Hornsea 4

Ørsted

Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 4, Annex 3.1: Refinement of the Cable Landfall

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Table of Contents

List of Tables

List of Figures

Glossary

Term	Definition
Design Envelope	A description of the range of possible elements that make up the Hornsea Project Four design options under consideration, as set out in detail in the project description. This envelope is used to define Hornsea Project Four for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
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.
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.
Export cables	Cables that transfer power from the offshore substation(s) or the converter station(s) to shore.
the Applicant	This is Hornsea Project Four offshore wind farm, owned by 'Ørsted Hornsea Project Four (UK) Ltd'.
the Hornsea Four array area	The Crown Estate agreement for lease (AfL) area. Note, this is not the same as the 'Study Area' which is defined on a receptor specific basis.
Landfall	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) tide and the Transition Joint Bay (TJB) inclusive of all construction works, including the offshore and onshore ECC, intertidal working area and landfall compound.
Onshore export cables	Cables connecting the landfall first to the onshore substation and then on to the NGET substation at Creyke Beck.
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 Ørsted Hornsea Project Four Ltd. offshore wind farm project.
Planning Inspectorate (PINS)	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Transition Joint Bay (TJBs)	TJBs are pits dug and lined with concrete, in which the jointing of the offshore and onshore export cables takes place.
Wind turbine	All of the components of a wind turbine, including the tower, nacelle, and rotor

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
DBA	Desk Based Assessment
DCO	Development Consent Order
DP	Dynamic Positioning
EA	Environment Agency
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EISA	Electrical Infrastructure Study Area
ES	Environmental Statement
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
IFCA	(Association of) Inshore Fisheries and Conservation Authorities
MCZ	Marine Conservation Zone
MHW	Mean High Water
MLW	Mean Low Water
MoD	Ministry of Defence
MWLS	Mean Low Water Spring
NSIP	Nationally Significant Infrastructure Project
OFTO	Offshore Transmission Owner
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
SMP	Shoreline Management Plan
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
UKC	Under Keel Clearance

Acronym	Definition
UXO	Unexploded Ordnance

Units

Unit	Definition
km	Kilometre(s)
m	Metre(s)
m/yr	Metre(s) per year

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: Site selection and consideration of alternatives**
Stage 2: Identification of an Electrical Infrastructure Study area	**Volume 1, Chapter 3: Site selection and consideration of alternatives**
Stage 3: Identification of the Landfall	**Volume 4, Annex 4.3.1: Grid Connection and Refinement of the Cable Landfall**
Stage 4: Identification of the Onshore Substation (OnSS) site	**Volume 4, Annex 4.3.2: Selection and Refinement of the Offshore Infrastructure**
Stage 5: Identification of the Offshore and Onshore Export Cable Corridor (ECC)	**Volume 4, Annex 4.3.2: Selection and Refinement of the Offshore Infrastructure** and **Volume 4, Annex 4.3.3: Selection and Refinement of the Onshore Infrastructure**

1.1.1.2 The Hornsea Four Electrical Infrastructure Study Area (EISA) is largely defined by the AfL (location of the Hornsea Four array area) and grid connection point at Creyke Beck (location of the OnSS). These two locations formed the eastern and western extents of the Electrical Infrastructure Study Area (EISA). The EISA has been used to structure the RPSS reporting format, with:

- Landfall covered in **Volume 4, Annex 4.3.1: Grid Connection and Refinement of the Cable Landfall**;
- All Hornsea Four offshore infrastructure east of landfall covered in **Volume 4, Annex 4.3.2: Selection and Refinement of the Offshore Infrastructure**; and
- All Hornsea Four onshore infrastructure to the west detailed in **Volume 4, Annex 4.3.3: Selection and Refinement of the Onshore Infrastructure**.

1.1.1.3 This is shown in **Figure 1**.

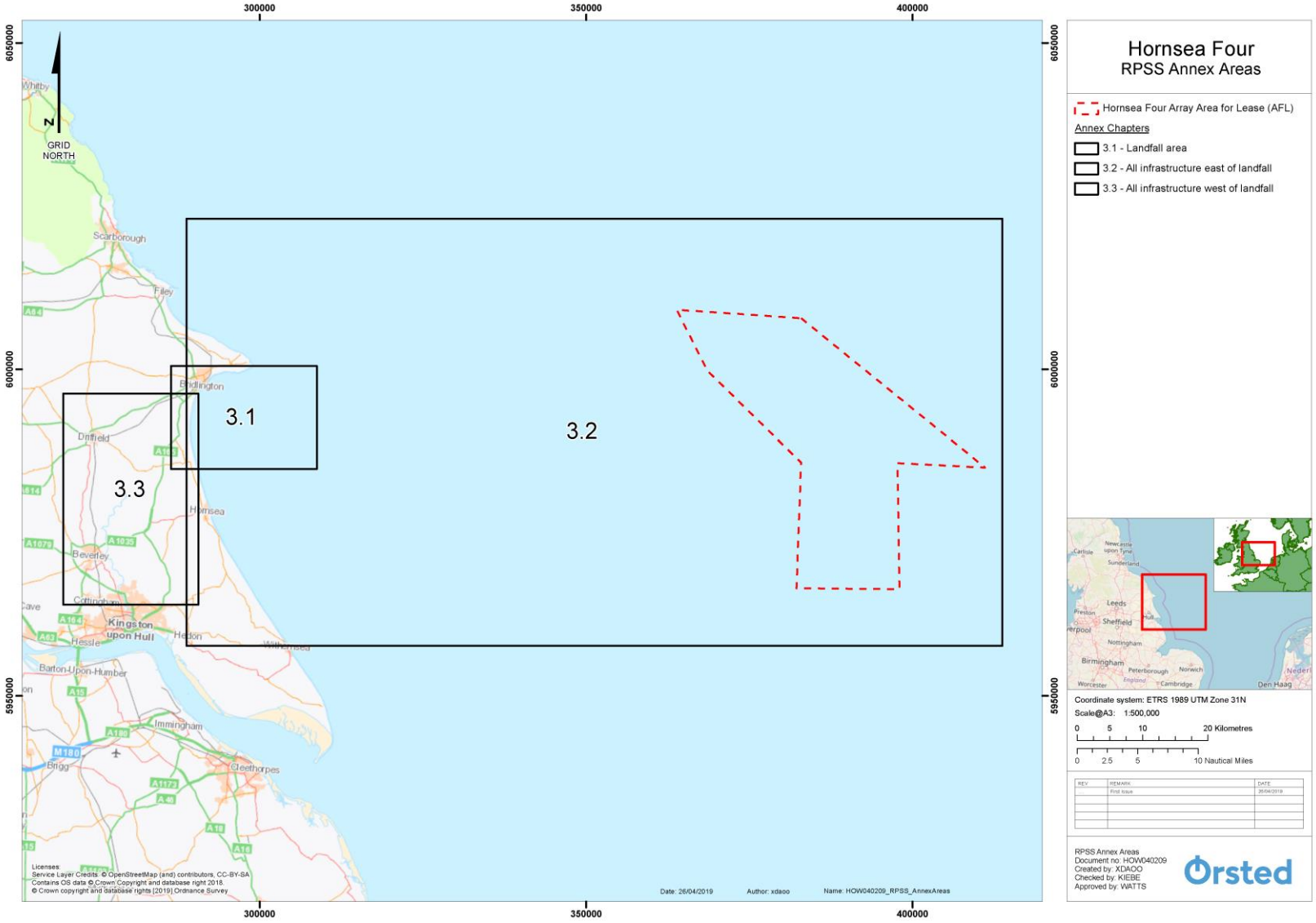

Figure 1: Hornsea Four RPSS reporting.

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 landfall is shown in **Figure 2**.

Table 2: Hornsea Four RPSS Programme.

Stage	Description
EIA Scoping October 2018	• 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; and • 3,000 m offshore ECC scoping boundary.
Scoping – PEIR consultation	• Feedback and comments from informal public consultation events, landowner liaison and stakeholders on the scoping report and scoping boundary.
PEIR July 2019	• 80m onshore ECC inclusive of permanent and temporary works areas with indicative construction access points; • OnSS site; • Two landfall options; and • 1,500 offshore permanent ECC with 500m temporary works areas buffer either side of ECC).
Section 42 and 47 consultation	• 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	• 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; and • 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.

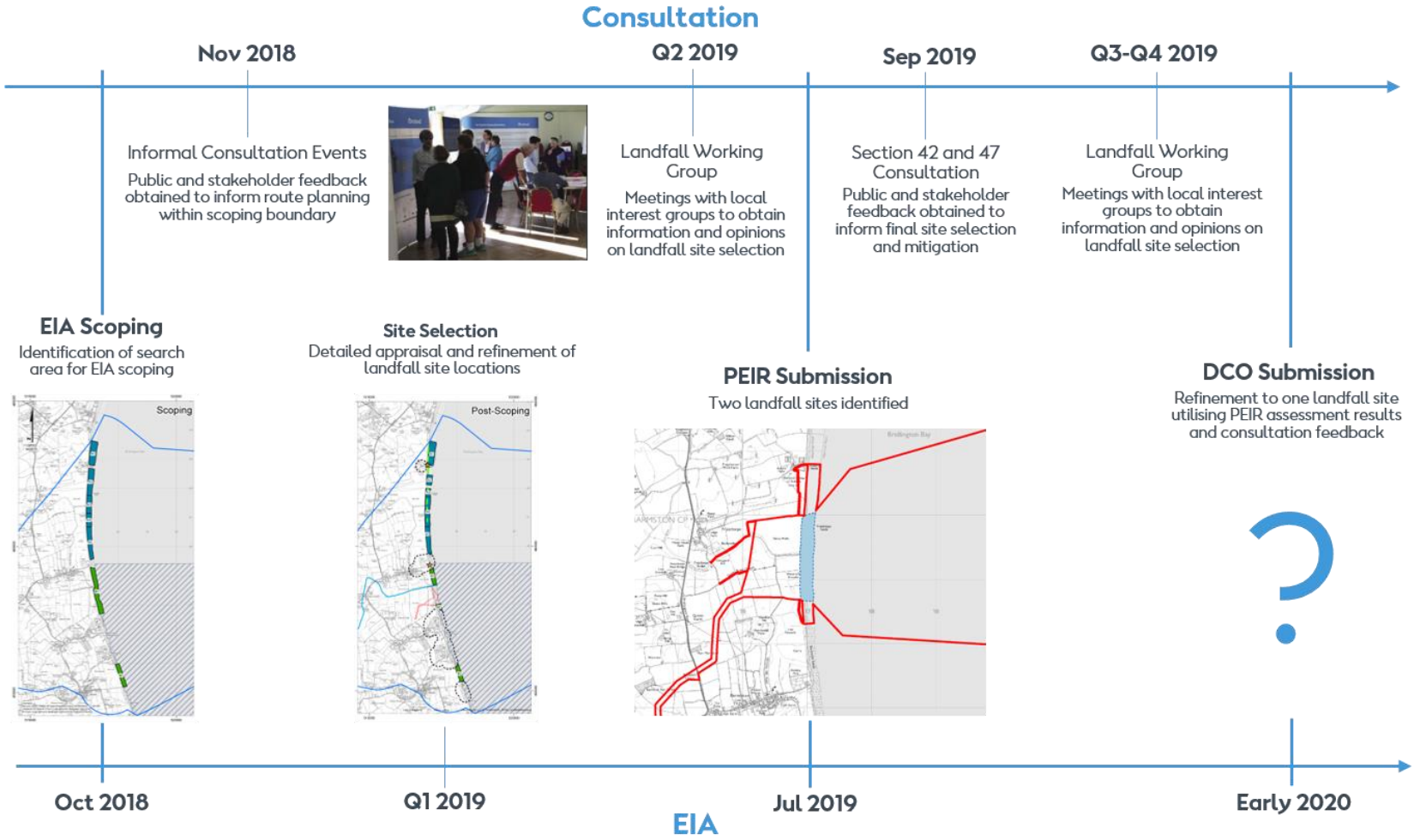

Figure 2: Landfall Site Selection Timeline.

1.2 Purpose of the Annex

1.2.1.1 This Annex has been produced by Ørsted Hornsea Project Four Ltd (hereafter referred to as Hornsea Four) to document the decision making behind the refinement of the onshore and offshore infrastructure since identification of the EISA up to submission of the Preliminary Environmental Information Report (PEIR). The offshore project element comprises all infrastructure seaward of the landfall (as shown in **Figure 1**). This Annex documents:

- Stage 3 – Identification of the Landfall.

1.2.1.2 Prior to submission of the PEIR the Applicant 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 of Yorkshire 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.

1.3 Project Elements

1.3.1.1 The Hornsea Four offshore electrical transmission system will consist of up to six export cables that will come ashore within a 1.5km wide offshore ECC. At landfall, a maximum of 6 transition TJBs will connect the offshore and onshore export cables, to facilitate the transition from offshore to onshore.

2. Stage 3: Identification of the Landfall

2.1 Guiding Principles

2.1.1.1 The cable landfall point is the location at which the offshore ECC intersects with the coastline. The landfall covers the shallow approaches, the intertidal area and the onshore route through to the transition jointing bay. The landfall will be installed via either open-cut or HDD.

2.1.1.2 The general guiding principles for landfall site selection were to:

- select the shortest route (hence reduce environmental impacts by minimising footprint and electrical transmission losses (most efficient project));
- avoid key sensitive features where possible and where not, seek to mitigate impacts, supported by the following commitment:
  - Co44: The Holderness Inshore Marine Conservation Zone (MCZ) will not be crossed by the offshore export cable corridor including the associated temporary works area;
- minimise disruption to populated areas, supported by the following commitments:
  - Co49: There will be no permanent High Voltage infrastructure installed above surface within 50m of residential properties and sub surface within 25m of residential properties;
  - Co134: Cable installation works at the landfall area will be located at least 200 m from residential receptors;
  - The built-up areas and associated buffer zones are illustrated in black hashed lines in **Figure 3B**; and
- find a site large enough to accommodate the connection technology outlined within the design envelope.

3. Version 1 – Defining the Landfall Study Area & Search Zones

3.1.1.1 The landfall search extended from north of Spurn Head to just south of Bridlington, which was sub-divided into a series of zones. These high-level zones provided the basis for a focussed and detailed Desk Based Assessment (DBA) to aid landfall selection. It does not imply that all locations within the high-level zone were considered viable landfalls.

3.1.1.2 A polygon of the foreshore between Mean High Water (MHW) and Mean Low Water (MLW) was created for the coastline in the EISA. This polygon was divided into six zones based on similar geographic features listed below and illustrated in **Figure 3A**:

- Zone A is defined as the area between Flamborough Head and the northern extent of Dogger Bank's Creyke Beck Cable Corridor – depicted in blue in **Figure 3A**;
- Zone B consists of the area from the north boundary of Dogger Bank's Cable Corridor to the caravan park south of Atwick – depicted in dark green in **Figure 3A**;
- Zone C is the caravan park south of Atwick to the start of the residential area north of Mappleton – depicted in light green in **Figure 3A**;

- Zone D consists of the area from the north of Mappleton to the boundary between the Garton and Roos parish councils – depicted in yellow in **Figure 3A**;
- Zone E consists of the boundary between the Garton and Roos parish councils and the edge of the Dimlington Cliffs Site of Special Scientific Interest (SSSI) – depicted in orange in **Figure 3A**; and
- Zone F is from the northern extent of Dimlington Cliffs SSSI to Spurn Head – depicted in red in **Figure 3A**.

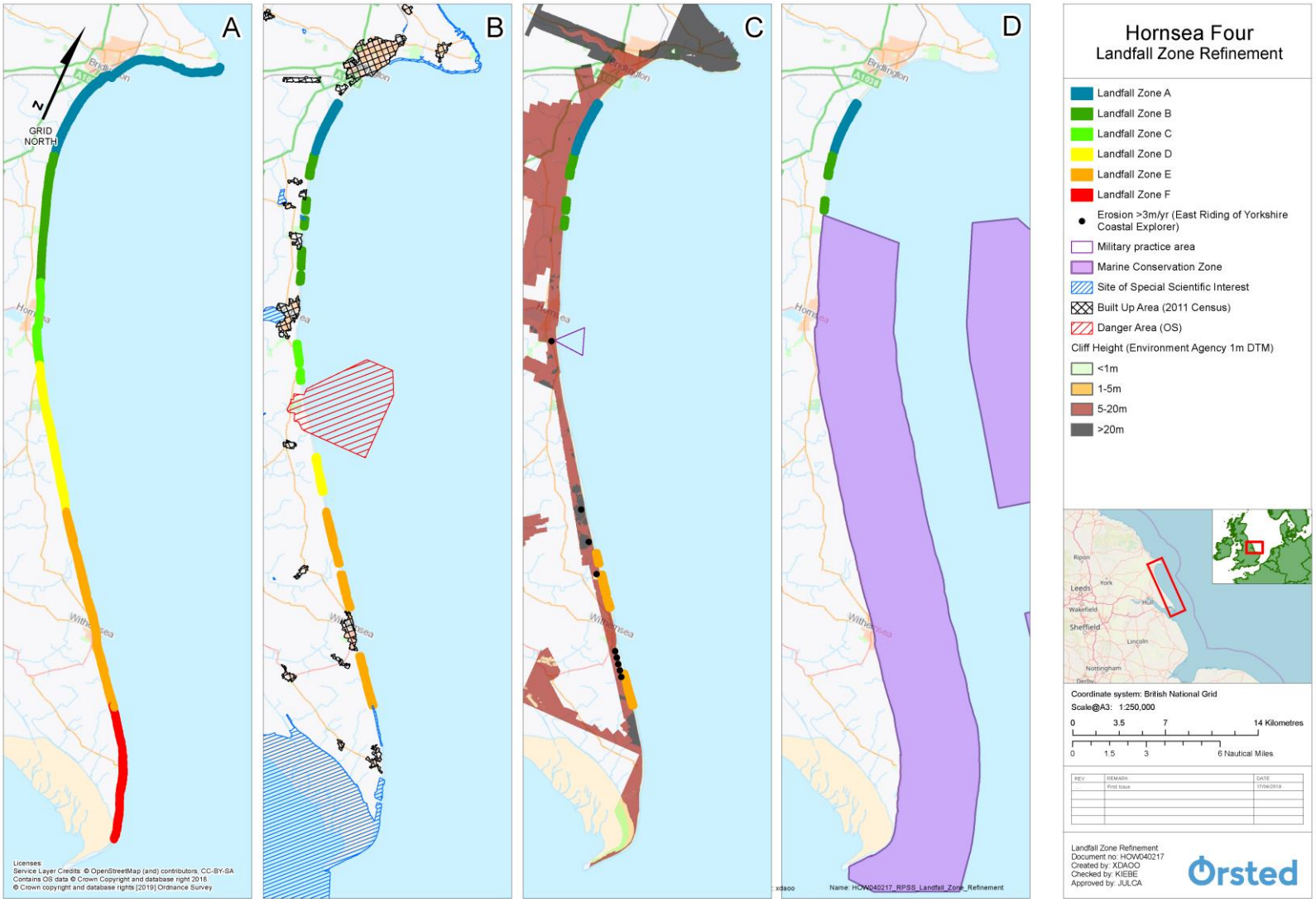

Figure 3: Hornsea Project Four – Landfall Zone Refinement.

4. Version 2 - Initial Landfall Assessment

4.1.1.1 During the initial assessment phase, areas which posed extensive constraints to cable installation (e.g. by prohibiting or reducing the likely deliverability of a viable connection route) were excluded where these were readily discernible from available data. For example, extensive constraints are considered to be:

- Military practice areas;
- Danger areas;
- Areas where erosion is >3m/yr;
- Areas with no feasible beach access within 2km;
- Residential areas;
- Dredging areas; and
- Munitions dumps.

4.1.1.2 In addition, sections of the coastline that were immediately adjacent to residential areas, recreational areas (e.g. caravan parks), as well as areas with cliff heights of over 20m were removed from consideration (see Figure 3B). This included Zone F in its entirety, which was undesirable due to:

- Active cliffs of greater than 20m height;
- Significant oil and gas infrastructure at Easington; and
- Environmental sensitivity of Spurn Head.

5. Analysis and Refinement of Coastal Landfall Options

5.1 BRAG Assessment

5.1.1.1 The remaining zones were further divided into 23 sites, as shown in Figure 3B. Many of these sites were created organically when large areas were removed, following the initial landfall assessment (see **Version 2 - Initial Landfall Assessment** above). Sections that remained longer were split into approximately equal lengths, with boundaries based on geographical features such as field boundaries and rivers. The suitability of each of the 23 sites was determined through a Black, Red, Amber and Green (BRAG) appraisal. At a high-level, each category is defined in Table 3.

Table 3: 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

5.1.1.2 Black and red constraints are critical in determining features that should be avoided wherever possible to avoid consenting risk, reduce EIA complexity and the need for mitigation. Amber and green constraints are those that may be more readily minimised or managed by employing appropriate mitigation measures. The key technical, consenting and commercial risks areas are outlined below.

5.1.1.3 Technical Constraints:

- Nearshore and beach profile, coastal geology and geomorphology e.g. distance to 10m depth contour for boat access; detrimental beach and seabed geology and sedimentology that could beach a vessel or bury/erode cables; presence of cliffs or eroding coast;
- Proximity to existing infrastructure e.g. existing cables, pipelines, outfalls, sub surface utilities and sea defences;
- Suitable access for construction vehicles and extent of suitable working/construction areas at HDD locations; and
- Proximity to residential areas which would limit working area or could potentially cause disturbance or require restrictive limits on construction activities.

5.1.1.4 Consenting Constraints:

- Proximity to designated sites of conservation interest (MCZ, SPA, SAC) or important rare features such as Annex 1 habitat (reef or sandbank); areas of commercial fishery importance (cockle/mussel beds etc);
- Proximity to existing infrastructure (as specified above);
- Interaction with recreation such as busy beaches, car parks or right of way/long distance trails;
- Proximity to residential areas (as specified above);
- Proximity to areas of cultural heritage (e.g. listed buildings, historical artefacts); and
- Proximity to surface water/floodplain and type of coastal protection measures.

5.1.1.5 Commercial constraints:

- Land acquisition requirements; and
- Proximity to sensitive stakeholders (e.g. cable crossings, fishing density).

6. Version 3 - Landfall Zone Refinement

6.1.1.1 Based on the BRAG categories, a detailed analysis was undertaken to reduce the number of landfall options. The intention of this stage was to provide sufficient detail to enable meaningful engagement through Scoping and initial consultation with the public, whilst retaining sufficient flexibility for iterative refinement through consultation feedback and acquisition of site-specific information.

6.1.1.2 Each site was visited by a multi-disciplinary team of environmental and consenting specialists, construction and installation engineers and commercial managers to assess their viability from all perspectives (technical, site and land access, environmental and consents issues).

6.1.1.3 Following the site visits and initial review of each site against the BRAG criteria, zones B4, B5, C1, C2, C2x, D1, D2, D3, E1, E5, E6 and E7 were discounted due to technical constraints, leaving 13 sites under consideration see **Figure 3C**. The Holderness Inshore Marine Conservation Zone (MCZ) represented a significant constraint for Environment & Consents. The MCZ is located offshore along the coastline of East Riding of Yorkshire between sites B3 and E9, illustrated in purple in **Figure 3D.** An offshore ECC approaching sites B3 to E9 would therefore need to pass through the MCZ. For this reason, these were removed from consideration.

6.1.1.4 The rationale behind discounting landfall sites during Version 1 to Version 3 stages of refinement are summarised in **Table 4** below.

Table 4: Initial Discounting Landfall Rationale.

Discounted Landfall Options	Rationale
B4, B5	Options discounted due to their location within the SPA and the ECC to these landfall sites would need to cross the MCZ; the project has committed to avoiding this designated site. There is no access to the foreshore from these sites and it is also very close to the village of Atwick.
C1, C2, C2x	Options discounted as the marine ECC to these landfall sites would need to cross the MCZ, and the project has committed to avoiding this designated site. From a technical perspective, site C2x is also unfeasible due to high and unstable cliffs (illustrated in **Photo 1**) and space is limited for compound.
D1, D2, D3, E1	Options discounted as the marine ECC to these landfall sites would need to cross the MCZ, and the project has committed to avoiding this designated site. The site is also downdrift from Ministry of Defence (MoD) firing range and has high and unstable cliffs and so the HDD route would need to be very long.
B3, E2, E3, E4, E5, E6, E7, E8, E9	Options discounted as the ECC to these landfall sites would need to cross the MCZ, and the project has committed to avoiding this designated site.
Zone F	Cliff heights >20m, environmental designations, oil and gas infrastructure at Easington

Photo 1: High, unstable cliffs within the C2x landfall zone.

7. Version 4 – Study of Shortlisted Landfall Zones

7.1.1.1 For the next stage of refinement, the BRAG criteria were updated to improve the relevance and level of detail. For example, removing certain criteria that were no longer valid and making each category quantitative. The updated BRAG criteria are provided in **Appendix A, Table 6.** This allowed for the selection of one or more preferred landfall zones to be taken forward to PEIR.

7.2 Data Collection & Analysis

7.2.1.1 Additional desk-based studies and site visits were undertaken, focussing on the remaining seven areas. The purpose of the site visits was to look at possible access routes and potential locations for a construction compound. Desktop geotechnical data was also obtained for the shortlisted landfall sites.

7.2.1.2 Data acquired, such as drone footage and aerial photography, were utilised to aid the refinement. Feedback following public consultation events also provided useful input. Key areas of concern to the public included:

- "The Cow Shed" farm shop and café at Fraisthorpe Beach: busy amenity for tourists and locals within A1/A2 landfall area;
- Onshore windfarm: runs parallel to A1/A2 landfall sites;
- The Barmston main drain: runs through B1 landfall site;
- Sandy & silty land: adjacent to A1-A3 landfall sites;
- Potential conflict with Dogger Bank cables: encompassing A5 & B1 landfall site locations; and
- Densely populated areas: excluded in initial refinement.

7.2.1.3 Emerging risks from the second stage of desk-based research were the extensive World War II artefacts, spanning South from Fraisthorpe Beach, and the UK Seaside Award/Rural Beach Seaside Award gained by Fraisthorpe and Barmston Beaches respectively.

7.3 Landfall Assessment Conclusions

7.3.1.1 **Appendix B** - Landfall BRAG Assessment **Table 6 -Table 9** provide the full BRAG assessment for the Version 4 stage of refinement and a summary for each landfall site is provided below.

Site A1

7.3.1.2 Site A1 was treated as a black constraint due to the high recreational value of Fraisthorpe Beach, popular with tourists and locals alike. Moreover, the discovery of World War II anti-invasion defences and presence of an onshore wind farm directly behind the landfall rendered this site undesirable from a technical perspective so site A1 was removed from consideration.

Sites A5 & B1

7.3.1.3 Updated information on the Dogger Bank Creyke Beck development indicated their proposed Offshore Cable Corridor encompassed both the A5 and B1 landfall site locations. This would pose difficulties, especially for offshore cable installation, as it is considered unfeasible to cross the cable in such shallow waters. The risk was therefore deemed too high, so sites A5 and B1 were discounted from further assessment.

Site B2

7.3.1.4 Site B2 presented a technically favourable site. It avoided the offshore Dogger Bank offshore cable crossing, had a good compound site location, excellent access and would render both offshore and onshore cable routes 2km shorter. However, site B2 is located within the Greater Wash SPA and the compound location is very close to residential properties and Skipsea Primary School. Furthermore, the proposed landfall compound is situated within church land where it would be difficult to reach a commercial agreement. This, combined with its location within a designated site and proximity to residential

properties, meant that the disadvantages of the site significantly outweigh the advantages and so B2 was discounted from further assessment.

Site A2

7.3.1.5 Whilst site A2 was a reasonably favourable landfall location, it presented several disadvantages in particular:

- Unfavourable access (in comparison to other remaining sites);
- Onshore cable route constrained by onshore wind turbine inland from site;
- Close proximity to high amenity beach, therefore likely to cause greater public disruption; and
- Close proximity and high prevalence of World War II artefacts, therefore risk posed by sensitive stakeholders.

7.3.1.6 As such, A2 was deemed less favourable than the other remaining sites and was discounted from further assessment.

7.3.1.7 The rationales for discounting certain sites are summarised in **Table 5** and they key constraints associated are represented visually in **Figure 4**.

Table 5: Post-Scoping Discounting Landfall Rationale.

Discounted Landfall Options	Rationale
A1, A2	Within/neighbouring Fraisthorpe Beach: • UK Seaside Award; • Popular destination with tourists and locals; • Busy café (The Cowshed Tearoom) and car park; and • "Active Coast" scheme promoting beach walking for health. Sites contain many World War II Artefacts: • Anti-tank concrete cubes/anti-invasion defences are still positioned in the sand; and • Promoted as a tourist attraction and point of cultural heritage. Onshore windfarm located directly behind the landfall Constraint for onshore cable route
A5, B1	Dogger Bank Creyke Beck offshore cable corridor borders both sites: • Considered unfeasible to cross cable in such shallow water. Caravan Park neighbours both sites: Sensitive stakeholders: tourists, residents, Barmston Beach (Rural Beach Seaside Award)
B2	• Nearby caravan parks and residential properties; • Access required through the village of Skipsea; • Located within the Greater Wash SPA; • Primary school present just inland of compound site; • Very high cliffs; potentially unstable due to high predicted erosion rate; and • Does not adjoin remaining landfalls; thus increasing project scope to progress geographically distinct sites.

Discounted Landfall Options	Rationale
	Landfall compound sited within church land where it will be difficult to reach a commercial agreement.

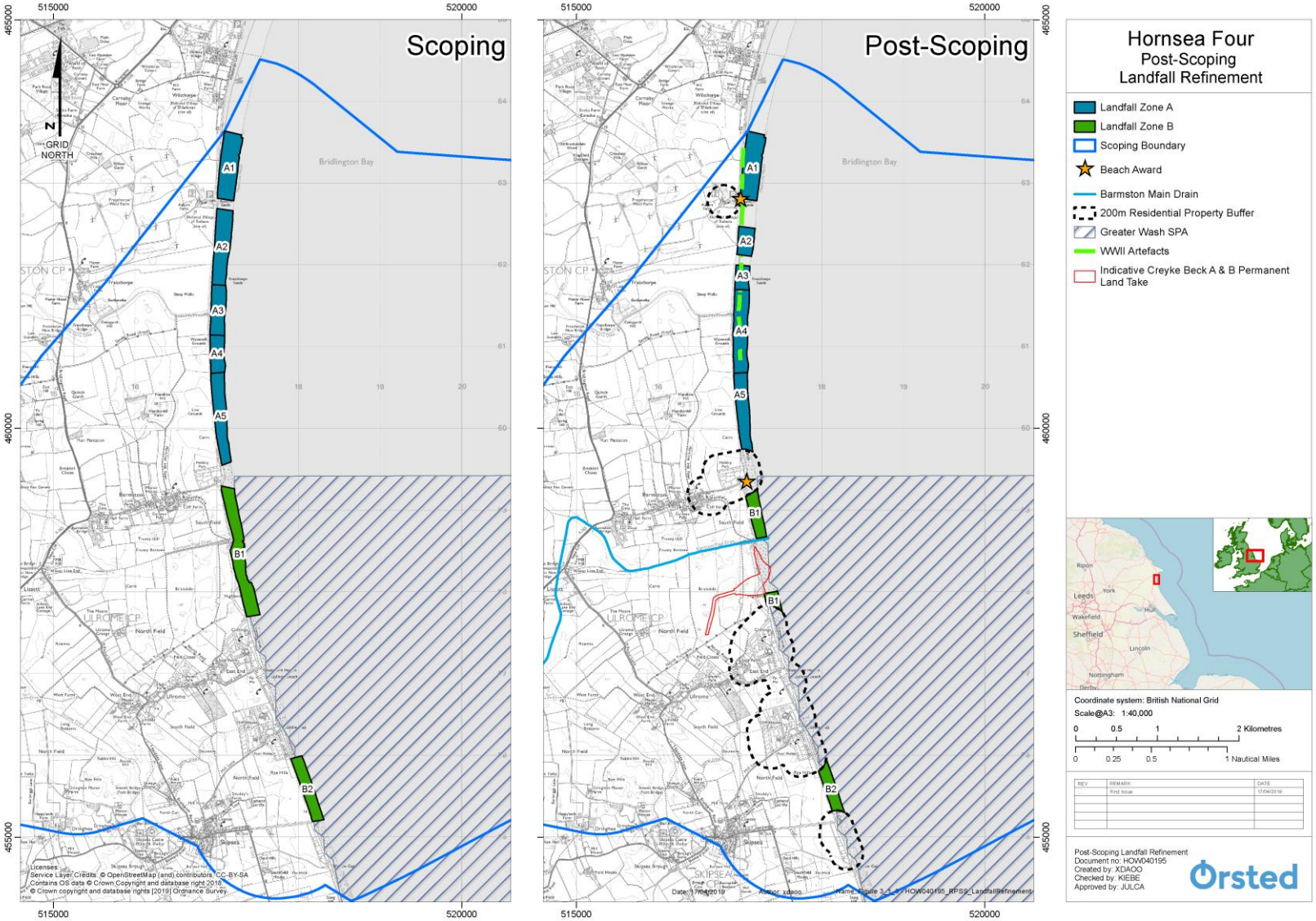

Figure 4: Hornsea Project Four – Post-Scoping Landfall Refinement.

7.4 Preferred Landfall Options

Sites A3 & A4

7.4.1.1 Following the above assessment, sites A3 and A4 were considered the most favourable from all perspectives (technical, commercial and consents). Some constraints remained, regarding access through the village of Fraisthorpe and historic artefacts, but these are generally considered to be low-risk and easily mitigated.

7.4.1.2 It was therefore concluded that sites A3 and A4 would be taken forward to PEIR. These landfalls will be considered as a continuous zone, with the optimum landfall compound, onshore cable route and the exact location which the offshore ECC will make landfall to be identified within this zone. The preferred landfall sites are illustrated in **Figure 5** below.

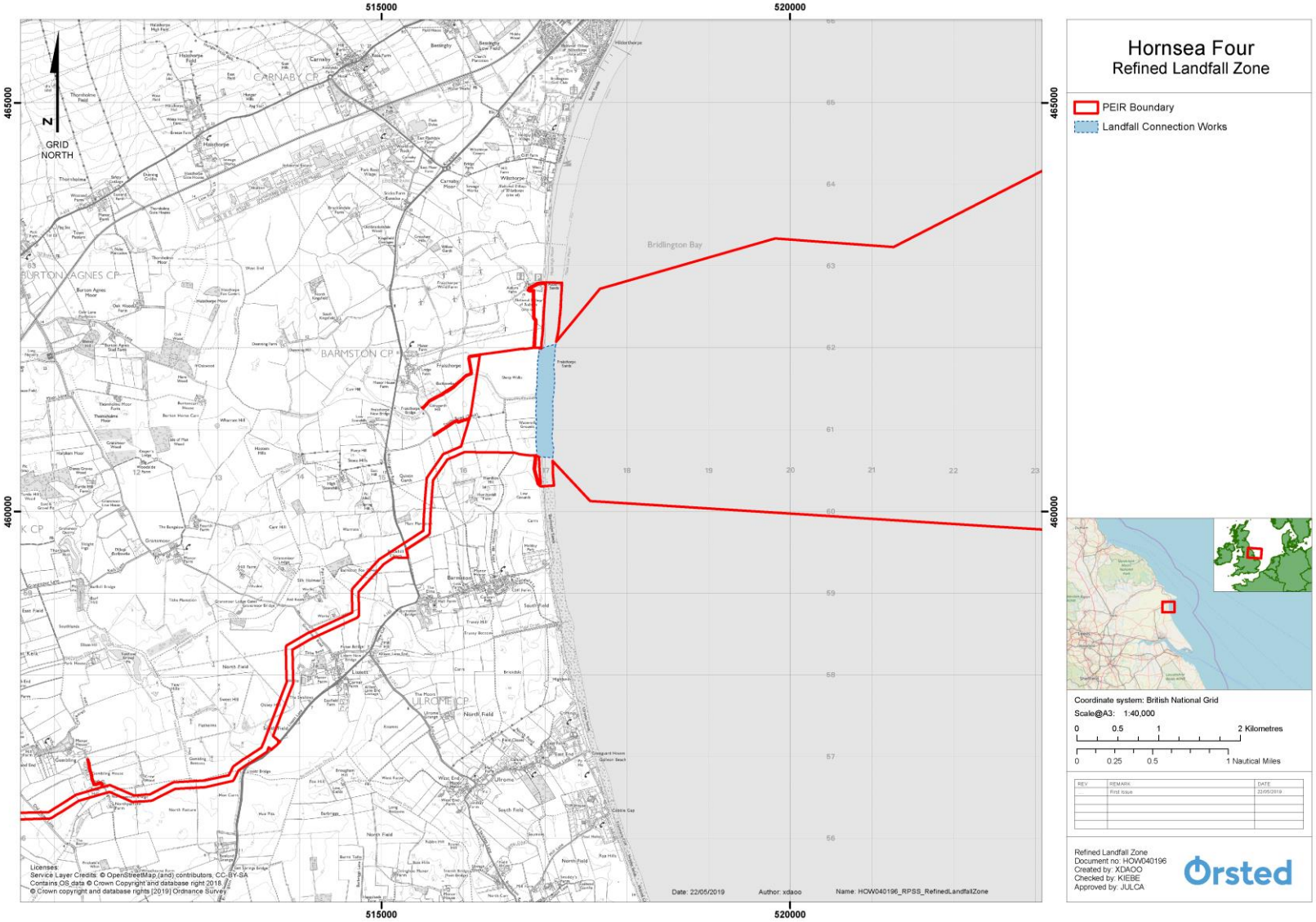

Figure 5: Hornsea Project Four – Refined Landfall Zone.

8. Conclusion and Next Steps

8.1.1.1 Stage 3 of the RPSS sought to identify the appropriate landfall area that will be required for the Hornsea Project Four Offshore Wind Farm. The refined landfall zone presented in **Figure 5** (comprising Site A3 and A4) has been derived through a combination of physical, commercial and environmental considerations balanced alongside engineering limitations. Decisions have been made by a multi-disciplinary team, taking into consideration consultation feedback as well as detailed studies.

8.1.1.2 Hornsea Four has shortlisted two stretches of the Holderness coastline for the landfall of the offshore export cables, with a total combined length of 1.3km. Refinement of the landfall at this stage allows for a focussed and detailed analysis to ensure the development of the EIA remains on track, as well as enabling detailed onshore and nearshore geophysical and geotechnical surveys to be undertaken. This, in combination with consultation responses, will inform the final landfall selection.

Appendix A – Landfall Constraints Appraisal Criteria

Table 6: Landfall BRAG appraisal criteria for technical, environmental and commercial constraints.

Constraint	Category	Black	Red	Amber	Green
Technical	Cliff height	>20m	5 - 20m	1 - 5m (open cut still possible)	No cliffs
	Open Cut/HDD Possible	Neither	HDD Only	Open Cut Only	Both
	Geology	n/a	Rock	Soft clay and loose sand	Firm - v. stiff clay & medium dense - v. dense sand
	Distance to 10m Depth Contour	n/a	>5km	1.5 - 5km	<1.5km
	Presence of sea defences	Sheet piles >15m	Sheet piles	Seawall / Large Dunes	Clear beach
	HDD Drill Length	> 2km	1 - 2km	500 - 1000m	< 500m
	Space for onshore compound (200 x 100m min)	No	n/a	n/a	Yes
	Space available for duct welding and stringing	n/a	No	n/a	Yes
	Beach Access	No feasible beach access within 2km	Bridging sea defences	Within 2km	Direct access within 500m.
	Compound Access	No feasible access to compound	New roads/tracks required	Minor trackway upgrades	Suitable pre-existing access direct to compound
	Length of intertidal	n/a	>2km	500m - 2km	< 500m

Constraint	Category	Black	Red	Amber	Green
	Nearshore obstacles	Dredging areas, munitions dumps	Wrecks, UXOs, 2 or more obstacles	2 obstacles, high fishing density	None
	Shoreline Topology	n/a	>12 degree slope	> 8 degree slope	Flat / Gentle Slope
	Nearshore seabed characteristics	n/a	Hard substrate, extensive rocky outcrops, very stiff clays	Intermediate, soft clays etc	Sandy bed, gravels
	Geohazards (erosion)	> 3m/yr	Less than 3m/yr	Less than 2m/yr	Less than 1m/yr
Environmental	Nature conservation	Within internationally or nationally protected habitat/species: - MCZ; - SSSI Units (dependent upon condition).	Within 2km of internationally or nationally protected habitat/species: - SPA/SAC/SCI; - MCZ; - Priority Habitats; - BAP habitats; - SSSI Units.	Within 5km of internationally or nationally protected habitat/species: - SPA/SAC/SCI; - MCZ; - Priority Habitats; - BAP habitats; - SSSI Units.	>5km from internationally or nationally protected habitat/species: - SPA/SAC/SCI; - MCZ; - Priority Habitats; - BAP habitats; - SSSI Units.
	Coastal Protection measures	Area defined as "Hold the Line" in Shoreline Management Plan (SMP)	Area defined as "Advance the Line" in SMP	Area defined as "Managed Realignment" in SMP	Area defined as "No Active Intervention" in SMP
	Surface water & floodplain	Development boundary overlaps with main river designated as feature of European/National SCI	Main river crossing or main drainage system within 100m	Within 100-200m of a main river crossing or main drainage system	>200m of main river crossing or main drainage system
	Proximity to residential area	<50m from residential properties	> 50m and <200m from residential properties	200m-500m from residential properties	Residential properties >500m
	Historic Environment	<50m from Listed Building or HER	>50m and <200m from Listed Building or HER	200m-500m from Listed Building or HER	>500m from Listed Building or HER

Constraint	Category	Black	Red	Amber	Green
	Cultural heritage	<50m of cultural heritage assets (anti-tank posts)	>50m and <200m of cultural heritage assets (anti-tank posts)	200m-500m from cultural heritage assets (anti-tank posts)	>500m from cultural heritage assets (anti-tank posts)
	Amenity and recreation	Within Blueflag beach/UK seaside award/tourist area/facilities (subject to seasonality)	>50m and <200m from Blueflag beach/UK seaside award/tourist area/facilities within close proximity (200m) (subject to seasonality)	Within 200m - 500m of Blueflag beach/tourist area/facilities within proximity (none within 500m) (subject to seasonality)	>500m of Blueflag beach/UK seaside award/tourist area/facilities within proximity (none within 1000m) (subject to seasonality)
	Planning Applications	Within planning application area that is approved or pending consideration.	>50m and <200m of planning application area that is approved or pending consideration.	>200m and <500m of planning application area that is approved or pending consideration.	>500m of planning application area that is approved or pending consideration.
Commercial	Electrical export cable	n/a	Agreement for crossing of an electrical export cable (or OFTO AfL/Lease area) is likely to be required as landfall site coincides with another project's landfall (note: this classifies as red as not only the agreement for crossing is required, but also buy-in from TCE to grant us an OFTO AfL with such an overlap with another project's OFTO AfL)	Agreement for proximity to an electrical export cable (or OFTO AfL/Lease area) is likely to be required as landfall site is proximate another project's landfall	No proximity or crossing to an electrical export cable (or OFTO AfL/Lease area)
	Static fishing density	n/a	CEFAS IFCA sightings - static gear effort > 0.1	CEFAS IFCA sightings - static gear effort 0.026-0.1	CEFAS IFCA sightings - static gear effort < 0.025

Constraint	Category	Black	Red	Amber	Green
	Disturbance	Permanent disturbance/loss of use to homes or businesses.	Highly urbanised location likely to significantly impact/temporary close businesses and significantly impact local residents.	Some impact expected to nearby residential properties and/or businesses.	Rural location with little to no impact expected to any nearby properties and/or businesses.
	Voluntary agreement	Case for CPO cannot, on objective grounds, be justified given impact on private interests, special category land, and/or human rights	Case for CPO justified, but challenging considering significant impact on private interests, special category land, and/or human rights	Case for CPO likely to be justified, but problematic, considering impact on private interests, special category land, and/or human rights	Case for CPO likely to be justified and non-problematic, considering negligible impact on private interests, special category land, and/or human rights
	Utilities	n/a	Significant presence of utilities and pipelines with a significant impact expected to cable placement and landfall	Some utilities and pipelines present with some impact to cable placement and landfall	Few utilities present with very limited impact to cable placement and landfall
	Ownership	n/a	Inalienable land and Crown Land (excluding TCE) own the landfall site = land which cannot be CPO'd such as National Trust, Government Departments such as MoD etc.	Small landholdings likely to require multiple agreements to cover landfall site	Large landholdings likely to be within private ownership
	Access to landfall	n/a	Significant distance from nearest public highway (>3km) & wider	Long distance from suitable public highway (1km - 3km) with	Access to suitable public highway nearby (<1km) without significant upgrades

Constraint	Category	Black	Red	Amber	Green
			road network is extremely poor with significant upgrades needed with significant impact expected to landowners being able to conduct their business	significant upgrades to permanent/temporary tracks required along private land with minor impact to landowners conducting their & a limited number of temporary passing places likely on the wider road network	to permanent/temporary tracks required & little or no temporary passing places required on wider road network
	Public access	n/a	Popular seaside destination with lots of open public space which is highly likely to cause significant issues in the test for CPO	Site likely to be frequently accessed by public but minor impact expected to public areas	Infrequent or no public access to beach/landfall site with little impact to public access expected
	Development	n/a	Indicative development potential: Significant development potential	Indicative development potential: Minor development potential	Indicative development potential: land is highly unlikely to be developed in the foreseeable future
	Connection to Grid	n/a	Considerable onshore cable connection required to connect to grid	Reasonable length onshore cable connection required (>10km <60km) to connect to grid	Short onshore cable connection required (<10km) to connect to grid

Appendix B - Landfall BRAG Assessment

Table 7: Landfall BRAG assessment for sites A1 and A2.

Constraint		Zone A1	Zone A2
Technical Review	Cliff height Geology Distance to 10m Depth Contour Presence of sea defences HDD Drill Length Space for onshore compound (200 x 100m min) Space available for duct welding and stringing Beach Access Compound Access Length of intertidal	• Low cliffs (8m) for large area of section enabling possibilities for open cut solution; • Open field ranging several hundred meters back from cliff, enabling TJB for both HDD or open cut beyond the 25-year erosion line; • No sea defence installed, except a few minor concrete blocks on the beach; • Flexibility in area for positioning both compound and TJB; • Direct access to beach possible along existing track; • Average erosion is 0.62m/yr, compound would have to be at least 175m back from the cliff; • Compound located in agricultural field, access through Fraisthorpe along existing road (Suitability of the road (two sharp bends) requires assessment and the coastal bridge to be checked for weight restrictions). A TJB alternative access track (660m) could be achieved around buildings to the west and would avoid the coastal interface and bridge. Access can be built directly from A165 as an option to avoid Fraisthorpe if required. Access through Fraisthorpe will need to be checked; • OS intertidal is 150m wide; • Approximately 8km to the 10m depth contour offshore. 3km offshore is a disused spoil ground marked by a west cardinal buoy; • 1500m drill shot would go past the 5m depth contour; • No nearshore bathymetry is available to assess ability for vessels/barges to ground out for shore pull operations. Area is known for high boulder numbers on surface and until	• Low cliffs (6-8m) for large area of section enabling possibilities for open cut solution; • Sheet piling and open cut to be considered; • Open field ranging several hundred meters back from cliff, enabling TJB for both HDD or open cut beyond the 25-year erosion line; • No sea defences; • Some indication of weak/unstable cliffs due to farm drainage; • Flexibility in area for positioning both compound and TJB; • Direct access to beach possible along existing track; • Average erosion is 0.38m/yr, compound would have to be at least 170m back from the cliff; • Compound located in agricultural field, access through Fraisthorpe along existing road, additional track required (220m) off the road to access the compound. Access can be built directly from A165 as an option to avoid Fraisthorpe if required; • OS intertidal is approx. 200m; • Approximately 8km to 10m depth contour, offshore route will pass very close to west cardinal mark; • 1500m drill shot would go past the 5m depth contour; • No nearshore bathymetry is available to asses' ability for vessels/barges to ground out for shore pull operations; • Area is known for high boulder numbers on surface and until otherwise confirmed, it has been assumed that vessels/barges shall be afloat during operations;

Constraint		Zone A1	Zone A2
	Nearshore obstacles Shoreline Topology Nearshore seabed characteristics Geohazards (erosion)	otherwise confirmed, it has been assumed that vessels/barges shall be afloat during operations; • Based on 25-year erosion line, Closest Point of Approach (CPA) with a fully loaded barge (3m) by 2m draught and 1m UKC (under keel clearance), the safe point of installation at MLWS would be at an 800m minimum distance to TJB; and • Similar, the CPA for a fully loaded DP vessel (7m + 2m UKC) the safe point of installation at MLWS would be at a 1700 m minimum distance to TJB.	• Based on 25-year erosion line, Closest Point of Approach (CPA) with a fully loaded barge (3m) by 2m draught and 1m UKC (under keel clearance), the safe point of installation at MLWS would be at an 800m minimum distance to TJB; and • Similar, the CPA for a fully loaded DP vessel (7m + 2m UKC) the safe point of installation at MLWS would be at a 1700 m minimum distance to TJB.
Environmental Review	Nature conservation	• Around 4km from the A1 compound to the boundary of Flamborough Head SAC to the North and SPA to the South; • Sensitive bird area, RSPB vested interest (Flamborough Head), sensitive stakeholders; and • Within impact risk zone of Flamborough Head SSSI.	Outside of protected area boundary.

Constraint		Zone A1		Zone A2	
	Coastal Protection measures	Area defined as "no active intervention" in SMP.		Area defined as "no active intervention in SMP. *N.B. - Scattered remains of groynes and other shore parallel wooden revetment in various stages of degradation*	
	Surface water + floodplain	None identified		None identified	
	Proximity to residential area	Small number of residential properties to the immediate north (first property ~0.5km from proposed compound, additional properties ~0.8km from proposed compound) and a farmyard, Auburn farmhouse, and café to the south (~ 0.4km away).		Medieval village of Auburn located ~900m from proposed compound.	
	Historic Environment	• Medieval village of Auburn ~300m from proposed compound; • Listed Buildings (St Edmunds Church ~ 2km from proposed compound).		• Medieval village of Auburn located ~900m from proposed landfall compound; • Listed Buildings (St Edmunds Church and Manor Farmhouse located approximately 1.5km from proposed compound).	
	Cultural heritage	A1 landfall site is within Fraisthorpe beach where significant World War II anti-tank concrete cubes and defences are positioned in the sand, providing an interesting focal point for visitors & advertised as tourist attraction.		A2 landfall site is within ~50-200m of Fraisthorpe beach where significant World War II anti-tank concrete cubes and defences are positioned in the sand, providing an interesting focal point for visitors & advertised as tourist attraction.	
	Amenity and recreation	• A1 landfall site is within Fraisthorpe beach which won a UK Seaside Award in 2018 & has 557 reviews on Google as a tourist attraction; • "The Cowshed Teashop" (busy café) is located at Fraisthorpe Beach; • Large parking area North of the café; • Busy beach with many recreational activities: (dog-)walking, sailing, horse-riding; • The council advertises an "Active Coast" scheme to promote walking for health along the coast.		A2 landfall site is within ~50-200m of Fraisthorpe beach which won a UK Seaside Award in 2018 & is very popular with local residents and tourists (see notes in A1).	
	Planning Applications	Planning application area approximately 250m from A1 site.		No planning applications in proximity of site.	
Commercial Review	Electrical export cable	• Site A1 is very likely to require a crossing agreement with Dogger Bank Creyke Beck export cable route;		• Site A2 is very likely to require a crossing agreement with Dogger Bank Creyke Beck export cable route.	

Constraint		Zone A1		Zone A2	
	Static fishing density	• Static gear density <0.025.		• Static gear density <0.025;	
	Disturbance Voluntary agreement Utilities Ownership Access to landfall Public access Development Availability of laydown areas Connection to Grid	• Relatively unconstrained site. Fairly rural location with small number of residential properties to the immediate north and a farmyard, farmhouse and café to the south; • Recent onshore wind farm developed nearby. Utility services are set back a reasonable distance from the coast so it is assumed a solution for any difficult crossings should be fairly easy to achieve; • Utility searches suggest no material risk; • Potential challenges to access landfall site due to long distance from A165. Potential access to beach 160m south. No direct access to beach unless new temporary access constructed through 8m high cliffs		• Relatively unconstrained site. Rural location with farmyard, farmhouse and café to the north; • Recent onshore wind farm developed nearby. Utility services are set back a reasonable distance from the coast so it is assumed a solution for any difficult crossings should be fairly easy to achieve; • Utility searches suggest no material risk; • Access to single track lane approximately 500m to the west. To avoid a number of bends a private farm track could be upgraded in part to facilitate access; • Potential beach access 180m north and 250m south. No direct access to beach unless new temporary access constructed through cliffs.	

Table 8: Landfall BRAG assessment for sites A3 and A4.

Constraint		Zone A3	Zone A4
Technical Review	Cliff height Open Cut/HDD Possible Geology Distance to 10m Depth Contour Presence of sea defences HDD Drill Length Space for onshore compound (200 x 100m min) Space available for duct welding and stringing Beach Access Compound Access Length of intertidal Nearshore obstacles Shoreline Topology	• Low cliffs (6-8m) for large area of section enabling possibilities for open cut solution; • Sheet piling and open cut to be considered; • Some part of section, cliff is below 1m; • Open field ranging several hundred meters back from cliff, enabling TJB for open cut beyond the 25-year erosion line; • No sea defences; • Flexibility in area for positioning both compound and TJB; • Beach access at the same location as A1 and A2, approximately 1300m away; • Average erosion is 0.6m/yr, compound would have to be at least 190m back from the cliff; • Compound located in agricultural field, access through Fraisthorpe along existing road and track, additional track required (1000m) off the road to access the compound; • Access can be built directly from A165 as an option to avoid Fraisthorpe if required; • OS intertidal is approx. 180m; • Approximately 7900m to 10m depth contour; • 1500m drill shot would go past the 5m depth contour; • No nearshore bathymetry is available to assess ability for vessels/barges to ground out for shore pull operations. Area is known for high boulder numbers on surface and until otherwise confirmed, it has been assumed that vessels/barges shall be afloat during operations; • Based on 25-year erosion line, Closest Point of Approach (CPA) with a fully loaded barge (3m) by 2m draught and 1m	• Low cliffs (8-11m) for some area of section enabling possibilities for open cut solution; • Sheet piling and open cut to be considered; • Open field ranging back from cliff, enabling TJB for open cut beyond the 25-year erosion line; • No sea defences; • Flexibility in area for positioning both compound and TJB; • Beach access at same location as A1 and A2, approx. 1900m away, or access at caravan park at Barmston, access here would have to be checked as looks as though road has collapsed; • Average erosion is 1.3m a year, compound would need to be at least 215m back from cliff; • Compound located in agricultural field (several options), access track required (1000m) off the Bridlington road; • OS intertidal is 165m; • Approximately 7800m to 10m depth contour; • 1500m drill shot would go past 5m depth contour; • No nearshore bathymetry is available to assess ability for vessels/barges to ground out for shore pull operations. Area is known for high boulder numbers on surface and until otherwise confirmed, it has been assumed that vessels/barges shall be afloat during operations; • Based on 25-year erosion line, Closest Point of Approach (CPA) with a fully loaded barge (3m) by 2m draught and 1m UKC (under keel clearance), the safe point of installation at MLWS would be at an 800m minimum distance to TJB; and

Constraint		Zone A3	Zone A4
	Nearshore seabed characteristics Geohazards (erosion)	UKC (under keel clearance), the safe point of installation at MLWS would be at an 800m minimum distance to TJB; and • The CPA for a fully loaded DP vessel (7m + 2m UKC) the safe point of installation at MLWS would be at a 1700 m minimum distance to TJB.	• Similar, the CPA for a fully loaded DP vessel (7m + 2m UKC) the safe point of installation at MLWS would be at a 1700 m minimum distance to TJB.
Environmental Review	Nature conservation	Outside of protected area boundary.	Outside of protected area boundary.
	Coastal Protection measures	Area defined as "no active intervention in shoreline management plan.	Area defined as "no active intervention in shoreline management plan.
	Surface water + floodplain	None identified	None identified
	Proximity to residential area	• Settlement of Fraisthorpe is ~1.3km from proposed compound; and • Manor Farmhouse located ~1.5km from proposed compound.	• Fraisthorpe is ~1.5km from proposed compound; • Small cluster of properties ~1.0km from proposed compound; and • Manor Farmhouse located ~ 1.8km from proposed compound.
	Historic Environment	• Medieval village of Auburn ~900m from proposed compound; and • Listed Buildings (St Edmunds Church and Manor Farmhouse located ~1.5km from proposed compound).	• Listed Buildings (St Edmunds Church and Manor Farmhouse) located ~1.8km from proposed compound.
	Cultural heritage	A3 landfall site is within 200-500m of Fraisthorpe Beach, where significant World War II anti-tank concrete cubes and defences are positioned in the sand, providing an interesting focal point for visitors & advertised as tourist attraction.	• From drone footage & aerial photography, World War II assets are located ~500m from Northern boundary of A4 landfall site; and • Heritage site called Watermill Grounds is located within proposed compound area.
	Amenity and recreation	• A3 landfall site is within 200-500m of Fraisthorpe Beach which won a UK Seaside Award in 2018 & is very popular with locals and tourists (see notes in A1); and • Drone video shows many people walking along beach in A3 area.	None identified

Constraint		Zone A3		Zone A4	
	Planning Applications	No planning applications in proximity of site.		No planning applications in proximity of site.	
Commercial Review	Electrical export cable Static fishing density	• Site A3 is very likely to require a crossing agreement with Dogger Bank Creyke Beck export cable route; and • Static gear density <0.025.		• Site A4 is very likely to require a crossing agreement with Dogger Bank Creyke Beck export cable route- and • Static gear density <0.025.	
	Disturbance Voluntary agreement Utilities Ownership Access to landfall Public access Development Availability of laydown areas Connection to Grid	• Relatively unconstrained site. Rural location with no nearby residential properties or buildings; • Recent onshore wind farm developed nearby. Utility services but are set back a reasonable distance from the coast so it is assumed a solution to any difficult crossings should be fairly easy to achieve; • Utility searches suggest no material risk; • Access to single track lane approximately 1.1km distant. Zone dissected by The Earl's Dike making access across challenging; • Direct access to beach via new temporary access within zone potentially possible.		• Relatively unconstrained site. Rural location with no nearby residential properties or buildings; • Utility searches suggest no material risk; • Access to single track lane approximately 1.35km distant; • Beach access 130m south. No direct access to beach unless new temporary access constructed through cliffs.	

Table 9: Landfall BRAG assessment for sites A5 and B1.

Constraint		Zone A5	Zone B1
Technical Review	Cliff height Open Cut/HDD Possible Geology Distance to 10m Depth Contour Presence of sea defences HDD Drill Length Space for onshore compound (200 x 100m min) Space available for duct welding and stringing Beach Access Compound Access Length of intertidal Nearshore obstacles	• No cliffs/low cliffs of 4-11m in large parts of sections. A few dunes separating the beach from the marshland behind it; • Uncertainty on feasibility for access and workability in the marsh/wetland; • No sea defences; • Open-cut possible; • Potential beach access from caravan park at Barmston but this needs to be checked; • Average erosion is 1.055m, compound would have to be at least 180m back from cliff; • Compound access through village of Barmston to be assessed for construction traffic or direct access constructed from A165; • OS intertidal is approx. 130m; • Approximately 7600m to 10m depth contour, 1500m drill shot would go past 5m depth contour; • No nearshore bathymetry is available to assess ability for vessels/barges to ground out for shore pull operations. Area is known for high boulder numbers on surface and until otherwise confirmed, it has been assumed that vessels/barges shall be afloat during operations; • Based on 25-year erosion line, Closest Point of Approach (CPA) with a fully loaded barge (3m) by 2m draught and 1m UKC (under keel clearance), the safe point of installation at MLWS would be at an 800m minimum distance to TJB; and	• Variety in cliff heights. From approx. 5-13m height; • Open cut solution may be possible in few distinct locations; • Sheet piling and open cut to be considered where possible; • HDD is potentially possible at landfall location but that it requires further analysis of cable-pull lengths and the potential for de-rating of cables which is not considered in this assessment; • Open field ranging back from cliff, enabling TJB for both HDD or open cut beyond the 25-year erosion line; • No sea defences; • Flexibility in area for positioning both compound and TJB; • Some ground instability in cliffs observed due to excessive agricultural land draining; • Potential beach access from caravan park at Barmston, this will need to be checked, or from caravan park 1km to the south, again this needs to be checked; • Average erosion is 1.3m/yr, compound will have to be at least 190m from the cliff; • Compound access through village of Barmston, check suitability for construction traffic or direct access to be constructed from A165; • Outfall pipe in north of site which needs to be avoided; • OS intertidal is approx. 145m;

Constraint		Zone A5		Zone B1	
	Shoreline Topology Nearshore seabed characteristics Geohazards (erosion)	• Similar, the CPA for a fully loaded DP vessel (7m + 2m UKC) the safe point of installation at MLWS would be at a 1700 m minimum distance to TJB.		• Approximately 7400m to 10m depth contour; and • 1500m drill shot extends past 5m depth contour.	
Environmental Review	Nature conservation	This option is on the boundary of the SPA located approximately 0.5km away.		• Located within Greater Wash SPA; and • Located within SSSI impact risk zone.	
	Coastal Protection measures	Area defined as "no active intervention" in shoreline management plan.		Area defined as "no active intervention" in SMP *N.B. Rock dumping on headland to the north and south. Concrete encased outfall of Barmston Marsh Drain across the foreshore to low water and protected by rock dumping on upper foreshore.*	
	Surface water + floodplain	• None identified; • Three minor drains located 200-700m from proposed compound location.		Barmston Main Drain is within B1 site.	
	Proximity to residential area	• Proposed compound location is approximately 200-300m from caravan park, which is a tourist hot-spot; • Barmston Beach is located at the bottom of the caravan park (designated Bathing Beach, Rural Beach Seaside Award); and • Village of Barmston is in between sites A5 & B1 approximately 0.7km from proposed compound location.		• Proposed compound location is approximately 0.3km from village of Barmston and approximately 0.5km from caravan park which is a tourist hot-spot; • Barmston Beach is located at the bottom of the caravan park (designated Bathing Beach, Rural Beach Seaside Award); and • No residential properties to the South.	
	Historic Environment	6 Listed Buildings on road in to Barmston from A165 (approx. 0.75km in length)		6 Listed Buildings on road in to Barmston from A165 (~0.4km - 1.7km from site)	
	Cultural heritage	No cultural heritage identified		• No cultural heritage identified in close proximity; • Old Hall Farm/Moat is ~1.25km from proposed compound site.	
	Amenity and recreation	• Barmston Beach is approximately 200-500m from A5 site. This is a designated bathing beach and has won a rural beach seaside		• Barmston Beach is approximately 200-500m to the North of B1 site. This is a designated bathing beach and	

Constraint		Zone A5	Zone B1
		award. It is a tourist hot-spot given its proximity to the caravan park; • Barmston Beach caravan park overlooks the proposed compound works area.	has won a rural beach seaside award. It is a tourist hot-spot given its proximity to the caravan park; • Barmston Beach caravan park lies ~400m to the North of proposed compound location.
	Planning Applications	Planning reference: 13/02451/STPLF (Erection of 1 no. wind turbine (55m to hub and 84m to tip) and associated infrastructure) is pending consideration and lies approximately 700m from A5 site.	Planning application area above caravan park (unsure of status) approximately 600m from B1 site.
Commercial Review	Electrical export cable Static fishing density	• Site A5 is very likely to require a crossing agreement with Dogger Bank Creyke Beck export cable route; and • Static gear density <0.025.	• Site B1 would imply a significant overlap with Dogger Bank's OFTO AfL area; and • Static gear density <0.025.
	Disturbance Voluntary agreement Utilities Ownership Access to landfall Public access Development Availability of laydown areas Connection to Grid	• Relatively unconstrained site. Rural location with no nearby residential properties or buildings except for southern part which abuts a caravan park; • Utility searches suggest no material risk; • • Long distance from suitable public highway to avoid built up areas; and • Number of options for direct access onto beach.	• Constrained site due to Dogger Bank DCO corridor and EA outfall; • Fairly rural location; • Approximately 700m of new track to facilitate access required & B1242 approximately 2km distant; • Utility searches suggest no material risk; • Limited options for direct access onto beach with their own constraints.

Table 10: Landfall BRAG assessment for site B2.

Constraint		Zone B2	
Technical Review	Cliff height Open Cut/HDD Possible Geology Distance to 10m Depth Contour Presence of sea defences HDD Drill Length Space for onshore compound (200 x 100m min) Space available for duct welding and stringing Beach Access Compound Access Length of intertidal Nearshore obstacles Shoreline Topology Nearshore seabed characteristics Geohazards (erosion)	• Very high and unstable cliffs (10-12m). Not suitable for open cut, long HDD required; • HDD is potentially possible at landfall location but it requires further analysis of cable pull lengths and the potential for de-rating of cables which is not considered in this assessment; • The method of long HDD could be used to overcome both the coastal erosion problem and the unstable cliffs, which could represent a health and safety issue during construction; • Subject to type of installation vessel/barge, a total drilled length of between 730m – 1500m (depending on the specific erosion rate and cliff height at the chosen landfall) may be required to achieve the necessary depth where the cliffs are high. Although this drill length is technically feasible, the cable specification may not allow for this length; • Open field ranging back from cliff, enabling TJB for HDD beyond the 25-year erosion line; • No sea defences at this location; • Flexibility in area for positioning both compound and TJB; • Potential beach access from Skipsea Sands Holiday Park; • Average erosion is 2.005m/yr, compound would have to be at least 240m back from the cliff; • Compound would have to be located in north of site so onshore ECC could avoid Skipsea. Compound access would be through the village of Skipsea or a temporary road could be built directly from B1242; • OS intertidal is approx. 140m; • Approximately 1800m to 10m depth contour; • 1500m drill shot extends past 5m depth contour; • No nearshore bathymetry is available to assess ability for vessels/barges to ground out for shore pull operations. Area is known for high boulder numbers on surface and until otherwise confirmed, it has been assumed that vessels/barges shall be afloat during operations; • Based on 25-year erosion line, Closest Point of Approach (CPA) with a fully loaded barge (3m) by 2m draught and 1m UKC (under keel clearance), the safe point of installation at MLWS would be at a 730 m minimum distance to TJB; and • The CPA for a fully loaded DP vessel (7m + 2m UKC) the safe point of installation at MLWS would be at a 1300 m minimum distance to TJB.	
Environmental Review	Nature conservation	• Located within Greater Wash SPA, Withow Gap SSSI located approximately 400m away; • Skipsea Bail Mere SSSI is approximately 1.4km away inland; and • Within SSSI impact risk zone.	

Constraint		Zone B2	
	Coastal Protection measures	Area defined as "no active intervention" in shoreline management plan (SMP).	
	Surface water + floodplain	• None identified; and • Minor drains ~250m from B2 compound.	
	Proximity to residential area	• B2 landfall compound is ~0.5km from Skipsea Primary School; • Houses to the south in very close proximity to potential works (<0.3km from compound); • Caravan park to the North is ~0.7km away.	
	Historic Environment	None identified	
	Cultural heritage	No cultural heritage identified	
	Amenity and recreation	None identified	
	Planning Applications	Planning application area 14/02221/PLF is approximately 800m from B2 boundary.	
Commercial Review	Electrical export cable	• Site B2 is somewhat likely require a proximity agreement with the Dogger Bank export cable; • Static gear density 0.026-0.1.	
	Static fishing density		
	Disturbance	• Relatively unconstrained site. Fairly rural location with small number of residential properties near southern edge and caravan park on northern edge; • Approximately 770m distant from B1242 across agricultural land; • Utility searches suggest no material risk; • No direct access to beach unless new temporary access constructed through tall cliffs; • Landowners at this site include the Church Commissioners for England which could present a commercial challenge.	
	Voluntary agreement		
	Utilities		
	Ownership		
	Access to landfall		
	Public access		
	Development		
	Availability of laydown areas		
	Connection to Grid		