the same land owner;
- **Construction access** – Both sites would utilise the same access from the A1079 during construction and would require a similar junction and access road;
- **Operational access** – Both sites have similar operational access options;
- **Surrounding utilities** – Both sites contain small-scale overhead lines, neither are disrupted by larger utilities;
- **Flood risk** – Majority of both sites is within Flood Zone 1, with a small percentage of both within Flood Zone 3 (2.3% of site A and 1% of site B); and
- **Cultural heritage** – no known receptors (Listed Building, HER / Scheduled Monument, Registered Park and Garden, World Heritage Site) are located within 500m of either site.

Table 7: OnSS Site Selection BRAG Appraisal.

Criteria	Site A	Site B	
Technical			
<p>Variation in topography</p> <p>Black: Level variations of the site of 15m+ (between highest and lowest points) which would significantly affect the inter-link between electrical HV- equipment.</p> <p>Red: Level variations of the site of 10-15m that requires significant earth movements and three+ level platforms to facilitate interlink between electrical HV-equipment.</p> <p>Amber: Level variations of the site of up to 10m that requires minor earth movements and two-level platforms to facilitate interlink between electrical HV-equipment.</p> <p>Green: Level variations (0-1m) of the site that requires minor earth movements and /or one level platform</p>	<p>Topographic variation within the site is 10-15m. Overall site slope is less than 2 degrees. Significant earthworks and potential for retaining walls.</p>	<p>Topographic variation within the site is up to 10m. Site slope is less than 1 degree. Medium earthworks required.</p>	
<p>Spoil generation</p> <p>Black: N/A</p> <p>Red: 40,000 m³+ of spoil to be produced with significant removal off-site and associated vehicle movements.</p> <p>Amber: 20,000-40,000 m³ of spoil produced due to earthworks with minimal to be removed off-site.</p>	<p>Estimated 60,000-70,000 m³ of earthworks required - either moved, graded, taken from site. This will result in high levels of traffic movements.</p>	<p>Estimated 30,000 m³ of earthworks required - either moved, graded, taken from site. This will result in low levels of traffic movements.</p>	

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Criteria	Site A		Site B	
<p>Green: 0-20,000 m³ of spoil produced due to earthworks with the potential for the majority to be retained on-site.</p>				
Environmental / Consenting				
<p>Nature conservation</p> <p>Black: Located on Internationally or nationally protected sites (SPA/SAC/SCI, RAMSARs, Priority Habitats, BAP habitats, SSSI Units (dependent upon condition), National Parks, Ancient woodland)</p> <p>Red: Within 0-20m of Internationally or nationally protected sites (listed within the 'Black' criteria)</p> <p>Amber: Within 20-250m of Internationally or nationally protected sites (listed within the 'Black' criteria)</p> <p>Green: Located 250+m from Internationally or nationally protected sites (listed within the 'Black' criteria)</p>	<p>Located within 20-250 m of ancient woodland and 150m of priority habitat.</p>		<p>250m+ of Ancient Woodland and Priority Habitat woodland.</p>	
<p>Proximity to residential receptors</p> <p>Black: Neighbouring or abutting (0-50m) residential properties</p> <p>Red: Residential properties within close proximity (50-200m)</p> <p>Amber: Residential properties within proximity (200-500m)</p> <p>Green: Closest Residential properties 500m+ distant</p>	<p>Nearest residential property located within 200-500m.</p>		<p>Nearest residential property within 50-200 m.</p>	
<p>Proximity to residential settlement</p> <p>Black: Hamlet or village located within 200m</p> <p>Red: Hamlet or village located within 200-500m</p>	<p>Bentley is located within 200-500m</p>		<p>No hamlets or villages located within 750m</p>	

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Criteria	Site A		Site B	
<p>Amber: Hamlet or village located within 500m-750m</p> <p>Green: Closest hamlet village located 750m+ distant</p>				
<p>Association with existing built development</p> <p>Black: N/A</p> <p>Red: No similar industrial development in the surrounding area</p> <p>Amber: Limited industrial development (considered to be limited in number and not characteristic of the immediate surrounding area)</p> <p>Green: Industrial development (considered to be generally characteristic of the immediate surrounding area)</p>	<p>No existing industrial infrastructure nearby.</p>		<p>Existing industrial infrastructure characterises the area to the east and south-east of the site. This includes Creyke Beck substation and a gas fired energy reserve facility. 40kV overhead lines cross parallel to the site.</p>	
<p>Landscape and visual</p> <p>Black: High potential for significant effects on designated landscapes, landscape character, visual effects on settlement clusters (including views to and from Beverley Minster), with no potential for mitigation.</p> <p>Red: High potential for significant effects on designated landscapes, landscape character, visual effects on settlement clusters (including views to and from Beverley Minster), with limited potential for mitigation.</p> <p>Amber: Medium potential for significant effects on designated landscapes, landscape character, visual effects on settlement clusters (including views to and from Beverley Minster), with potential for mitigation.</p>	<p>Within 250m of The Yorkshire Wolds Important Landscape Area (ILA) local landscape designation.</p> <p>Located in a relatively intact landscape of gently undulating arable fields, lying adjacent to Brinkhill Wood and a small copse of matures trees designated as ancient woodland.</p> <p>Nearby woodland will act as an effective visual screen to the development in most views from Beverley, but views towards the site are attainable from the southern edge of a housing estate located along Broadgate.</p>		<p>Over 1km to the east of The Yorkshire Wolds ILA. and partially screened by intervening hedgerows and tree belts.</p> <p>Located within a relatively degraded landscape of large flat arable fields delineated with hedgerows. Large electricity pylons crossing agricultural land and terminating at the large Creyke Beck Substation substantially detracts from the rural character of the local landscape.</p> <p>Largely screened from the edge of Beverley by intervening blocks of mature woodland. These also screen views of the site from Beverley Minster. Views towards the site from</p>	

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Criteria	Site A	Site B	
<p>Green: low potential for significant effects on designated landscapes, landscape character, visual effects on settlement clusters (including views to and from Beverley Minster).</p>	<p>Mature woodland will screen lower-lying infrastructure from Cottingham. Views are also attainable from the small hamlet of Bentley.</p>	<p>the settlement edge of Cottingham are screened by intervening large green houses, plant nurseries and the existing Creyke Beck Substation.</p>	
<p>Noise and vibration</p> <p>Black: High potential for significant effects with no potential for mitigation.</p> <p>Red: High potential for significant effects with limited potential for mitigation.</p> <p>Amber: Medium potential for significant effects with potential for mitigation.</p> <p>Green: Low potential for significant effects.</p>	<p>Noise sensitive receptors, including the hamlet of Bentley, are located within 200-500m of the site.</p>	<p>Noise sensitive receptors (individual residential properties) are located within 50-200m of the site.</p>	
<p>Amenity and recreation</p> <p>Black: N/A</p> <p>Red: Located on public sports and recreation facilities, public right of way (PRoW) network, National cycle network</p> <p>Amber: Located within 0-50 m of public sports and recreation facilities, PRoW network, National cycle network</p> <p>Green: Located within 50 m+ from public sports and recreation facilities, PRoW network, National cycle network</p>	<p>PROW located immediately adjacent to the south of the site.</p>	<p>PRoW goes through the site.</p>	

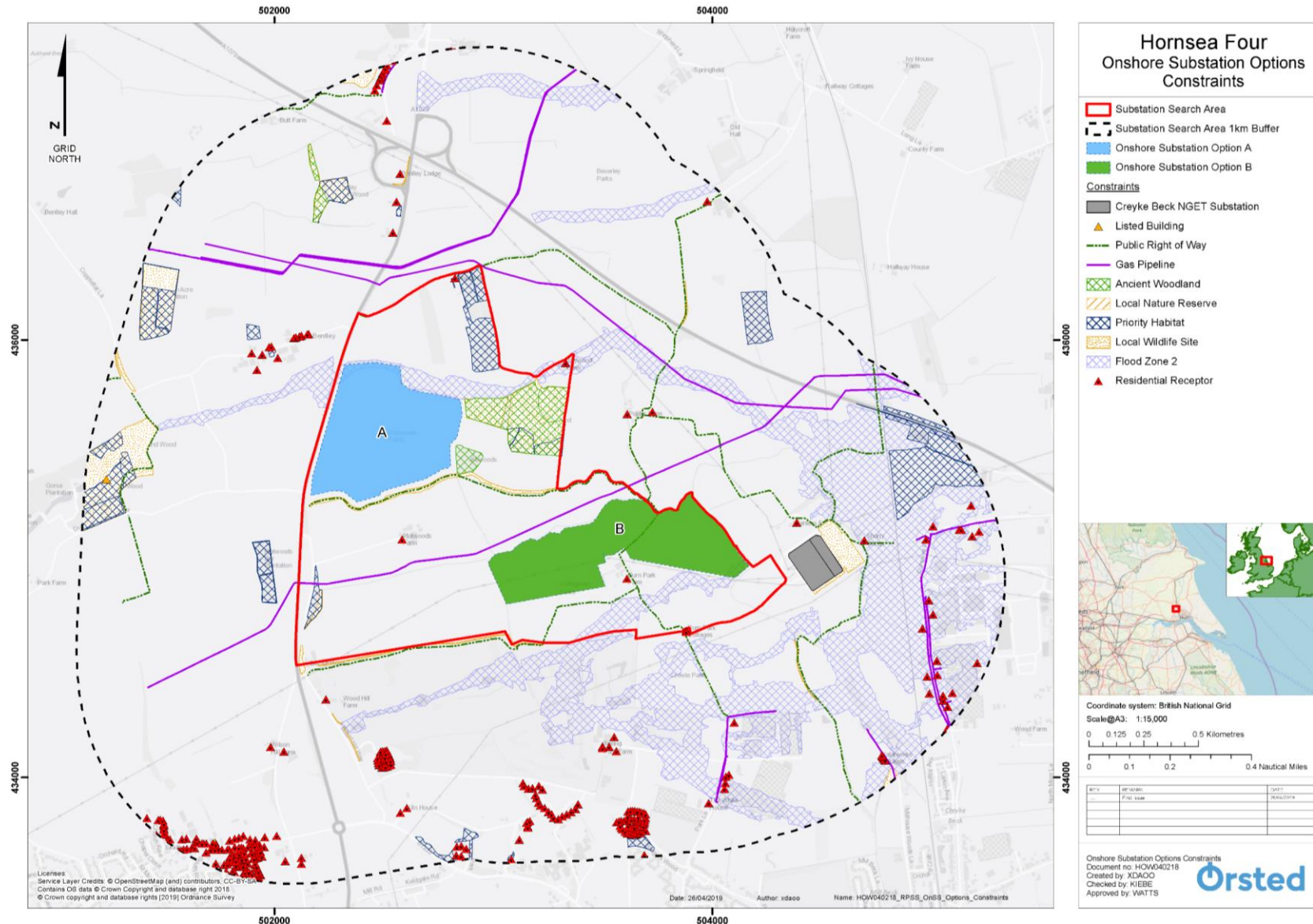


Figure 9: OnSS Constraints Map (not to scale).

2.3.5 OnSS Site Selection Conclusions

2.3.5.1 The process of OnSS site selection, which began with the identification of the initial search area, with multiple phases of refinement, inclusive of community feedback, a high-level RAG appraisal of zones, access appraisal, and a detail BRAG appraisal of specific potential sites, has culminated in the identification of the preferred site in which to locate the Hornsea Four OnSS, which is **Site B** located within Zone 2. The refinement process is summarised in [Figure 10](#). This option is preferred due to:

- Lower variation in topography, resulting in a reduction in potential spoil due to ground works;
- Greater distance from ecological designations;
- Natural screening to the north from intervening blocks of mature woodland, which screen the site from Beverley Minster. Other existing screening minimises views from other urban settlements;
- Fewer existing overhead lines running through site;
- Proximity to existing industrial infrastructure;
- Reduced length of 400Kv ECC;
- Greater proximity to settlements and lower density of residential receptors in the surrounding area; and
- Support from the OnSS Working Group, comprised of parish council representatives.

2.3.5.2 Risks associated with the preferred option include:

- Proximity of nearest residential receptor and associated effects during construction and operation; and
- Requirement to divert existing PRow running through the site.

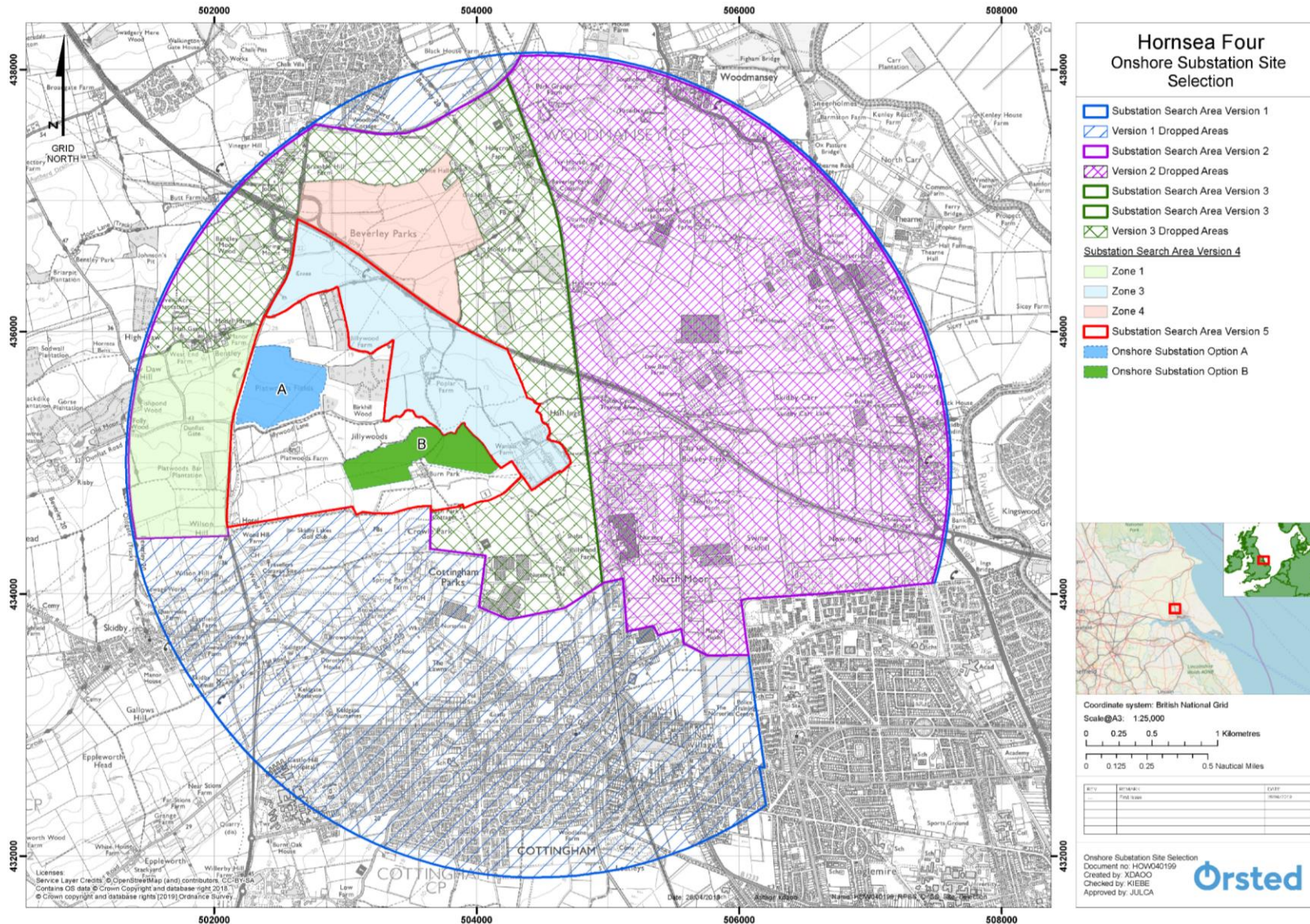


Figure 10: Overview of OnSS Site Selection (not to scale).

3 Initial Selection of Onshore Export Cable Corridor (ECC) Study Area

3.1 Background

3.1.1.1 The onshore ECC will house the onshore electrical cables connecting the location where the offshore export cables make landfall to the OnSS. The location of the onshore ECC is therefore influenced by the landfall and OnSS site selection.

3.1.1.2 During construction trenching will take place in sections of between 750 and 3,000 m at a time, each requiring access. Jointing bays will be used to connect successive sections of the cable. The location of the link boxes will only be finalised during the construction phase of the project once the onshore ECC is being installed. For further details on the activities to [Volume 1, Chapter 4: Project Description](#).

3.2 Version 1 – Developing route options

3.2.1.1 The location of the initial onshore ECC route options was driven by the prospective landfall zones ([Volume 4, Annex 3.1](#)) and OnSS search area ([Section 2.2](#)). Using a comparative BRAG assessment the original 23 landfall zones were reduced to 7 landfall zones, situated within the original landfall zones A and B ([Volume 4, Annex 3.1](#)).

3.2.1.2 Two onshore ECC routes were drawn from landfall zones A and B ([Volume 4, Annex 3.1](#)) to OnSS search area Version 2 ([Figure 3](#)). The first onshore ECC route was drawn from the middle of landfall B2 (onshore ECC B1), in zone B before routing east of Beverley (onshore ECC B2), as the expedient route option ([Figure 11](#)) Landfall zone B2 was the preferred option as it was understood that the Dogger Bank Creyke Beck cable would be making landfall somewhere in a 2km wide area in the region of landfall zone B1. Further detail on the exact location of the Dogger Bank Creyke Beck landfall was not known.

3.2.1.3 The second onshore ECC option started at the middle of landfall zone A (onshore ECC A1) and routed west of Beverley (onshore ECC A2) providing an alternative option around Beverley ([Figure 11](#))

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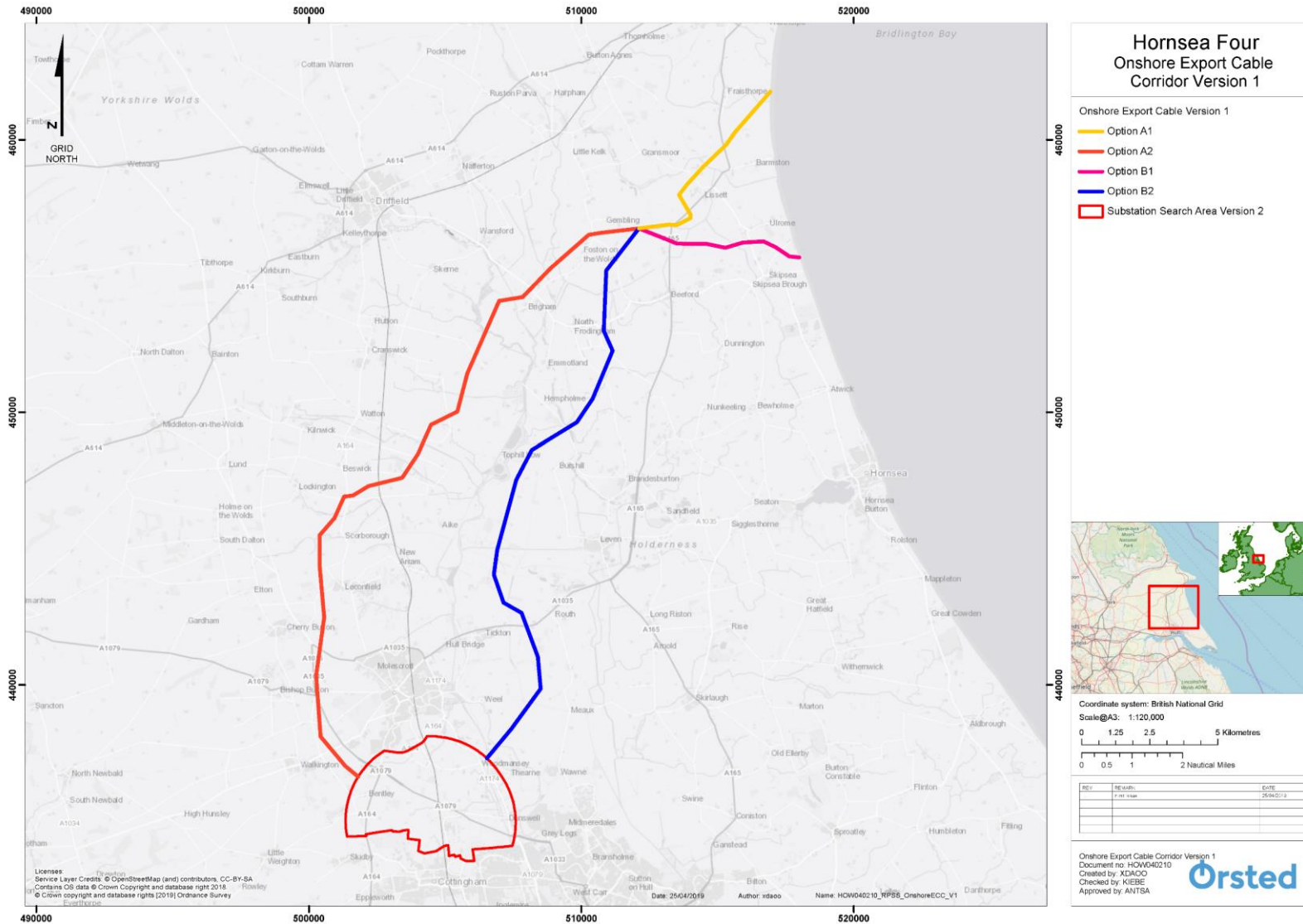


Figure 11: Onshore Export Cable Corridor Version 1 – Developing route options (not to scale).

3.2.1.4 The initial onshore ECC options ([Figure 11](#)) were routed at a low resolution around the east and west of Beverley using Ordnance Survey Open Data base mapping and the constraints data available at the time. These data sets included:

- Ancient woodland;
- RSPB Important Bird Areas;
- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs);
- Sites of Special Scientific Interest (SSSIs);
- Country Parks;
- National Parks;
- Authorised and Historic Landfill sites;
- Environment Agency (EA) Main Rivers;
- Flood Zone 1, 2 and 3 areas;
- Local Nature Reserves ;
- Priority Habitats;
- Ramsar sites;
- Registered common land (CROW Act);
- National Grid gas pipelines, underground cables and substations;
- (Humber) Historic Environment Record (HER) Listed buildings;
- Scheduled monuments;
- Registered parks and gardens; and
- Registered battlefields.

3.2.1.5 The centre line of both onshore ECCs was routed with the following guiding principles:

- Routed through open agricultural land where possible to avoid towns, villages, residential areas and buildings;
- Shortest possible connection between the start and end points would be preferable where no other constraints were apparent; and
- Major existing infrastructure (i.e. roads and National Grid infrastructure) would be crossed perpendicular to the existing infrastructure, as the optimal approach angle for HDD crossings.

3.2.1.6 Using these routing principles, the centreline of both onshore ECC options were diverted around the various constraints. The identifiers (IDs) shown in [Figure 12](#) show the locations at which the onshore ECC options were diverted around constraints.

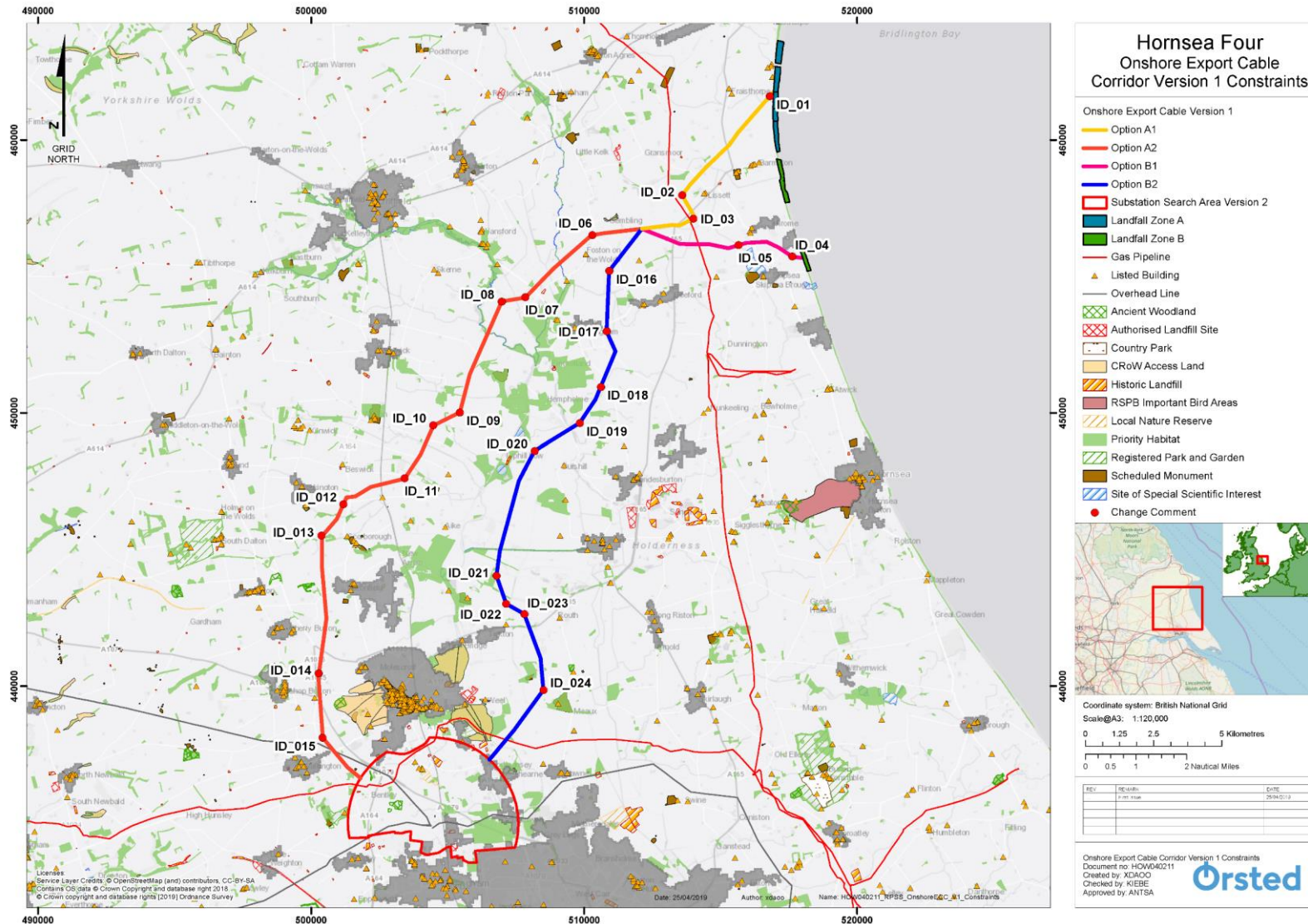


Figure 12: Onshore Export Cable Corridor Version 1 Constraints (not to scale).

3.3 Version 2 – Choosing one route option

3.3.1.1 Once two onshore ECC options had been established, a single preferred option was required to take forward.

3.3.2 Methodology

3.3.2.1 To choose a single onshore ECC option a BRAG appraisal was undertaken and applied to a 2000m buffer applied to both onshore export cable corridors. The ranking is defined in [Table 8](#) and the constraints are ranked in [Table 9](#).

Table 8: Onshore ECC Version 2 BRAG criteria.

Rating	Summary
Black	Potential showstopper to development
Red	High potential to constrain development
Amber	Intermediate potential to constrain development
Green	Low potential to constrain development

Table 9: Onshore ECC used for Version 2.

Type of constraint	Category	Black	Red	Amber	Green
Environmental/ Consenting	Nature Conservation	<p>Route centreline directly intersecting:</p> <ul style="list-style-type: none"> SSSI Units Ancient woodland National Parks SPAs/ SACs Ramsar sites Country Parks <p>For the following sites there are not considered to be any show stopping constraints to development:</p> <ul style="list-style-type: none"> UK BAP Priority Habitats (Natural England) Woodland pasture Locally designated sites e.g. Local Wildlife Sites 	<p>Route centreline within 0 - 100m of:</p> <ul style="list-style-type: none"> SPAs /SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks <p>Or directly intersecting:</p> <ul style="list-style-type: none"> UK BAP Priority Habitats Woodland pasture Locally designated sites e.g. Local Wildlife Sites 	<p>Route centreline within 100m - 500m of:</p> <ul style="list-style-type: none"> SPAs /SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks <p>Or between 0 - 100m of:</p> <ul style="list-style-type: none"> UK BAP Priority Habitats Woodland pasture Locally designated sites e.g. Local Wildlife Sites 	<p>Route centreline more than 500m from:</p> <ul style="list-style-type: none"> SPAs /SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks <p>Or more than 100m from:</p> <ul style="list-style-type: none"> UK BAP Priority Habitats Woodland pasture Locally designated sites e.g. Local Wildlife Sites
	Surface Water and Flood Zones	There are no flood zone constraints considered to be showstoppers to development	Route centreline intersecting a Flood Zone 3 area	Route centreline intersecting a Flood Zone 2 area	Route centreline intersecting a Flood Zone 1 area
	Other infrastructure and development	<p>Route centreline directly intersecting:</p> <ul style="list-style-type: none"> Any land allocated for development in the ERYC Local Plan; Any area of Historic Landfill; Any area of Authorised Landfill 	<p>Route centreline within 0m - 100m of:</p> <ul style="list-style-type: none"> Any relevant land allocated for development in the ERYC Local Plan; Any area of Historic Landfill; Any area of Authorised Landfill 	<p>Route centreline within 100m - 200m of:</p> <ul style="list-style-type: none"> Any relevant land allocated for development in the ERYC Local Plan; Any area of Historic Landfill; Any area of Authorised Landfill 	<p>Route centreline more than 200m from:</p> <ul style="list-style-type: none"> Any relevant land allocated for development in the ERYC Local Plan; Any area of Historic Landfill; Any area of Authorised Landfill
	Proximity to sensitive stakeholders	<p>Route centreline directly intersecting:</p> <ul style="list-style-type: none"> RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone) 	<p>Route centreline within 0m – 100m of:</p> <ul style="list-style-type: none"> RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone) 	<p>Route centreline within 100m - 200m of:</p> <ul style="list-style-type: none"> RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone) 	<p>Route centreline more than 200m from:</p> <ul style="list-style-type: none"> RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone)
Residential receptors	Route corridor within 0m – 50m of any residential receptor	Route corridor within 50m - 100m of any residential receptor	Route corridor within 100m - 150m of any residential receptor	Route corridor more than 150m from any residential receptor	

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Type of constraint	Category	Black	Red	Amber	Green
	Cultural heritage	Route centreline directly intersecting: Listed Buildings; Scheduled Monuments boundaries; Registered parks and gardens; Registered battlefields	Route centreline within 0m - 50m of: Listed Buildings; Scheduled Monuments boundaries; Registered parks and gardens; Registered battlefields	Route centreline within 50m - 200m of: Listed Buildings; Scheduled Monuments boundaries; Registered parks and gardens; Registered battlefields	Route centreline 200m+ from: Listed Buildings; Scheduled Monuments boundaries; Registered parks and gardens; Registered battlefields

3.4 Comparative appraisal

- 3.4.1.1 A BRAG assessment and comparative appraisal was undertaken based on the BRAG constraints in [Table 9](#) which listed all constraints within the 2000m buffer around onshore ECC options A1 and B1. The comparative appraisal for the landfall sections (A1 and B1) showed no significant difference. As a result it became clear that the exact location of the onshore ECC option in the vicinity of A1 or B1 would be driven by the preferred landfall site ([Volume 4, Annex 3.1](#)).
- 3.4.1.2 A similar comparative appraisal was also carried out on the 2000m buffer area applied to A2 and B2 ([Table 10](#)).

Table 10: Onshore ECC A2 and B2 Comparative appraisal.

Type of Constraint	Category	Onshore ECC A2		Onshore ECC B2	
Environmental/ Consenting	Nature Conservation	<p>Local Wildlife Sites:</p> <ul style="list-style-type: none"> • Gembling Common; • Old Howe House; • Skerne Wetlands (Yorkshire Wildlife Trust Site); • Barff Hill Dyke; • Lockington; • Bealey’s Beck, Lockington; • Bealey’s Lane; • Old Lane, Leconfield; • Leconfield Castle; • Raventhorpe Embankment; • Lambfold Wood; • Killingwold Graves Plantation; • Newbald Road; • Beverley Westwood; • Beverley Barracks; • A164 Bypass; • Moor Lane; and • Risby Corner; <p>Priority habitats:</p> <ul style="list-style-type: none"> • x 1 semi-improved grassland; • x 16 deciduous woodlands; • x 3 coastal and floodplain grazing marsh; • x 6 traditional orchards; and • x1 reeds bed <p>Ancient Woodland and Priority habitat:</p> <ul style="list-style-type: none"> • x 1 deciduous woodland 		<p>Local Wildlife Site:</p> <ul style="list-style-type: none"> • Old Howe House; and • Long Lane, Dunswell <p>Priority Habitat:</p> <ul style="list-style-type: none"> • x 2 traditional orchards • x 9 coastal and floodplain grazing marsh; and • x 1 deciduous woodland <p>SSSI, Local Wildlife Site and Priority Habitat:</p> <ul style="list-style-type: none"> • Tophill Low <p>SSSI and Priority Habitat:</p> <ul style="list-style-type: none"> • Leven Canal 	

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Type of Constraint	Category	Onshore ECC A2		Onshore ECC B2	
		<p>Ancient woodland, SSSI, Local Wildlife Site and woodland pasture:</p> <ul style="list-style-type: none"> Burton Bushes <p>Ancient woodland, Local Wildlife Site and Priority Habitat:</p> <ul style="list-style-type: none"> Bentley Moor Wood <p>Local Wildlife site and Priority Habitat:</p> <ul style="list-style-type: none"> Acre Plantation (deciduous woodland); Swadgery Mere Wood (deciduous woodland); Shorthill Hag (deciduous woodland); Cranswick Common (deciduous woodland); and Fox Covert (deciduous woodland) <p>SSSI:</p> <ul style="list-style-type: none"> River Hull Headwaters 			
	Surface Water and Flood Zones	The length of onshore ECC centreline that crosses Flood zone 2 and 3: Approximately 8km.		The length of onshore ECC centreline that crosses Flood zone 2 and 3: Approximately 15km	
	Other infrastructure and development	<p>Historic landfills:</p> <ul style="list-style-type: none"> Land off Cruckley Lane; Cosalt Quarry landfill site; and West End Farm 		<p>Historic landfills:</p> <ul style="list-style-type: none"> Top Hill Low Woodmansey Grange sites A-D 	
	Proximity to sensitive stakeholders	None		None	
	Residential receptors	<p>Residential receptors include:</p> <ul style="list-style-type: none"> Foston on the Wolds (village); Carr House Farm; 		<p>Residential receptors include:</p> <ul style="list-style-type: none"> Northpasture Farm; Carr House; 	

Type of Constraint	Category	Onshore ECC A2	Onshore ECC B2	
		<ul style="list-style-type: none"> • Brigham Farm; • Corpslanding; • Throstlenest Farm; • Low Farm Carr house; • Gonary Hall Farm; • Rose Cottage Farm; • Haven House Farm; • Ashfield Farm; • Mount Pleasant. <p>Settlements include villages of:</p> <ul style="list-style-type: none"> • Foston on the Wolds; and • Bentley 	<ul style="list-style-type: none"> • Southfield Inn; • Carr Farm; • Low Besick Farm; • Linley Bungalow; • Field House Farm; • Wood House. <p>Settlements include:</p> <ul style="list-style-type: none"> • Lissett Village; • The outer edge of North Frodingham Town; • A high concentration of residential receptors at Woodmansey Road (A1174). Construction activities would potentially be within 50m of the closest residential receptor with no other alternatives. 	
	Cultural heritage	<p>Conservation Areas:</p> <ul style="list-style-type: none"> • Foston; • Beswick; • Lockington • Cherry Burton; and • Walkington <p>Scheduled monuments:</p> <ul style="list-style-type: none"> • Rotsea medieval settlement and field system; • Cemetery and medieval settlement at Scarborough; • Moated site of Leconfield Castle; • Moated site south west of Parkhouse Farm; • Moated site north of Parkhouse Farm; • Romano-British enclosure, Burton Bushes, Westwood Common; and • A heavy anti-aircraft gunsite, 350m west of Butt Farm 	<p>Conservation Area:</p> <ul style="list-style-type: none"> • Tickton <p>Scheduled monuments:</p> <ul style="list-style-type: none"> • Meaux duck decoy, south west of Meaux Decoy Farm; • Site of Meaux Cistercian Abbey <p>Listed Buildings:</p> <ul style="list-style-type: none"> • Grade II Woodhouse Farmhouse, Beeford • Grade II Tickton Grange • Grade II Abbey Cottage, Tippett Lane 	

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Type of Constraint	Category	Onshore ECC A2		Onshore ECC B2	
		<p>Listed Buildings:</p> <ul style="list-style-type: none"> • Grade II Church of Saint Andrew; • Grade II Mill Farmhouse; • Grade II Former Lockington Railway Station; • Grade II Rectory Farmhouse and Wing Walls • Grade II White House Farm • Grade II Killingwoldgraves; and • Grade II Bishop Burton 			

- 3.4.1.3 The comparative appraisal identified that the western route (A2) was the preferred option due to the greater number of constraints encountered by B2, east of Beverley.
- 3.4.1.4 In addition, a major pinch point was identified on Woodmansey Road (A1174) on the approach to the OnSS search area. The indicative Dogger Bank Creyke Beck export cable corridor crossed the road within the only available gap between residential properties (also bringing the onshore ECC within 50m of residential receptors) making it an unfeasible route option.
- 3.4.1.5 The decision to drop the ECC option to the east of Beverley was also influenced the reduction in the search area used for the OnSS ([Section 2.2](#)) leaving the remaining onshore ECC route shown in [Figure 13](#).

3.5 Version 3 – Onshore ECC refinement

- 3.5.1.1 Once a single onshore ECC option had been chosen a flyover survey was undertaken to obtain high resolution imagery. The imagery was used to identify possible constraints in greater detail, resulting in the further refinement of the onshore ECC route ([Figure 13](#)).
- 3.5.1.2 For example, the imagery identified hedgerows and ponds in greater detail and the centreline of the ECC was moved to avoid them. Similarly, further re-routing to cross existing infrastructure at 90 degrees was undertaken.
- 3.5.1.3 The onshore ECC was diverted at the points shown in by the IDs on [Figure 13](#).

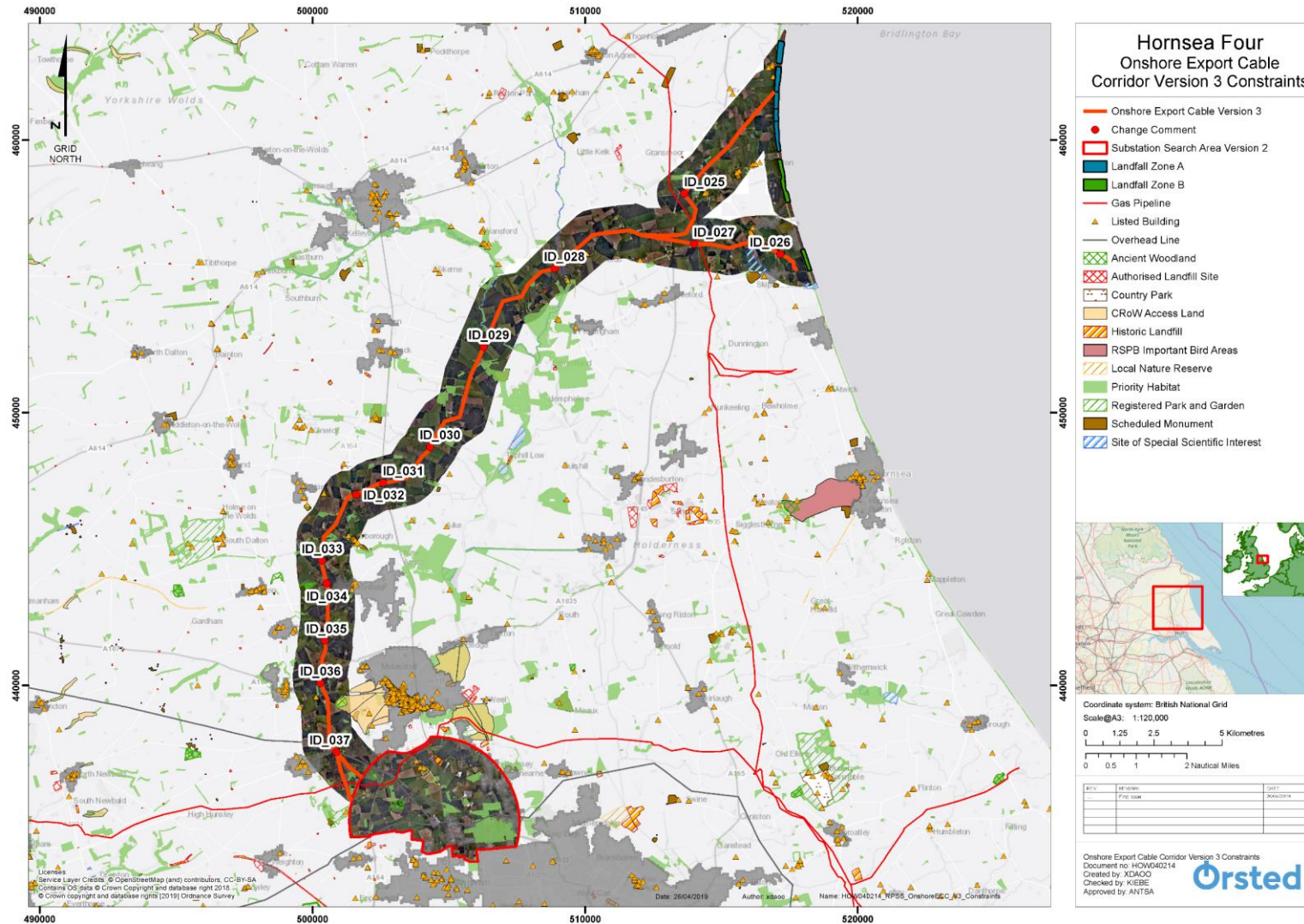


Figure 13: Onshore Export Cable Corridor Version 3 – Routing using aerial imagery (not to scale).

3.5.1.4 Once this had been completed, buffers were applied to the onshore ECC A1 as follows ([Figure 14](#)):

- 200m – for the Indicative Permanent Cable Area
- 700m – for the Indicative Temporary Works Area
- 2000m – for the Scoping Boundary. The area within which the Indicative Permanent and Temporary Cable Areas may be deviated.

3.5.1.5 The buffered areas would allow for micro-siting of the 80m ECC to be developed after the Scoping report was submitted. As the exact landfall location was yet to be decided the entire area between onshore ECC options A1 and B1 were included for possible landfall cable routing as the landfall sites were still undergoing the refinement process ([Volume 4, Annex 3.1](#)).

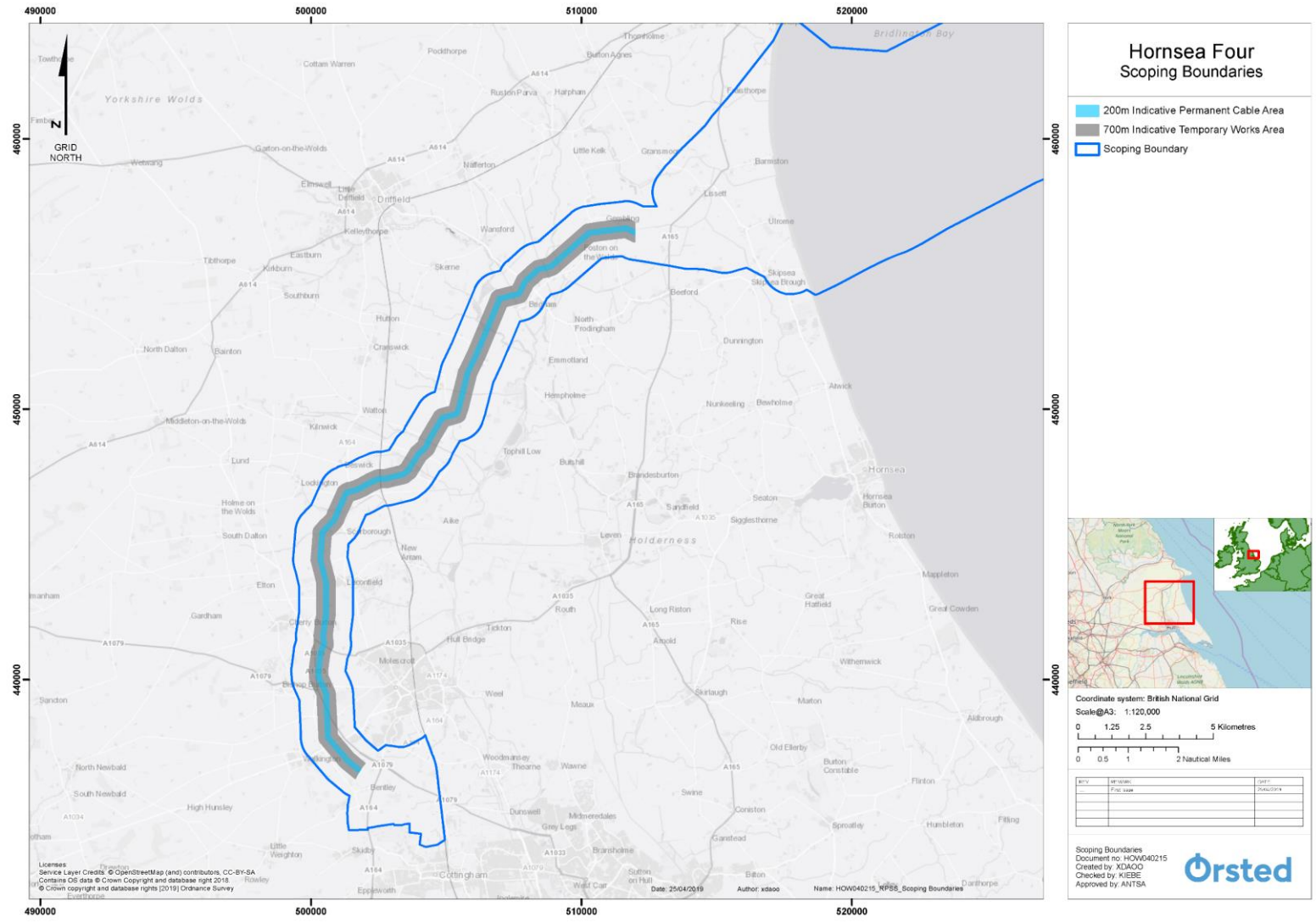


Figure 14: Onshore ECC Scoping boundaries (not to scale).

4 Refinement of Onshore ECC

4.1 Background

4.1.1.1 After the Scoping report was submitted the 80m onshore ECC was refined in stages, identifying and incorporating potential accesses and logistics compounds. This refinement was based on any newly received third party data and by updating the BRAG criteria. The refinement of the 80m onshore ECC was carried out with the aim of keeping the majority of the 80m onshore ECC within the 200m Indicative Permanent Cable Area and 700m Indicative Temporary Works Area. The area outside of the 700m Indicative Temporary Works Area would only be used if routing within it was not possible.

4.2 Version 4 – Refined Indicative 80m Export Cable Corridor (Version 1)

4.2.1 Methodology

4.2.1.1 Using the 200m Indicative Permanent Cable Area and the 700m Indicative Temporary Works Areas as the starting point, the 'Refined Indicative 80m Export Cable Corridor (Version 1)' (referred to as the 'refined 80m onshore ECC v1' here) was developed. This involved two main stages:

1. Field Boundary alignment - The refined 80m onshore ECC v1 was aligned as closely as possible to field boundaries in order to minimise the land severance and disruption. All field boundary alignments considered adjacent landowners aiming to identify the best route for all. Where the refined onshore 80m ECC v1 was moved in parallel with field boundaries a 10m buffer was maintained from hedgerows to account for any potential Root Protection Zones.
2. Updated BRAG criteria – The definitions for the BRAG criteria were updated to aid onshore ECC routing ([Table 11](#)) and updated with new information acquired since the Scoping report was submitted ([Table 12](#)).

Table 11: Onshore ECC Version 4 BRAG criteria definitions.

Criteria	Summary	Cable corridor route implications
Black	Considered to be a showstopper to development	The ECC should not intersect any 'Black' constraints where open cut is required. Where crossing these constraints is unavoidable, Hornsea Four will seek to use HDD techniques.
Red	Considered to carry high risk or have a high potential to constrain development	The ECC should only intersect the 'red' areas when necessary due to other constraints. Where crossing these constraints is unavoidable, Hornsea Four will seek to use HDD techniques.
Amber	Considered to carry a medium level of risk or have an	Intersecting 'Amber' areas is not preferable, and 'Green' areas should be used as a preferred alternative where possible.

Criteria	Summary	Cable corridor route implications
	intermediate potential to constrain development	
Green	Considered to carry low risk or have a low potential to constrain development	Intersecting 'Green' areas is preferable.

4.2.1.2 The new information received and incorporated in to the new BRAG criteria is as follows:

- ERYC Conservation Areas;
- Humber Historic Environment Record (HER) event and monument data;
- Local Wildlife Sites;
- Tree Preservation Orders;
- Utilities Data (excluding National Grid datasets which had already been obtained); and
- Yorkshire Wildlife Sites.

4.2.1.3 Elements of the BRAG criteria which were developed further are:

- ERYC Local Plan Allocations.

4.2.1.4 While creating the refined indicative 80m ECC the following areas were avoided altogether:

- (Humber) Historic Environment Record sites (apart from one roman settlement);
- Golf courses;
- Registered common land (CROW Act);
- Land owned by government departments, National Trust, Forestry Commission and the Ministry of Defence; and
- The 50m buffer around residential receptors

4.2.1.5 Planning applications were also considered and avoided using a similar BRAG criterion. This can be found in [Volume 4, Annex 5.5](#).

Table 12: Onshore Export Cable Corridor Version 4 BRAG criteria.

Type of constraint	Category	Black	Red	Amber	Green
Environmental/ Consenting	Nature Conservation	<p>Route corridor directly intersecting: SPAs/ SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks Tree Preservation Order (TPOs) Sites of Community Interest (SCIs)</p> <p>For the following sites there are <i>not</i> considered to be any showstopper constraints to development: UK BAP Priority Habitats Woodland pasture Locally designated sites e.g. Local Wildlife Sites Conservation areas (ERYC) Local Wildlife Sites Yorkshire Ecological Centre – Candidate & Designated) Yorkshire Wildlife Sites</p>	<p>Route corridor within 0m – 100m of: SPAs/ SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks TPOs SCIs</p> <p>Or directly intersecting: UK BAP Priority Habitats Woodland pasture Locally designated sites Conservation areas (ERYC) Local Wildlife Sites Yorkshire Ecological Centre – Candidate & Designated) Yorkshire Wildlife Sites</p>	<p>Route corridor within 100m - 500m of: SPAs /SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks TPOs SCIs</p> <p>Or between 0 - 100m of: UK BAP Priority Habitats Woodland pasture Locally designated sites Conservation areas (ERYC) Local Wildlife Sites (NE) Yorkshire Ecological Centre – Candidate & Designated) Yorkshire Wildlife Sites (NE) Yorkshire Ecological Centre)</p>	<p>Route corridor more than 500m from: SPAs /SACs SSSI Units National Parks Ancient woodland Ramsar sites Country Parks TPOs SCIs</p> <p>Or more than 100m from: UK BAP Priority Habitats Woodland pasture Locally designated sites Conservation areas (ERYC) Local Wildlife Sites (NE) Yorkshire Ecological Centre – Candidate & Designated) Yorkshire Wildlife Sites (NE) Yorkshire Ecological Centre)</p>
	Surface Water and Flood Zones	<p>There are no pond or body of water constraints considered to be showstoppers to development</p> <p>There are no flood zone constraints considered to be showstoppers to development</p>	<p>A known pond or body of water within the 80m corridor is considered to have a high potential to constraint development</p> <p>There are no flood zone constraints considered to have a high potential to constrain development</p>	<p>Route corridor 0 – 50m from a known pond or body of water is considered to have an intermediate potential to constrain development</p> <p>Route corridor intersecting a Flood Zone 2 or Flood Zone 3 area</p>	<p>Route corridor more than 50m from a known pond or body of water is considered to have a low potential to constrain development</p> <p>Route corridor intersecting a Flood Zone 1 area</p>
	Other infrastructure and development	<p>Route corridor directly intersecting: Any land allocated for development in the ERYC Local Plan</p>	<p>Route corridor within 0m - 100m of: Any relevant land allocated for development in the ERYC Local Plan</p>	<p>Route corridor within 100m - 200m of: Any relevant land allocated for development in the ERYC Local Plan</p>	<p>Route corridor more than 200m from: Any relevant land allocated for development in the ERYC Local Plan consented</p>

Type of constraint	Category	Black	Red	Amber	Green
		Any area of Historic Landfill Any area of Authorised Landfill	Any area of Historic Landfill Any area of Authorised Landfill	Any area of Historic Landfill Any area of Authorised Landfill	development Any area of Historic Landfill Any area of Authorised Landfill
	Proximity to sensitive stakeholders	Route corridor directly intersecting: RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone)	Route corridor within 0m – 100m of: RSPB Reserves; National Trust Land MoD Exercise Area (inclusive of any buffer zone)	Route corridor within 100m - 200m of: RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone)	Route corridor more than 200m from: RSPB Reserves; National Trust Land; MoD Exercise Area (inclusive of any buffer zone)
	Cultural heritage	Route corridor directly intersecting: Listed Buildings Scheduled Monuments boundaries Registered parks and gardens Registered battlefields HER Event & Monument Data (Humber record centre)	Route corridor within 0m - 50m of: Listed Buildings Scheduled Monuments boundaries Registered parks and gardens Registered battlefields HER Event & Monument Data (Humber record centre)	Route corridor within 50m - 200m of: Listed Buildings Scheduled Monuments boundaries Registered parks and gardens Registered battlefields HER Event & Monument Data (Humber record centre)	Route corridor more than 200m from: Listed Buildings Scheduled Monuments boundaries Registered parks and gardens Registered battlefields HER Event & Monument Data (Humber record centre)
Technical	Gas and Water underground pipelines	Placing the onshore ECC less than 40m from the edge of the gas pipeline	Placing the onshore ECC 40m – 60m from the edge of the gas pipeline	Placing the onshore ECC 60m – 80m from the edge of the gas pipeline	Placing the onshore ECC more than 80m from the edge of the gas pipeline
	Overhead lines	A 400kV tower within the ECC is considered to be a showstopper to development	A 400kV tower 0m - 20m from the outer most edge of the 80m corridor	A 400kV tower 20m - 40m from the outer most edge of the 80m corridor	A 400kV tower more than 40m from the outer most edge of the 80m corridor
Land and Property	Land ownership status	There are no land owner survey access status constraints considered to be showstoppers to development	Land owners with a red survey access status	Land owners with an amber survey access	Land owners with a green survey access

N.B. All text criteria in **Bold** was developed or incorporated only for the 'Refined Indicative 80m Export Cable Corridor (Version 1)'.

*NE – Natural England

4.2.1.6 Constraints which the RPSS process was unable to avoid included:

- Mineral Safeguarding Areas;
- East Riding of Yorkshire Important Landscape Area – However, Hornsea Four would seek to minimise and mitigate any effects from the construction of the ECC;
- PRowS and the Sustrans Cycle Network - Any PRowS or cycleways would be diverted for the minimum required time or crossed using HDD methods where necessary.

4.2.1.7 In addition to the BRAG criteria, various other cable routing considerations were employed:

1. Land & Property considerations

- Landholdings – Where possible small landholdings likely to be within private ownership were avoided as potentially being proportionally more disruptive to land owners and tenants.

2. Technical considerations

- Concentration of Utilities – If multiple utilities were present in the same area but not in sufficiently close proximity to be crossed using a single HDD they were avoided;
- Overhead electrical infrastructure – Where 11kV, 33kV and 132kV electrical pylons and poles were visible in the utilities data and aerial imagery they were avoided in the first instance. If unavoidable the onshore ECC was routed so that the pylons/ poles sat as close to the edge of the onshore ECC as possible. This was to limit a potential 10m+ width reduction to the permanent working width as generally enforced by asset owners through a 5m diameter exclusion zone; and
- Railway crossings – where the onshore ECC crosses railways, the cable corridor is required to be a minimum of 120m wide. This is because Hornsea Four may be required to HDD each cable separately by the railway track owner, creating 6 single circuits. This is an example of a ‘complex’ HDD crossing.
- Crossing angles – Where ‘simple’ HDD crossings were anticipated the onshore ECC was angled to cross the obstacle at 75 – 90 degrees as the optimal technical crossing angle. For example, when crossing standard gas pipelines.

3. Environmental and Consenting

- For the purposes of developing the 80m onshore ECC distances were measured from the closest outermost edge of the ECC to the constraint.

4.2.2 Constraints mapping

4.2.2.1 Constraints were mapped up using the BRAG criteria. This, along with the routing principles allowed the refined onshore 80m ECC v1 to be routed from the landfall search area ([Volume 4, Annex 3.1](#)) to the OnSS search area ([Figure 15](#)).

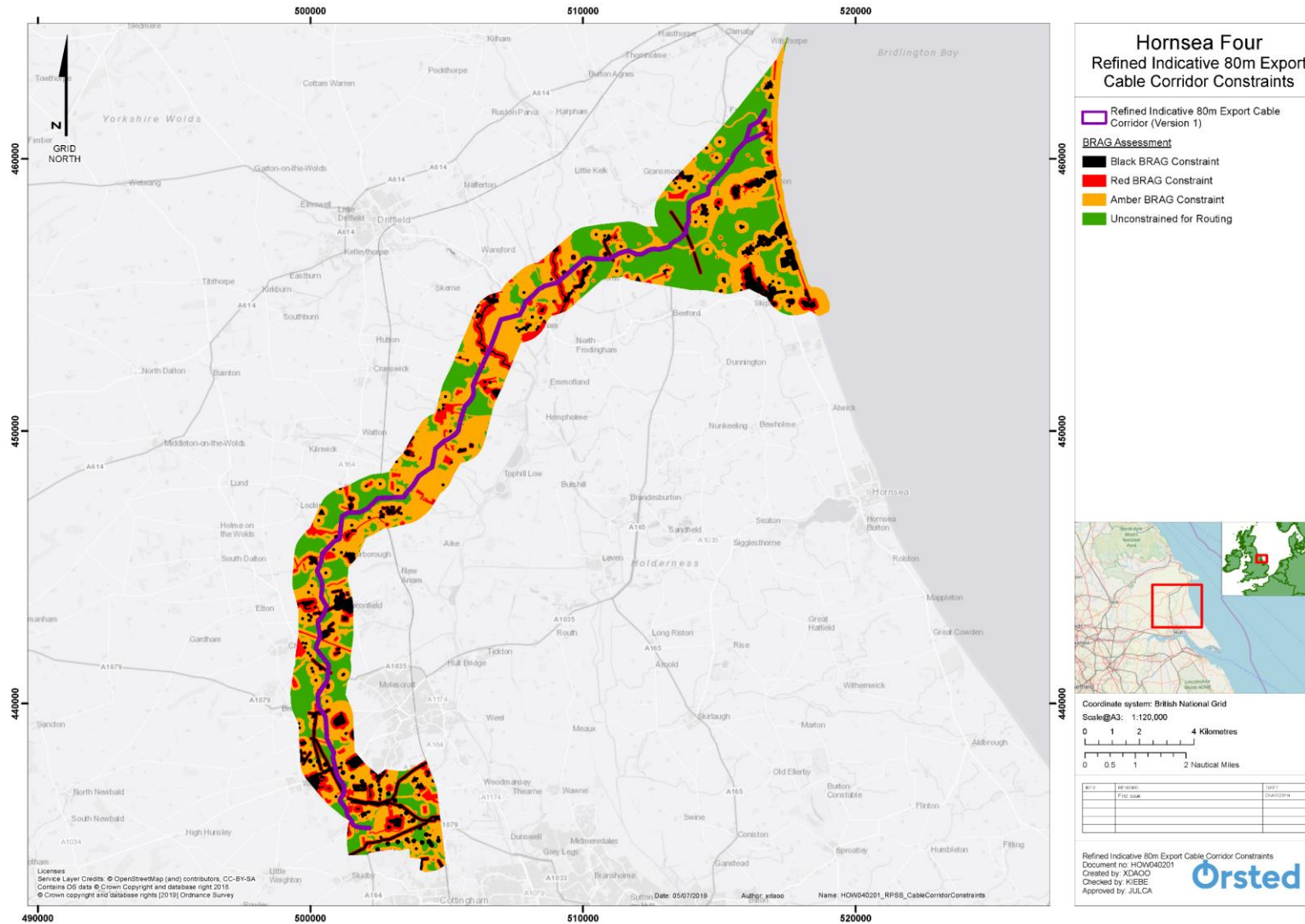


Figure 15: Refined Indicative 80m Export Cable Corridor Constraints map (not to scale) .

4.2.3 Version 4 – Refined Indicative 80m Export Cable Corridor (Version 1) – Landfall

4.2.3.1 Based on the remaining preferred landfall zones, A3 and A4 an onshore ECC option was developed from the middle of each of the zones as the exact location of the landfall was undergoing refinement (**Volume 4, Annex 3.1**). The only requirements for these sections of the onshore ECC were that:

- 'The Earl's Dike' south of landfall A3 was to be crossed at an angle of 75 – 90 degrees;
- Both sections of the onshore ECC also adhered to the updated BRAG criteria (**Table 12**).

4.3 Version 5 – Refined Indicative 80m Export Cable Corridor (Version 1) – Accesses and Compounds

4.3.1 Access requirements for the onshore ECC

4.3.1.1 Based on the assumption that the onshore ECC will be installed in sections approximately 1.6km in length, the ideal placement of accesses would coincide with the joint bays and permanent subsurface link box structures which would be located between sections. Any jointing bays and subsequent link boxes are indicative until construction. However, their indicative placement has been used to inform the location of the indicative accesses and compounds. As such the Technical requirements for the accesses are as follows:

- Distance: There should be an access to the onshore ECC approximately every 1.6 km
- Width: Each access should be 6m in width as the maximum design scenario for construction vehicles

4.3.1.2 The Land and Property requirements involved:

- Using existing openings in trees and hedgerows, gates and field access points where possible;
- Aligning accesses additional to the 80m onshore ECC with field boundaries to minimise disruption to fields and limit the areas of severed land;
- Taking accesses across fields already containing the permanent footprint of the onshore ECC, as opposed to using 'virgin' fields.

4.3.1.3 The Environmental and Consenting requirements dictated that all accesses and access points adhered to the BRAG criteria used to route the onshore ECC v1 (80m) (**Table 12**).

4.3.2 Logistics compound requirements for the onshore ECC

4.3.2.1 Based on experience from previous projects the following Technical requirements were established for the onshore ECC logistics compounds:

- There should be a logistics compound located approximately every 4km along the onshore ECC with a maximum area of 150m x 150m.
- Each compound should be located immediately adjacent to the onshore ECC for logistical ease, preferably with an existing road or identified access point in close proximity.

4.3.2.2 The Land and Property requirements involved ensuring that logistics compounds were located in areas which would already be severed by the temporary construction area of the onshore ECC.

4.3.2.3 Similar to the onshore ECC accesses, the Environmental and Consenting requirements also dictated that all logistics compounds adhered to the BRAG criteria used to route the onshore ECC v1 (80m) ([Table 12](#)).

4.3.3 Development of accesses and logistics compounds for the onshore ECC

4.3.3.1 Using the various requirements, the indicative accesses and logistics compounds were placed using Ordnance Survey Mastermap and the high-resolution flyover aerial imagery. As the aerial imagery was taken in June 2018, it was used as the most up-to-date data set for routing through or around physical features. Where possible, alternative indicative accesses and logistics compounds were identified. Alternative options were provided for some logistics compounds, for example where there may have been two areas of severed land, on opposite sides of the same road. Similarly, although use of a highway access point within the working width may have been preferred by Hornsea Four, if aerial imagery showed existing farm track gates and hedgerow openings on both sides of the main road, alternative access tracks were provided for landowner and tenant feedback.

4.3.3.2 Once this first version of the accesses and compounds was completed for the entire refined onshore 80m ECC v1, the indicative joint bay locations were then tweaked and moved closer to roads and accesses, and further away from watercourses and flood zones where possible. An average distance of 1.6km between joint bays was always maintained.

5 Onshore ECC Red Line Boundary (RLB) for PEIR

5.1.1.1 Letters and plans showing the 'Refined Indicative 80m Export Cable Corridor (Version 1)', indicative logistics compounds and accesses were sent to landowners and tenants in November 2018. Meetings were subsequently conducted with landowners and tenants as a part of the informal consultation with a view to receiving feedback and comments on:

- The indicative 80m ECC, logistics compounds and accesses, including to receive landowner preferences where more than one compound and/or access track option had been provided;
- Any questions raised on features of the land throughout the route planning and site selection process; and
- Any other local knowledge landowners and tenants wanted to share. For example, local knowledge relating to environmental features, drainage, and man-made features not discernible from aerial imagery.

5.2 Land owner feedback

- 5.2.1.1 The majority of landowners and tenants were consulted with as a part of this informal consultation. As requested by Hornsea Four landowners and tenants also provided feedback which ranged from the identification of undesignated historic environment sites, areas of particularly wet ground, evidence of historic badger setts and land drainage information.
- 5.2.1.2 Hornsea Four accepted change requests where it was feasible to do so. Examples of these change requests included moving the onshore ECC off of a paddock at Carr Hour Farm, and an area earmarked for the storage of silage north west of Brigham Quarry. Similarly, Hornsea Four received landowner feedback that if any of the access tracks involved taking a route through the nearby village of Fraisthorpe it would not be favoured by local residents. As such, a proposed access track to be used for both landfall A1 ([Volume 4, Annex 3.1](#)) and an adjoining section of the onshore ECC was moved to take access from the public highway further south, despite being a less favourable access from a technical perspective.

5.3 Preliminary traffic and transport assessments

- 5.3.1.1 In response to feedback from local information events in October and November 2018 and subsequently through landowner consultation, online and via postal feedback forms, Hornsea Four enlisted a local transport consultant (Local Transport Projects Limited) to assess the viability of access tracks and local road networks for the construction of the project. The local transport consultants assessed the following:
- The likely sensitivity of local roads, based on the proposed preliminary access points from local highways. This included possible upgrade and improvement works (and therefore potential disruption) which might result; and
 - The likely safety of all proposed access points from local highways, including proposed access tracks; and
- 5.3.1.2 This work broadly involved assessing aspects of local road networks, such as road width, local and national speed limits, and visibility, with the likely vehicles and loads which would be required during construction. Techniques such as 'swept path' analyses were used to calculate the likely paths which would be taken by construction vehicles, feeding in to a SWOT analysis of the local road networks.
- 5.3.1.3 These assessments resulted the following changes along the onshore ECC:
1. The removal of haul road crossing access points – these were removed as safer alternatives, either in the form of access tracks or highway access points had already been identified, which were recommended to be used instead. If not already identified, they were then subsequently identified in response to the removal of the haul road crossing points;
 2. The removal of highway access points – these were also removed either as a result of existing access points having the potential to be unsafe, where alternative safer access points could be used, or where new access tracks were subsequently drawn up;

3. The addition or moving of access tracks – for the aforementioned reasons in points 1 and 2;
4. The removal of access tracks – removed as multiple options had been provided in the first place, until a preliminary assessment on safety and landowner feedback back been received; and
4. The moving of logistics compounds to align better with the existing road networks and safety and sensitivity these and other Hornsea Four access tracks.

5.3.2 Removal and update of highway access points, haul road crossing points and logistics compounds

5.3.2.1 In order to minimise the effect on local roads and in response to feedback received from LIEs, highway access points were removed from the main road through Foston and Old Howe Lane. As such these two highway access points would be used as haul road crossings only. Highway access points east of Lissett Windfarm (off Lissett Lane), and off Out Gates (south of Gembling Lane) were identified as being preferable ([Figure 16](#)). In response to this change the logistics compound originally located east of Foston, was instead moved south east of Lissett Windfarm as being located closest to a main road (Lissett Lane).

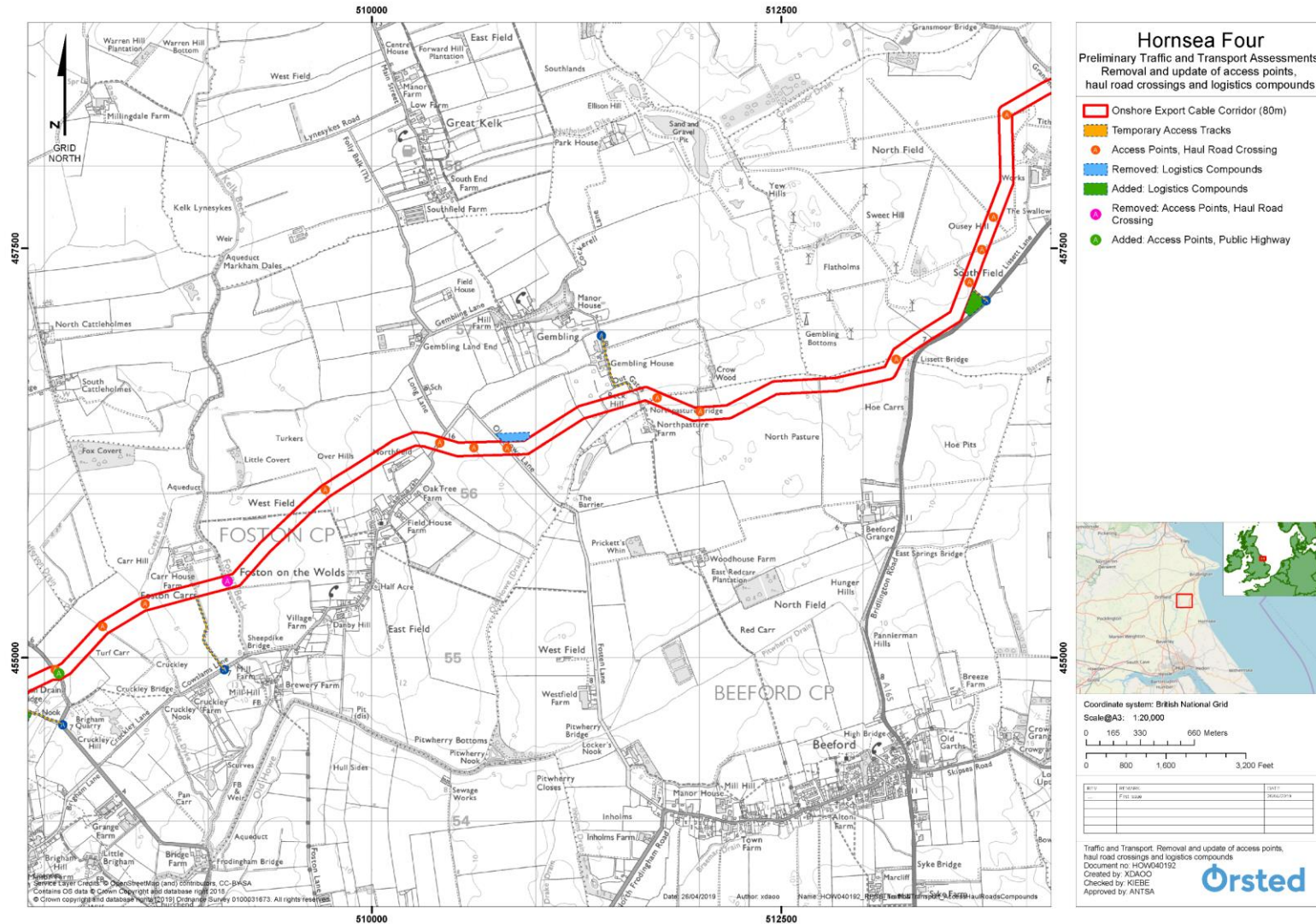


Figure 16: Preliminary traffic and transport assessments – Removal and update of highway access points, haul road crossing points and logistics compounds (not to scale).

5.3.3 Removal of unsafe accesses and highway access points

5.3.3.1 **Figure 17** shows the three preliminary access tracks east of Cherry Burton Golf Club were removed in favour of using the access track and highway access point off Constitution Hill to the south. This was because the section of Miles Lane directly to the east of Cherry Burton Golf Club as was deemed to have fast traffic and insufficient visibility in its current state. As a result the access track off Constitution Hill was retained, and a highway access point within the onshore ECC was added.

5.3.4 Addition / moving of access tracks

5.3.4.1 **Figure 18** shows the highway access point south of Mount Pleasant (on York Road) was removed in favour of inserting access tracks to the east of the roundabout. The preliminary traffic and transport assessment found that the further the distance of the highway access points from the roundabout, the safer they are likely to be. The highway access point within the onshore ECC was therefore removed and two access tracks, one to access each side of the HDD across York Road, to the north and south were inserted using existing entry points in to the adjacent fields. Existing entry points were used where possible to limit the removal of hedgerows.

5.3.4.2 Similarly, the preliminary traffic and transport assessment found that the A1079 and Newbald Road, south of Killingwoldgraves should not be used for haul road crossings if possible. As a result the haul road crossings were removed from these roads (**Figure 18**) in favour of using the new access track from the south side of York Road, and inserting two new access tracks off Newbald Road. The new access tracks off Newbald Road are likely to be safer as the access from the existing highway is further away from the bridge over the A1079 (to the east). The new access track off the south side of York Road would be used to access the north side of the HDD across the A1079, and the access track on the north side of the Newbald Road would be used to the access both the south side of the HDD across the A1079 and the north side of the HDD across Newbald Road. The access track to the south side of the Newbald Road would then be used for the south side of the HDD across Newbald Road.

5.4 Onshore ECC approach to landfall

5.4.1.1 As the exact location of the landfall compound within the final PEIR landfall (**Volume 4, Annex 3.1**) area is not known, it was decided that the onshore ECC on the landward side should be widened to create a funnel on the approach to the landfall. This would allow greater flexibility for pulling the cables in to the onshore ECC, depending on where the final compound may be located.

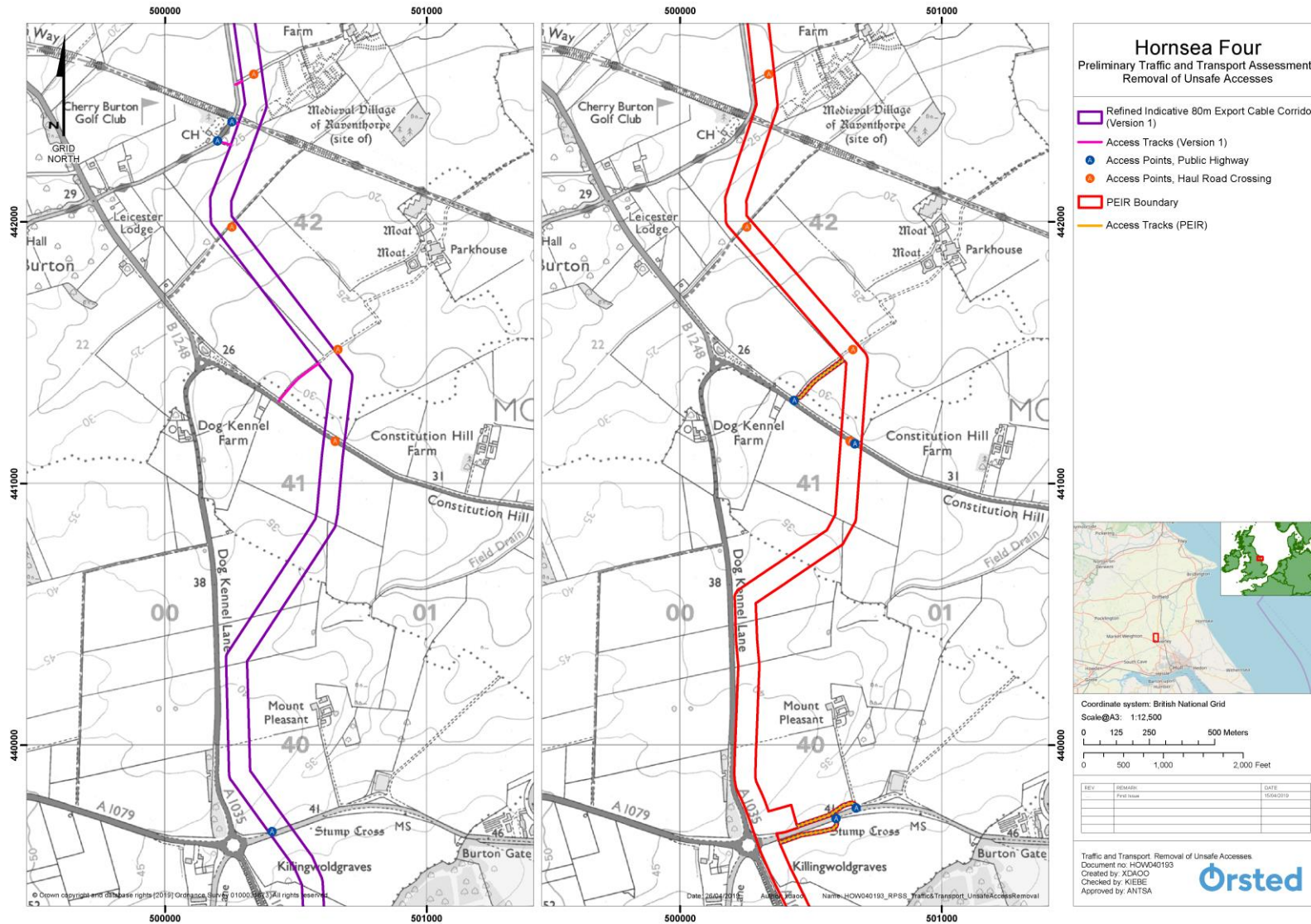


Figure 17: Preliminary traffic and transport assessments – Removal of unsafe accesses and highway access points (not to scale).

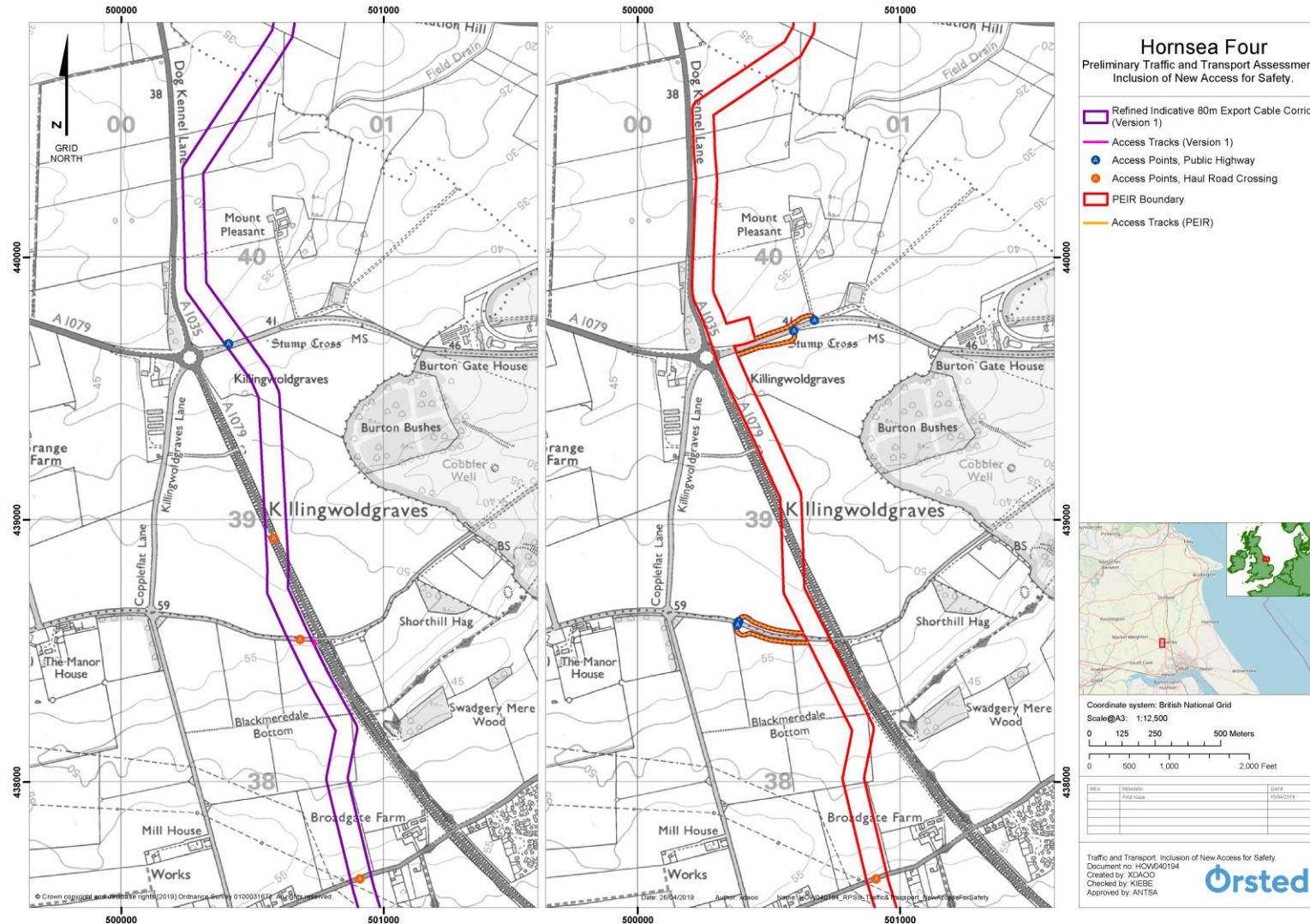


Figure 18: Preliminary traffic and transport assessment – removal of highway access points and addition of new access tracks for safety (not to scale).

5.5 ECC approach to the OnSS

- 5.5.1.1 Once a final OnSS site had been chosen ([Section 2.3.4](#)), an onshore ECC route to the site needed to be developed within the refined OnSS search area. Until this point the onshore ECC had only been developed up to the OnSS search area ([Figure 3](#)) as the exact location of the site was not known. Due to the high number of constraints in this area, a more refined BRAG criteria was established ([Table 13](#)). This BRAG criteria was mapped up and used to route the last onshore ECC section to the OnSS.

Table 13: Onshore ECC approach to OnSS option B BRAG Criteria.

Type of constraint	Constraint	Black	Red	Amber	Green
Technical	HDD Cable Crossing angle	Less than 45 Degree Crossing Angle	Between 45-60 Degree Crossing Angle	Between 60 - 80 Degree Crossing Angle	Between 80 – 90 Degree angle as possible
	Gas pipelines	Placing the onshore ECC parallel to and less than 40m from the edge of the gas pipeline	Placing the onshore ECC parallel to and between 40m – 60m from the edge of the gas pipeline	Placing the onshore ECC parallel to and between 60m – 80m from the edge of the gas pipeline	Placing the onshore ECC more than 80m from the edge of the gas pipeline
	Pylons and towers (11kV & 33kV)	There are no 11kV or 33kV pylon constraints considered to be a showstopper to development	An 11kV or 33kV pylon 0 – 5m from the outer most edge of the 80m corridor	An 11kV or 33kV pylon 5m – 15m from the outer most edge of the 80m corridor	An 11kV or 33kV pylon more than 15m from the outer most edge of the 80m corridor
	Interface with temporary or permanent OnSS works areas	Onshore ECC directly intersecting with the planned temporary works areas for the OnSS	Onshore ECC 0m – 20m from the planned temporary works areas for the OnSS	Onshore ECC 20m – 30m from the planned temporary works areas for the OnSS	Onshore ECC 30m – 40m from the planned temporary works areas for the OnSS
Environmental and Consenting	Nature Conservation – Ancient woodland	Route corridor directly intersecting: Ancient woodland	Route corridor within 0m – 100m of: Ancient woodland	Route corridor within 100m – 500m of: Ancient woodland	Route corridor more than 500m from: Ancient woodland
	Nature Conservation – UK BAP Priority Habitats	For the following sites there are not considered to be any showstopper constraints to development: UK BAP Priority Habitats	Route corridor directly intersecting: UK BAP Priority Habitats	Route corridor between 0 - 100m of: UK BAP Priority Habitats	Route corridor more than 100m from: UK BAP Priority Habitats
	Surface Water	There are no pond or body of water constraints considered to be showstoppers to development	A known pond or body of water within the 80m corridor is considered to have a high potential to constraint development	Route corridor 0 – 50m from a known pond or body of water is considered to have an intermediate potential to constrain development	Route corridor more than 50m from a known pond or body of water is considered to have a low potential to constrain development
	Flood Zones	There are no flood zone constraints considered to be showstoppers to development.	There are no flood zone constraints considered to have a high potential to constrain development	Route corridor intersecting a Flood Zone 2 or Flood Zone 3 area	Route corridor intersecting a Flood Zone 1 area
	Residential (and out-building*) receptors	Route corridor within 0m – 50m of any residential property or out-building	Route corridor within 50m - 100m of any residential property or out-building	Route corridor within 100m - 150m of any residential property or out-building	Route corridor more than 150m from any residential property or out-building

N.B. All text criteria in **Black** was developed or incorporated only for the onshore ECC section from the Beverley Road to the OnSS site

* Also a Land and Property constraint

6 National Grid Creyke Beck Substation Connection

6.1.1.1 In order to distribute the power produced by Hornsea Four to UK homes, the project will need to connect in to the National Grid at the National Grid Creyke Beck Substation ([Volume 4, Annex 3.1](#)). National Grid plc is not required to work to the same timescales as Hornsea Four and so an exact grid connection point has not been formally offered and agreed with the project. As a result, the fields directly adjacent to the Creyke Beck Substation (denoted by the '400kV export cable corridor' area in [Figure 19](#)) have been included within the red line boundary. Discussions with National Grid plc, as the operator and owner of the transmission system, are ongoing. Hornsea Four will seek to refine the project boundary in this area when a connection point or multiple connection points have been agreed with them.

Hornsea 4



Figure 19: 400kV connection to the National Grid Creyke Beck Substation (not to scale).