FOREWIND

DOGGER BANK
TEESSIDE A & B

March
2014

Environmental Statement Chapter 6 Appendix D Coastal Cable Corridor Assessment

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Cover photograph: indicative image showing installation of meteorological mast within the Dogger Bank Zone

Dogger Bank Teesside Projects

Coastal Cable Corridor Assessment

May 2012

Final Report

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1 INTRODUCTION

1.1 Background

1.1.1 Forewind Limited (Forewind) plans to connect up to 4GW of projects from the Dogger Bank Zone to the Teesside region (referred to as Dogger Bank Lackenby). Forewind has commissioned Royal Haskoning to undertake a study to identify environmental constraints to the selection of cable routes and the installation of cables for Dogger Bank Lackenby (see **Figure 1.1**). The work has been partitioned into three investigations;

a) Offshore - from the Dogger Bank Zone to the outer extent of the coastal study area.

b) Coastal - between MHWS and 20km from the shore.

c) Onshore - between MHWS and the onshore electrical connection point.

1.1.2 This report presents the findings of the coastal investigation and serves to identify and evaluate the environmental constraints (biological, human and physical) that could affect landfall within the defined cable route study area. The coastal study area is defined by the distance between mean high water springs (MHWS) out to approximately 20km from shore (see **Figure 1.1)**. The distance from shore was considered to represent a suitable distance within which constraints have the potential to influence landfall decision making.

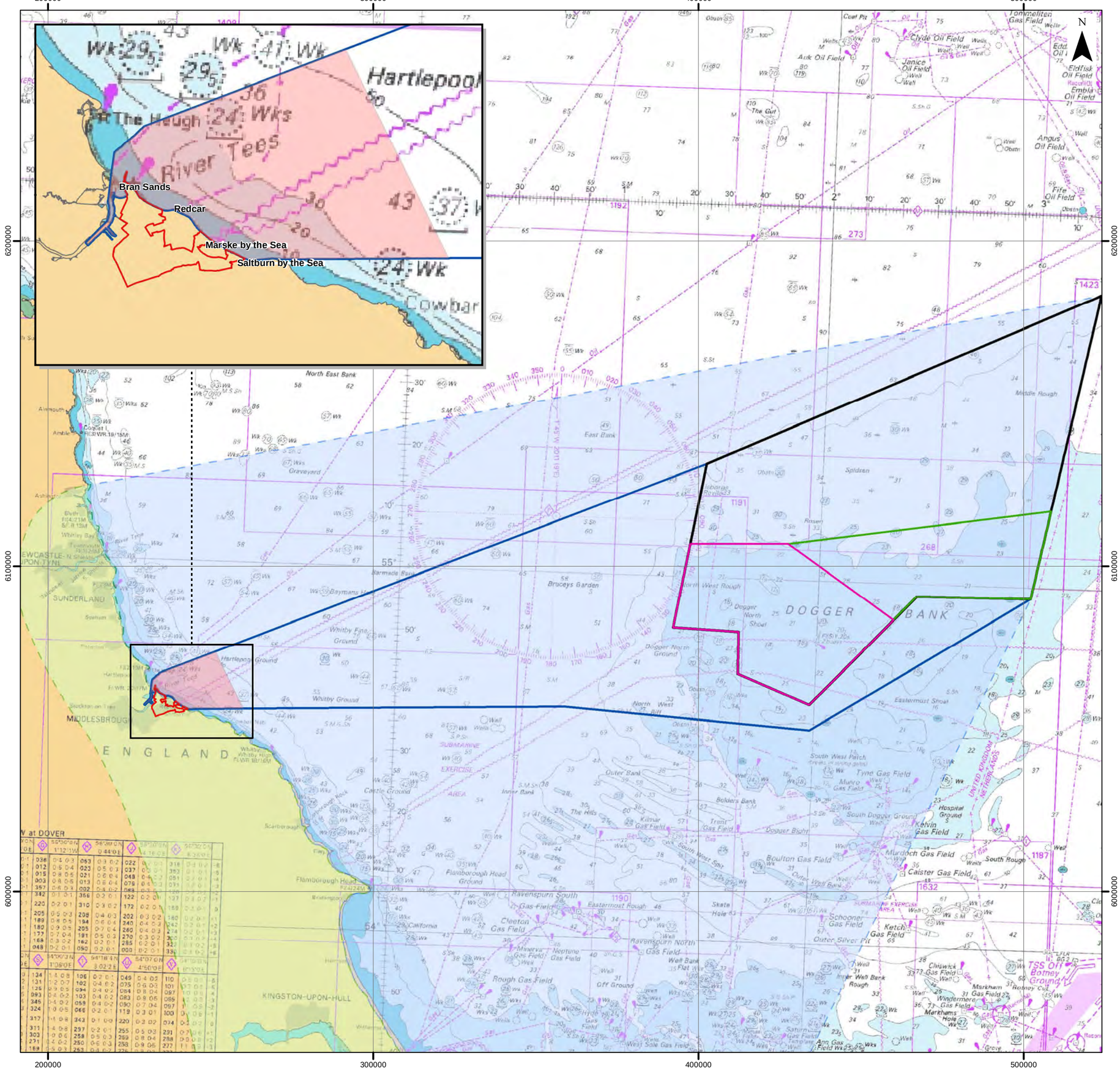
1.1.3 The study has investigated the environmental constraints that have the potential to influence landfall selection from a consenting perspective. This assessment aims to provide a number of options to Forewind for further consideration alongside the outputs from the offshore and onshore reports and other reports that will feed in to this process. It will also provide an indication of any potential issues that may arise within those options. This assessment will aid and/or provide:

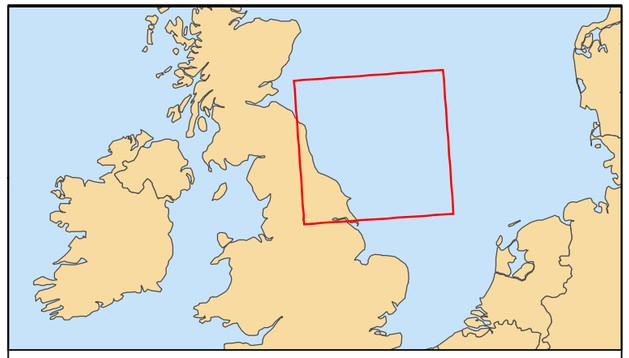
a) Cable landfall options appraisal;

b) Project planning (financial and consenting); and

c) Documentation of the decision making process for consultation purposes under The Planning Act, 2008.

1.1.4 It is understood that the 4GW of proposed capacity for Dogger Bank Lackenby could be represented by eight 500MW pairs of cables, or four 1GW pairs of cables, or a combination of 500MW and 1GW cables. Depending on the constraints identified, it could be that landfall is represented by a single location for all 4GW of cables, or a number of separate landfall locations.





LEGEND

- Dogger Bank Round 3 Zone
- Onshore Zone Development Envelope
- Offshore Zone Development Envelope
- Dogger Bank Zone Tranche A
- Dogger Bank Zone Tranche B
- Teesside Offshore Study Area
- Teesside Coastal Study Area
- Teesside Onshore Study Area

0 10 20 40
Kilometres

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PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure 1.1: Teesside Projects Overarching Cable Corridor Study Area

VER	DATE	REMARKS	Drawn	Checked	Approved
0	19/12/2011	Draft	GMC	PG	
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SCALE	1:1,154,500	PLOT SIZE	A3	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

1.2 Assessment Approach

1.2.1 This study has been informed through a desk-based data and information gathering exercise followed by mapping and interpretation through the use of GIS. The process followed for the assessment of landfall areas involved the following:

- Data acquisition from Forewind.
- Identification and acquisition of key information sources including:
  a) The North East Coast Shoreline Management Plan 2 - River Tyne to Flamborough Head (North East Coastal Authorities Group, 2007);
  b) The Teesside Offshore Wind Farm Environmental Statement (ES) (EDF Energy Ltd, 2004);
  c) The Breagh pipeline ES (RWE, 2010);
  d) The Northern Gateway Container Terminal ES (PD Teesport, 2006); and
  e) The Dogger Bank Zone Characterisation (ZoC) report (EMU, 2010 and 2011), undertaken as part of the Zone Appraisal and Planning (ZAP) process.
- GIS interrogation of the acquired data and production of draft GIS maps for initial assessment;
- Scoping of the areas to be assessed;
- Detailed investigation of the remaining areas;
- Ranking of the potential options and final conclusions.

1.2.2 The study does not provide detail on all of the environmental and human parameters known to occur within the study area (as this has been provided within the ZoC). It focuses on those parameters that are considered to represent a potential consenting constraint and which may influence route selection.

1.2.3 Environmental constraints include biological, human and physical considerations. The purpose of this document is to assess the implication (risk) of each constraint to the project i.e. increased consenting effort, increased consultation effort and technical and/or financial challenges during installation and operation.

1.2.4 It is important to note that the mapping of constraints, and conclusions drawn from them, is based on data available at the time of writing. Site specific surveys along a chosen export cable corridor will be undertaken where any of these existing datasets require further studies in order to adequately inform the Environmental Impact Assessment (EIA) and engineering design. One example is the British Geological Survey (BGS) seabed sediment data which, whilst suitable for informing such high level route

selection, will need to be augmented by site specific surveys to enable actual routing decisions to be made.

1.3 General Description of the Coastal Study Area

Overview

1.3.1 The study area extends from the western end of Bran Sands within the Tees Estuary to Saltburn by the Sea. The frontage is made up of a number of sandy bays divided by rock outcrops. There are a number of residential areas behind this stretch of coastline – Redcar, Marske by the Sea and Saltburn by the Sea (see **Figure 1.1**).

Physical description

1.3.2 The North East Shoreline Management Plan 2 (North East Coastal Authorities Group February, 2007) provides the most recent and useful description of the coastal study area.

1.3.3 The Tees Estuary has a breakwater to either side of the mouth of the estuary; the South Gare breakwater on the southern side of the estuary is a larger structure than at North Gare, but runs parallel to the main channel of the Tees and is built out over areas of deposited slag. Within the mouth of the Tees, to the south, is Bran Sands Bay.

1.3.4 To the east of the South Gare breakwater is the wide expanse of the Coatham dunes. This area is protected at its western end by the slag banks, known as the German Charlies. Where these banks are high, they draw out the foreshore and the general line of the dunes.

1.3.5 The Redcar seafront extends as a defended headland over a distance of some 1.5km. This headland is formed by the presence of outcropping rock to the foreshore, with the Coatham Rocks to the west and the Redcar Rocks to the east. Between these two outcrops is a deeper channel (the Luff Way) opening to the east.

1.3.6 The defences are predominantly concrete revetments backed by a low crest wall in areas, protecting the important coastal road, properties and commercial interests of the sea front town centre.

1.3.7 Although the coastal strategy for the area has demonstrated considerable risk of flooding due to wave overtopping of the main seafront defences, there is also a large residential area behind the open grassed strip, which is at potential risk from flooding.

1.3.8 Only at Marske by the Sea and at Saltburn by the Sea does development impinge on the coastal zone. While at a broad level this southerly section of coast seems quite uniform in plan shape, in reality its shape and local orientation is extremely varied, influenced by local wave climate, by small changes in beach level, and by variation in the materials of the coastal slope.

Ecological interests

Marine ecology - intertidal

1.3.9 The intertidal zone within the study area is dominated by barren littoral coarse sand on the lower shore. The sands are not known to support any species of conservation

concern. These habitats are typical of the region and the wider North Sea, and are often exposed to high levels of sediment disturbance. Barren sand (LS.LSa.MoSa.BarSa) for example, has a very low sensitivity to physical disturbance and very high recoverability (Budd, 2008a).

1.3.10 The sands at Coatham, Redcar and Marske by the Sea, support amphipods, isopods and polychaetes (Connor *et al*., 1997). Connor *et al*., (1997) also reported that species composition and abundance is generally low and sediment types are largely homogenous over the study area. Consequently, impacts on intertidal fauna where coarse sand is present within the footprint of the landfall works and vehicle access routes would not be anticipated to be significant and do not represent a constraint to consent.

1.3.11 The South Gare breakwater is surrounded by boulders colonised by algae *Enteromorpha sp., Porphyra sp.* and *Fucus serratus*. The Coatham Rocks are dominated by flat dense beds of mussels *Mytilus edulis* as well as red and green algal species. The kelp *Laminaria saccharina,* sparse filamentous red algae and common periwinkle *Littorina littorea* are present in rockpool areas. It is expected that Forewind would avoid the breakwater and, as such, it represents a hard constraint.

Marine ecology – Sublittoral

1.3.12 The inshore sublittoral environment of Tees Bay is predominantly sand with polychaetes, amphipods and bivalves recorded to a depth of 22m (Babtie, 1999). The mouth of the Tees Estuary and the area north of Redcar is mostly muddy sand and communities are less diverse than inshore sandy sites or offshore muddy gravel areas.

1.3.13 There are small areas of shelving bedrock, boulders and cobbles located at Longscar, in the northern part of Tees Bay and to the east of West Scar at Redcar. Silted bedrock and boulders are recorded with a sparse turf of hydroids and bryozoans as well as species such as dead-man's fingers *Alcyonium digitatum*, hydroids *Nemertesia antennina* and *Abietinaria abietina,* peacock worms *Sabella pavonina* and the bryozoan *Flustra folacea*. In samples taken to inform the studies supporting the Teesside Offshore Wind Farm ES (EDF Energy Ltd, 2004) the most numerically dominant taxa in the study area were the Annelida (mainly polychaetes), followed by Mollusca and Crustacea.

1.3.14 Site specific survey of the export cable corridor will be required to confirm whether or not sensitive habitats and species that represent a constraint to route selection are present.

Marine mammals

1.3.15 The North Sea is relatively poor in numbers of marine mammals and diversity of species. However, numbers in the coastal areas around Tees Bay are relatively higher than further south. Of four species recorded in the wider area (harbour porpoise *Phocoena phocoena*, white-beaked dolphin *Lagenorhynchus albirostris*, white-sided dolphin *Lagenorhyncus acutus* and minke whale *Balaenoptera acutorostrata*), only harbour porpoise occurs in the region with any frequency (Reid *et al*., 2003).

1.3.16 Two species of seal are commonly found in the North Sea: the grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina*. Grey seal are widespread throughout UK waters. Large breeding colonies exist to the south of Tees Bay at Donna Nook (south of

Grimsby, Lincolnshire) and northwards at the Farne Islands. Grey seal are regularly observed in the Tees Estuary but do not breed in the area. Harbour seal usually use sand banks and isolated estuarine shore to haul out of the water between foraging and during pupping. There is a colony of harbour seal that has been established in the mouth of the River Tees since 1994 (EDF Energy, 2004). Both grey and harbour seal haul out in an area known as Seal Sands on the northern bank of the Tees, which is outside of the study area.

1.3.17 While marine mammals are of interest to the overall EIA process, given their protected status; subject to further investigation and agreement with the relevant stakeholders, it is considered that they do not represent a constraint to the selection of cable routes.

Designated sites and sites of conservation importance

1.3.18 Designated sites and the habitats and species features they support are an important consenting consideration for development and as such this section includes relevant information on appropriate conventions and legislation related to marine nature conservation. It also provides a description of relevant designated sites in this area as determined from international, national and local legislation.

1.3.19 The sites of of greatest importance are shown on **Figure 1.2** and include:

- Teesmouth and Cleveland coast Special Protected Area (SPA);
- Teesmouth and Cleveland coast Ramsar site;
- South Gare and Coatham Sands Site of Special Scientific Interest (SSSI);
- Runswick Bay - recommended Marine Conservation Zone (rMCZ);
- North Yorkshire and Cleveland Heritage Coast;
- Potential Annex 1 sand habitat is located offshore across the study area; and
- UK BAP priority habitat (sand dunes). North Gare and Seaton Sands, South Gare and Coatham Sands.

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Teesmouth & Cleveland Coast SPA
Teesmouth & Cleveland Coast Ramsar
South Gare & Coatham Sands SSSI
Redcar
Saltburn-by-the-Sea
Middlesbrough
Runswick Bay rMCZ
North Yorkshire & Cleveland Heritage Coast
NORTH SEA
LEGEND
Teesside Offshore Study Area
Teesside Coastal Study Area
Recommended Marine Conservation Zone (rMCZ)
Site of Special Scientific Interest (SSSI)
Special Protected Area (SPA)
Ramsar Site
Heritage Coast
Potential Annex 1 Sand Habitat
Reef
Potential Reef
UK BAP Priority Habitat (Coastal Sand Dunes)
National Nature Reserve (NNR)
Local Nature Reserve (LNR)
Local Wildlife Site (LWS)
RSPB Reserves
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JNCC, Natural England, ERIC
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Kilometres
PROJECT TITLE
DOGGER BANK R3 DEVELOPMENT
Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment
DRAWING TITLE
Figure 1.2: Designated sites and areas of conservation interest

VER	DATE	REMARKS	Drawn	Checked	Approved
0	10/02/2012	Draft	GMC	PG	
1	07/03/2012	Final	LW	AP	

DRAWING NUMBER:
9W7904/TPCCCA/1.2/00

SCALE	PLOT SIZE	DATUM	PROJECTION
1:105,000	A3	WGS84	UTM31N

FOREWIND

The Teesmouth and Cleveland coast SPA and Ramsar site

1.3.20 The Teesmouth and Cleveland coast SPA and Ramsar site includes a range of coastal habitats on and around the Tees Estuary, which has been considerably modified by human activities. Together, these habitats provide feeding and roosting opportunities for important numbers of water birds in winter and during passage periods. In summer little tern *Sterna albifrons* breed on beaches within the site, while sandwich tern *Sterna sandvicensis* are abundant on passage.

1.3.21 This site qualifies under Article 4.1 of the Birds Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

- During the breeding season
    - Little tern *S. albifrons*, 37 pairs representing at least 1.5% of the breeding population in Great Britain (4 year mean 1993-1996).
- On passage
    - Sandwich tern *S. sandvicensis*, 2,190 individuals representing at least 5.2% of the population in Great Britain (5 year mean 1991-1995).

1.3.22 This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

- On passage
    - Ringed plover *Charadrius hiaticula*, 634 individuals representing at least 1.3% of the Europe/Northern Africa - wintering population (5 yr mean spring 91-95)
- Over winter
    - Knot *Calidris canutus*, 4,190 individuals representing at least 1.2% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean 1991/2 - 1995/6).
    - Redshank *Tringa totanus*, 1,648 individuals representing at least 1.1% of the wintering Eastern Atlantic - wintering population (5 year peak mean 87-91

1.3.23 The area also qualifies under Article 4.2 of the Directive (79/409/EEC) as a wetland of international importance by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports 21,406 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: sanderling *Calidris alba*, lapwing *Vanellus vanellus*, shelduck *Tadorna tadorna*, cormorant *Phalacrocorax carbo*, redshank *Tringa totanus* and knot *Calidris canutus*.

The South Gare and Coatham Sands SSSI

1.3.24 South Gare and Coatham Sands SSSI is of considerable interest for its flora, invertebrate fauna and birdlife. The range of habitats present includes extensive tracts of intertidal mud and sand, sand dunes, saltmarsh and freshwater marsh, which have all developed since the construction of the South Gare breakwater during the 1860s. Also exposed at low tide are areas of rocky foreshore along the breakwater, three slag banks known as the German Charlies, and Coatham Rocks.

1.3.25 Areas of mud and sand-flat on Bran Sands provide important winter feeding grounds for bar-tailed godwit *Limosa lapponica*, curlew *Numenius arquata*, redshank *Tringa totanus*, dunlin *Calidris alpina* and grey plover *Pluvialis squatarola*. Further intertidal areas along Coatham Sands support an internationally important population of sanderling (1200 birds, some 8% of the West European population). Both areas support ringed plover on passage migration (c. 150 birds). Knot feed along the intertidal areas, the breakwater and on the mussel beds of the German Charlies and Coatham Rocks with peak counts of 6000 birds (some 2% of the West European population). These latter areas also support turnstone (c. 180 birds), purple sandpiper and oystercatcher (English Nature, 1988).

1.3.26 NE has recently been imposing winter installation bans on cabling in the inshore and intertidal areas due to disturbance and displacement of species from these protected areas. This may therefore present a consenting constraint.

Runswick Bay Zone recommended Marine Conservation Zone (rMCZ)

1.3.27 National MCZ's are currently in draft and are scheduled to be designated at the end of 2012. This rMCZ extends out from the coast at Whitby. The area of this site that intersects the study area comprises high energy circalittoral rock and subtidal mixed sediments and supports the ocean quahog *Arctica islandica*. The rMCZ slightly overlaps the cable corridor area to the south. Current knowledge suggests that this does not present a significant constraint in the context of this assessment, although there is a risk that MCZ designation may result in additional mitigation or monitoring in relation to cable laying.

The North Yorkshire and Cleveland Heritage Coast

1.3.28 The site extends some 36km from Saltburn by the Sea down to Scarborough. Heritage Coasts are designated for the protection, enhancement and enjoyment of the coastline. Development is not precluded within a Heritage Coast Area, but would be anticipated to be more complex to consent (given the small overlap with the study area and available non-heritage coast frontage). If practicable, it would be advisable for the export cable corridor to avoid landfall along The North Yorkshire and Cleveland Heritage Coast.

Potential Annex 1 Sand Habitat

1.3.29 The potential Annex 1 sand habitat area extends along the whole of the coastline in the study area. Site surveys will need to confirm the presence or absence of Annex 1 habitat in this area.

UK BAP priority habitat (Sand Dunes)

1.3.30 The sand dunes located North Gare and Seaton Sands, South Gare and Coatham Sands are subject to UK BAP priority habitat status.

1.4 Scoped Out Areas

Forewind seeks to avoid developed areas along the coast, where more suitable alternative locations are available. On this basis, there are a number of areas that are recommended to be scoped out from further assessment. These are shown in **Figure 1.3** and labelled A to C. In removing these specific areas from further consideration, Forewind is taking account of, and avoiding, potential impacts on residential areas.

Area A

1.4.1 Scoped out due to its proximity to the residential area of Redcar, immediately adjacent to the coast. In addition, the coastline here is made up of intertidal and subtidal bedrock, which may present problems with cable burial and protection methods (with consenting implications). The length of shoreline that would be excluded is approximately 4km.

Area B

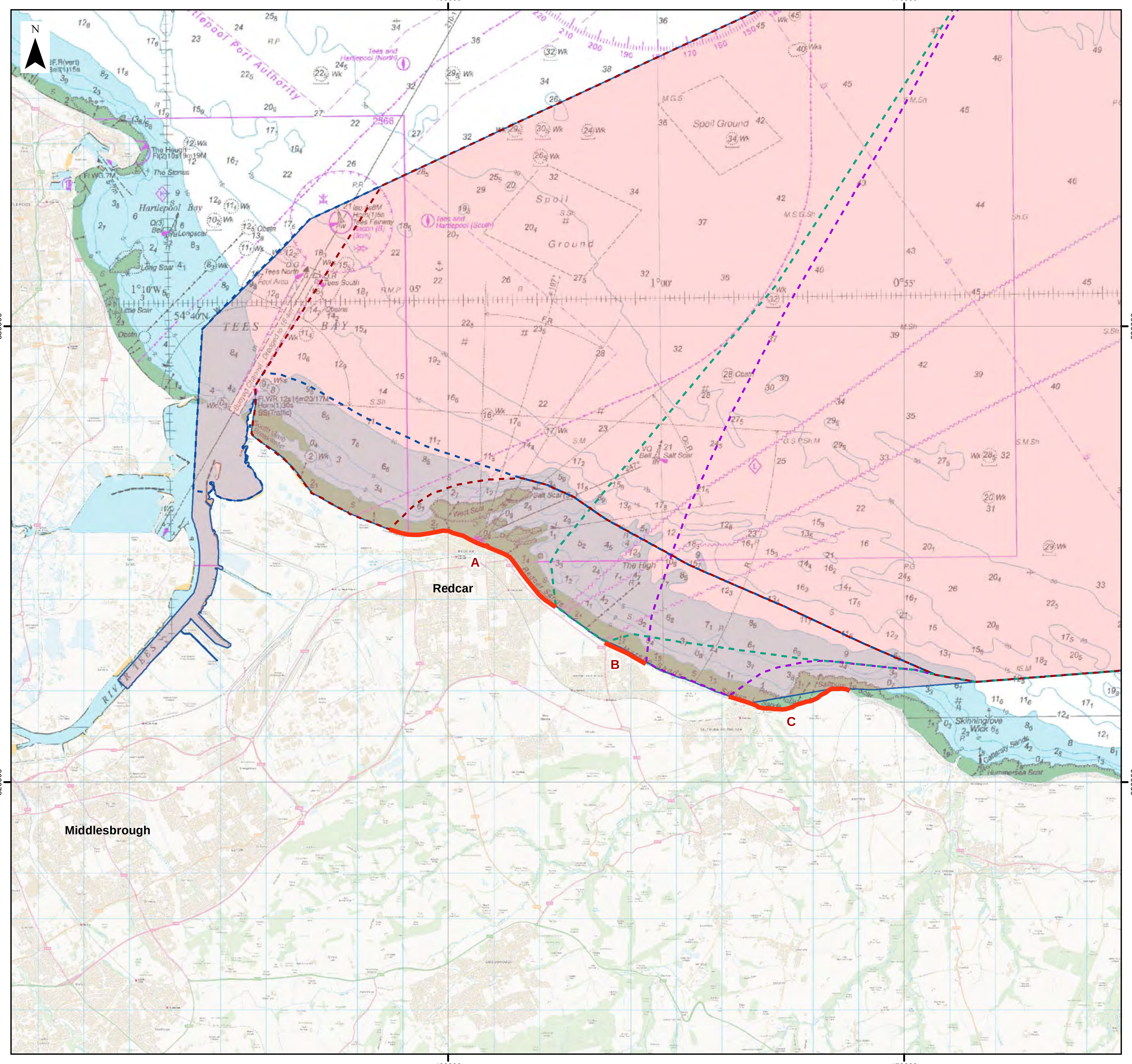
1.4.2 Scoped out due to its proximity to the residential area of Marske by the Sea. The length of shoreline that would be excluded is approximately 1km.

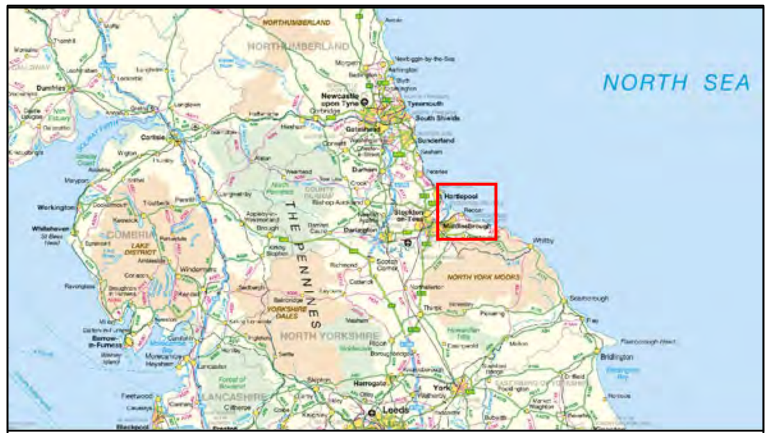
Area C

1.4.3 Scoped out due to its proximity to the residential area of Saltburn by the Sea, including greenfield sites and heritage coastline. The length of shoreline that would be excluded is approximately 1.5km.

1.5 Scoped in Areas

1.5.1 Four landfall option sites have been identified within the study area for further consideration (see **Figures 1.3** and **1.4)**. The environmental (biological, human and physical) considerations for each area are described and discussed below in relation to constraints for the cable route (see **Section 3**).





LEGEND

- Scoped Out Areas
- Teesside Offshore Study Area
- Teesside Coastal Study Area
- Nearshore Landfall Option 1
- Nearshore Landfall Option 2
- Nearshore Landfall Option 3
- Nearshore Landfall Option 4

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Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure 1.3: Scoped Out Areas A, B and C, and Potential Landfall Areas 1-4

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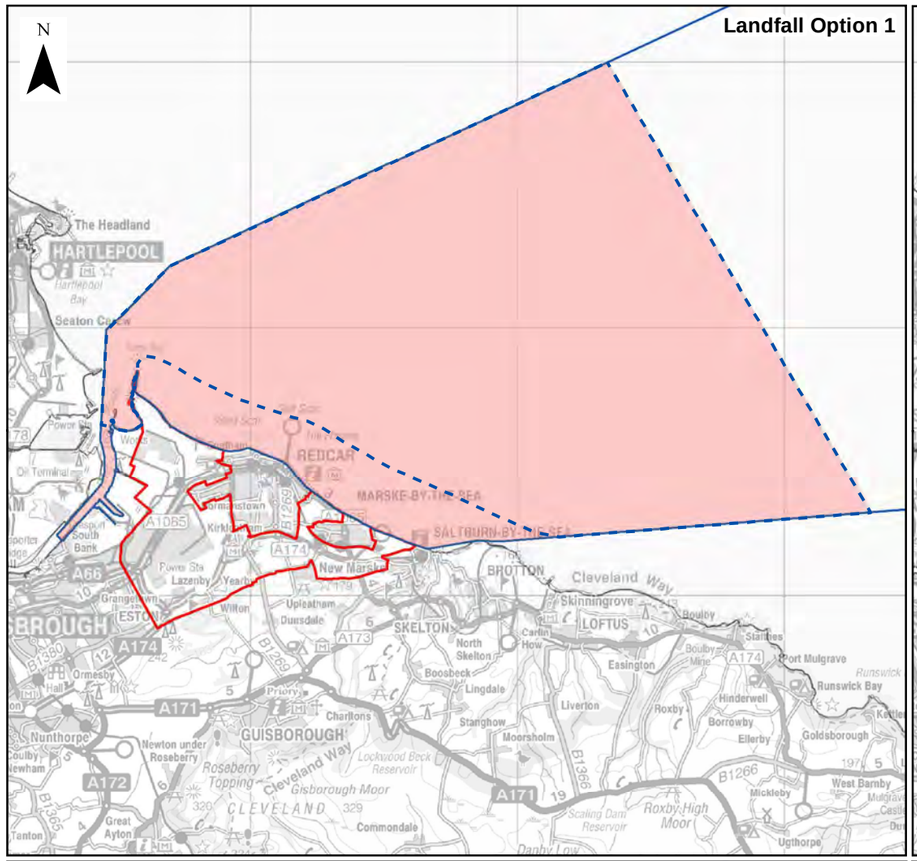

LEGEND

- Teesside Offshore Study Area
- Teesside Coastal Study Area
- Teesside Onshore Study Area
- Nearshore Landfall Option 1
- Nearshore Landfall Option 2
- Nearshore Landfall Option 3
- Nearshore Landfall Option 4

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Kilometres

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Figure 1.4: Landfall Options 1 - 4

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1:230,000	A3	WGS84	UTM31N

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2 MAPPING OF DEVELOPMENT CONSIDERATIONS

2.1.1 In order to inform the assessment of each of the four landfall sites within the study area for environmental constraints, information from a number of sources was used to develop a series of GIS maps (see **Table 2.1)**. The resulting nine maps are presented in **Appendix A** – **Figures A1 to A9**. Each map describes specific information for each of the four proposed landfall areas and all were considered during the assessment.

Table 2.1 Data sources

Data Source	Detail
British Geological Society (BGS)	Seabed sediments
Centre for Environment, Fisheries and Aquaculture Science (Cefas)	Fish spawning activity, disposal grounds
Breagh pipeline ES	Pipeline route information
EMU	Information from Zone Characterisation
English Heritage and Cleveland and Redcar Council and Tees Archaeology	Archaeology
Joint Nature Conservation Committee (JNCC)	Designated sites
KIS-CA	Offshore cables
Natural England	Designated sites
UK Hydrographic Office	MoD PEXA's
Forewind and fishery liaison agents	Fishing grounds
RPS	Geological interpretation
SeaZone	Bathymetry, seabed features
Teesside Offshore Wind Farm ES	Wind Farm licensing constraints
The Crown Estate	Wind Farm lease areas
UK Deal	Oil & Gas infrastructure
British Geological Society (BGS)	Seabed sediments

3 ASSESSMENT OF DEVELOPMENT CONSIDERATIONS

3.1.1 Based on the desk study and GIS mapping exercise, four broad potential landfall areas along the coast have been identified within the study area (**Figure 1.3** and **Figure 1.4**). The boundaries of the landfall areas as they extend out to the edge of the coastal study area are arbitrary and as wide as possible to enable the maximum opportunity for cable routing.

3.1.2 Each of the four potential landfall areas contains certain environmental (biological, human, and physical) constraints. The maps contained in **Appendix A** detail the constraints that have been identified that will need to be considered. **Table 3.1** provides an overview of the development considerations that fall within each of the areas identified. Each landfall area is then described and discussed in more detail (**Sections 3.2** to **3.5**) and the areas are then compared with respect to the risk associated with each constraint (**Table 3.4**). All four areas are then ranked with respect to the level of risk associated with each constraint based on current knowledge and understanding (**Tables 4.1** and **4.2**).

Table 3.1 Overview of development considerations

Development Consideration	Landfall Area 1	Landfall Area 2	Landfall Area 3	Landfall Area 4
General Environmental Considerations				
Bedrock		x		
Potential for coastal erosion	x	x	x	x
Sand dunes			x	x
Fish spawning grounds	x	x	x	x
Fish nursery grounds	x	x	x	x
Human Considerations				
Offshore wind farms	x	x		
Existing/consented/planned pipelines	x	x	x	x
Subsea cables (planned and active)	x	x	x	x
Subsea cables (out of service)	x	x	x	x
Military exercise areas				
Historic munitions ground				
Wrecks and obstructions	x	x	x	x
Known archaeology				
Navigation (including anchoring)	x	x		
Navigational dredging	x			

Development Consideration	Landfall Area 1	Landfall Area 2	Landfall Area 3	Landfall Area 4
Sewage outfalls		x	x	
Disposal ground	x	x		
Static gear fishing ground	x	x	x	x
Other man-made obstructions	x		x	
Tourism and recreation+				x
Designated Sites & Features				
Natura 2000 Sites (SPA, SAC)	x	x		
Potential Annex I Habitat*	x	x	x	x
SSSI	x	x		
Draft MCZs	x	x	x	x
Heritage Coast				x
Designated bathing water			x	
UK BAP Sand dunes			x	x

* Features identified by the JNCC that may represent Annex I Habitat as defined under the Habitats Directive.
+ denotes the area is popular for tourism and recreation

3.2 Landfall Area 1

3.2.1 Landfall Area 1 (LA1) lies within the Tees Estuary and extends from the western end of Bran Sands, beyond Buzzer House, to the lighthouse at South Gare (see **Figure 1.4**). The landfall boundaries for this area are defined due to:

- The western end of this area is at the edge of the study area; and
- The northern end of the area is at a dividing point between the Tees Estuary and the wider Tees Bay area. Both environmental and human considerations change at this dividing point.

Physical Description of LA1

3.2.2 Prior to the mid-19th century, the Tees Estuary was wide and shallow and bordered by extensive wetlands. The Estuary had tidal ingress for about 44km from the mouth. Since this time, the Estuary has undergone substantial anthropogenic changes as the channel was trained, land was reclaimed and the channel deepened to its present depth (PD Teesport, 2006).

3.2.3 Historical charts suggest that the natural channel level at the mouth of the Tees Estuary is around -10m Ordnance Datum Newlyn (OD (N)) (7.15m below Chart Datum (CD)).

As a result of training works and deepening by dredging, the current depth at the mouth is about double this natural level. Dredging and training works have occurred since the establishment of the first dredged channel of -4.3m CD from Middlesbrough Docks to the sea which occurred in 1853 (NECAG, 2007).

3.2.4 The Tees Estuary is flood dominant and enclosed by spits on both banks, extended by the North and South Gare breakwater structures. The coast on either side of the estuary mouth is composed of sandy beaches backed by dunes. Inside the breakwaters is an embayed area dominated by sandy sediments. The Estuary is likely to be a sink for sediments, with coarser sediments transported in via longshore drift liable to be deposited in and around the mouth area in the lea of the breakwater structures with finer sediments likely to be deposited further upstream (ABPmer, 2006).

3.3 Landfall Area 2

3.3.1 Landfall Area 2 (LA2) extends from South Gare point along Coatham Sands to the outskirts of Coatham itself, halting on the coast in order to avoid the subtidal rocks known as West Scar (see **Figure 1.4**) The boundaries are therefore defined due to:

- The northern boundary abuts the boundary of LA1; and
- The eastern boundary borders a large area of subtidal and intertidal rocks as well as the town of Redcar.

Physical Description of LA2

3.3.2 This stretch of coast is undefended and comprises a 300m wide sand beach (Coatham Sands) backed by low sand dunes forming links (British Geological Survey, 1998a). The hinterland comprises a low-lying land-claimed coastal plain (Coatham Marsh) in the mouth of the Tees Estuary, until further south-east towards Redcar. The South Gare Breakwater in the north-west and Coatham Rocks in the south-east hold the beach in place. In addition, three nearshore slag banks at low water, east of South Gare Breakwater, known as the German Charlies, provide further shelter to the coast. The crenulated nature of the bay indicates that the beach plan shape is likely to be tending towards an equilibrium form. Sediment is likely to be supplied to the beach from the dunes and from sources offshore in Tees Bay. Indeed, Motyka (1986) and Motyka and Beven (1986) suggested that very little beach sediment moves south out of Hartlepool Bay and Tees Bay, both tending to act as sediment traps (NECAG, 2007). Within this area is the cable landfall of the Teesside Offshore Wind Farm (see **Figure 3.1**) and an overview of the measures taken by EDF Energy Ltd in order to gain consent to make a landfall within a designated area is given in **Table 3.2**. A summary of the FEPA licence conditions is given in **Table 3.3**.

Figure 3.1 Teesside Offshore Wind Farm Overview

Source: EDF Energy (Northern Offshore Wind) Ltd (2004)

Table 3.2 Summary of measures undertaken by EDF Energy Ltd in order to reduce potential impacts on the nature conservation designations below MHWS

Potential Impact	Incorporated mitigation/offsetting/enhancement measure	Extent to which impact mitigated	Monitoring requirements
Damage to dune habitat	Directional drilling employed through the dunes within the SSSI and across deposited slag.	Substantially	None
Disturbance to nesting birds onshore	Potential impact reduced by using directional drilling under the dunes and across deposited slag to install cables.	Substantially	None
Disturbance to nesting little tern	Potential disturbance avoided through commitment not to undertake any construction activity within 500m of any active little tern nest.	Fully	None
Disturbance to breeding terrestrial birds	Construction scheduling of the terrestrial component of the grid connection cabling avoided commencement between April and	Fully	None

Potential Impact	Incorporated mitigation/offsetting/enhancement measure	Extent to which impact mitigated	Monitoring requirements
	June		

Table 3.3 Summary of FEPA Conditions from the Teesside Offshore Wind Farm (See **Appendix 2** for full wording**)**

Restriction	FEPA Wording
Damage to SSSI	No equipment or plant will be stored within the SSSI boundary and access routes/schedules within the SSSI will be agreed with Natural England in advance
Cable Installation	Export and intra-array cable laying plan to be approved at least four months prior to construction. Jetting of cables restricted, unless pre-authorised. If authorised, suspended monitoring of sediment plumes is required
Disturbance to nesting little terns	Potential disturbance avoided through commitment not to undertake any construction activity within 500m of any active little tern nest.
Disturbance to breeding terrestrial birds	Schedule construction of the terrestrial component of the grid connection cabling where practical to avoid commencing the works during the period of April to June

3.4 Landfall Area 3

3.4.1 Landfall Area 3 (LA3) extends from Red Howles (just south of Redcar) to Bydale Howle on Marske Sands (just north of Marske by the Sea) (see **Figure 1.4**). The boundaries of LA3 are defined by:

- The western boundary, beginning where the built up area of Redcar finishes above MHWS and also the intertidal and subtidal rock is no longer present; and
- The eastern boundary, located where the built up area of Marske by the Sea begins above MHWS.

Physical Description of LA3

3.4.2 The coastline fronting the Redcar headland comprises a sand beach (Redcar Sands) backed by a sea wall and revetment. Behind the sea wall is a variable width land-claimed sand dune, fronting till. Seaward of the beach is a well-defined rock shore platform (Coatham and Redcar Rocks) composed of Redcar Mudstone Formation (BGS, 1998a), which controls the position of the headland. The beach appears to be fairly volatile and sensitive to wave conditions with loss over short periods followed by recovery over periods of a few years (Babtie 1997). For example, substantial amounts of sand were lost from this beach during storms in 1995/1996 followed by recovery in 1997. Longshore sediment transport around the headland is to the south. However, large volumes of sediment could potentially be moved north under easterly storm conditions such as those in winter 1995/96. The mean high water and mean low water

marks have suffered long-term (1858-1990) erosion of 0.3m/yr and 0.17m/yr, respectively (Babtie, 1999). It is possible that the long-term lowering of Redcar Sands is related to sediment trapping in Tees Bay by North and South Gare Breakwaters.

3.4.3 Redcar headland is a fixed hard point containing a sea wall and a wide rock shore platform. The presence of a sandy beach fronting the shoreline here indicates that this headland is not a longshore sediment transport barrier and there is connectivity between the beaches to its west (Coatham Sands) and east (Marske Sands).

3.4.4 Beach elevation data for the central part of Redcar Sands for December 2004 shows the upper 130m of the beach at the western side slopes gradually seaward from an elevation of 3.4m OD, at the base of the sea wall, to around 0.9m OD at a distance of 130m. The eastern side, closer to Redcar Rocks, slopes from 1.8m OD to -0.7m OD. The data shows a lowering (and likely thinning) of the beach in an easterly direction towards the exposure of shore platform, which is at an average elevation of around 0.7m OD (NECAG, 2007).

3.5 Landfall Area 4

3.5.1 Landfall Area 4 (LA4) extends from Marske by the Sea just north of Hunnies Howle to just north of Saltburn at Agar's Gap (see **Figure 1.4**). The boundaries are defined as follows:

- The western boundary begins on the edge of the built up area of Marske by the Sea; and
- The eastern boundary ends where the settlement of Saltburn by the Sea begins.

Physical Description of LA4

3.5.2 This stretch of coast comprises a wide (300-400m) sand beach (Marske/Saltburn Sands) held in place by Saltburn Scar (Redcar Mudstone Formation headland) to the east. Along the western end, the beach is backed by a rock revetment built on to the face of a narrow strip of sand dune fronting a till hinterland (BGS 1998a). Here the beach is controlled by groynes, which were nourished with 70m^3 of sand and shingle per metre of frontage between 1973 and 1983. The eastern half is mainly undefended and the beach is backed by a narrow strip of dunes in front of till slopes, apart from a stretch of sea wall in front of Saltburn by the Sea at the eastern extremity. Prior to the defences being built, the dunes and till cliffs appear to have been eroding at a fairly constant rate to form a gently curving bay between Redcar Rocks and Saltburn Scar.

3.5.3 The dunes are in poor health and are actively eroding, forming a 'veneer' in front of the till hinterland. In places the dunes are absent and till is exposed at the coast. In front of the till, the beach is composite with pebbles forming an upper storm beach with a wide sandy lower beach, indicate that the pebbles are supplied locally through erosion of the till. In front of the dunes, the upper pebble beach breaks down and there are patches of shingle sometimes shaped into cusps on the beach surface, which is mainly sand.

3.5.4 Net longshore sediment transport is to the east (Babtie 1997, 1999). Numerical modelling suggests that the potential to transport sediment increases gradually from

Coatham Sands, across Coatham/Redcar Rocks to Marske Sands. This is probably due to a subtle change in orientation of the coast relative to the predominant wave direction. These values suggest that more sediment is being lost from Marske/Saltburn Sands than is being delivered from the west, around Redcar headland. The small amount of sediment build-up on the west side of the Redcar groynes indicates that actual longshore sediment transport is low in this area. In addition, the presence of Saltburn Scar does not allow much loss of sediment to the east. Over the long-term (1858-1990), the mean high water mark has consistently retreated (0.04-0.74m/yr, with the highest values in the west). The mean low water mark has also retreated in most areas (0.15-0.8m/yr) but with local accretion at Marske by the Sea (0.01m/yr). Overall, the erosion rate for undefended land has been estimated (Babtie, 1999) to be around 0.4m/yr with localised rates of 0.6-0.7m/yr closer to Redcar (NECAG, 2007).

3.6 Landfall Areas Environmental Constraints and Risks

3.6.1 **Table 3.4** compares all potential landfall areas against the development constraints (see **Table 3.1**) and assesses the risks associated with each one.

3.6.2 Constraints and risks common to all landfall areas are identified first followed by a comparison of risks for all sites against other environmental (biological, human and physical) constraints.

Table 3.4: All Landfall Areas Constraints and Risks

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
Potential Annex 1 Sand Habitat (Figure A1)	Stretches across entire coastal study area and must be considered as a potential consenting constraint. However, site investigation will be needed to confirm the presence/absence of Annex 1 habitat and determine consenting requirements.			
Commercial Fish Stocks (Figures A7-8) All four areas may be used as nursery areas for a number of commercial fish species, namely cod, herring and whiting. Static gear sited offshore in LA2 and more intense fishery to the south.	Any overlap of the proposed cable route with static fishing gear may result in increased consenting effort, with potential concerns anticipated (based on the experience at Breagh) to be associated with timing of construction works and potential indirect impacts on targets species and their habitats, which may require specific further investigation.			
Royal Yachting Association sailing areas (Figure A3) All four of the areas identified below are used by the RYA as sailing areas.	There may be local opposition from sailing enthusiasts and RYA on safety concerns during construction.			
World War II (WWII) relics (Figure A5) Within the Teesside Offshore Wind Farm ES (EDF Energy Ltd, 2004), it was noted that the Defence of Britain Project had recorded numerous items related to anti-invasion defences along Coatham Sands (within LA2), most dating	Consideration of the possibility of WWI or WWII relics being present along these frontages will be required in the EIA.			

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
from WWII but some from World War I (WWI). Most of the structures have now been removed or destroyed.				
Coastal Erosion The coastline can experience rapid draw down during storms (EDF Energy Ltd, 2004).	There may be stakeholder concerns about increased erosion due to cabling activity which will need to be addressed.			
Marine Fauna A harbour seal colony is established on Seal Sands, which is on the opposite bank of the Tees to area LA1.	The proximity of this area to the seal colony at Seal Sands may require mitigation and monitoring during cable installation. Seasonal and tidal restrictions may be imposed.	None	None	None
Teesmouth and Cleveland coast SPA (Figure A1) This site qualifies under Article 4.1 of the Birds Directive (79/409/EEC) noted for the presence of breeding overwintering on passage protected birds species.	Interference/disturbance of bird breeding and nesting sites caused by the construction phase will concern Natural England and other stakeholders and is likely to result in monitoring and mitigation conditions. However, the Teesside Offshore Wind	As LA1	None	None

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
	Farm gained consent including bringing the cable ashore within the SPA, Ramsar and SSSI within LA2. The measures required in order to gain consent are contained within the Teesside Offshore Wind Farm ES (EDF Energy Ltd 2004) (see **Tables 3.2** and **3.3**). There is a risk that consents may not be given again despite the precedent set.			
Teesmouth and Cleveland coast Ramsar site (Figure A1) The area qualifies under Article 4.2 of the Directive (79/409/EEC) as a wetland of international importance by regularly supporting at least 20,000 waterfowl.	As above	As above	None	None
South Gare and Coatham Sands SSSI (Unit 2) (Figure A1) An area of considerable interest for its flora, invertebrate fauna and birdlife.	As above	As above	None	None

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
Recommended Marine Conservation Zone (Figure A1) Runswick Bay rMCZ lies in the south-eastern most extent of the study area**.**	Additional mitigation and monitoring may be required as a result of MCZ designation, however this is deemed a low risk given the small overlap with the south-eastern corner of the study area.	As LA1	As LA1	As LA1
UK BAP priority habitat (sand dunes) (Figure A1) The sand dunes located in LA3 (North Gare and Seaton Sands, South Gare and Coatham Sands).	None	None	Development will not be permitted if it adversely affects the site unless it can be demonstrated that there are overriding reasons for the development and that it cannot be located elsewhere. Where development is permitted, conditions and planning obligations to keep damage to a minimum are likely.	As LA3
Heritage Coast (Figure A1) The North Yorkshire and Cleveland Heritage Coast extends from Saltburn by the Sea down to Scarborough.	None	None	None	Within the management plan for this feature it is noted that future renewable energy development with the potential to impact on the

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
				Heritage Coast will need to take its importance and value into consideration (NYCCF, 2008).
Infrastructure (Cables, Pipelines, Wind Farms) (Figure A2) ➢ Teesside Offshore Wind Farm sited 1.5km off Coatham Sands and cable landfall. ➢ CATS gas pipeline (Everest to Teesside trunkline) operated by BP, has landfall to the south of the Teesside cable landfall. ➢ Three pipelines being constructed by RWE as part of the Breagh gas field project. ➢ Progressive Energy are in the planning stage for a Carbon Capture and Storage (CCS) pipeline passing to the north of the CATS pipeline, with landfall between this and the	To avoid the Teesside Offshore Wind Farm cable and other existing infrastructure, an approach from the northern most edge of LA1 would be the only option.	Only the Teesside Offshore Wind Farm and cable just 1.5km offshore will physically constrain the potential for this site but may prove to be a regulatory barrier especially given the number of cable crossings that will be required if routed through the wind farm. The buffer zone around both the wind farm cable and the pipelines may result in associated concerns/objections being raised by the operators that the cable route should avoid the buffer zones.	The presence of the CANTAT 3 cable and the Breagh gas pipeline will result in similar concerns as noted under LA2.	There are no other cables or pipelines making landfall in this area, although some would need to be crossed in the approach.

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
Teesside Offshore Wind Farm export cables. ➢ Three telecommunications cables sited between (Redcar and Marske) only one is in service (CANTAT 3).		The built and proposed infrastructure severely reduces the available landfall area within LA2.		
Other Infrastructure Potential construction of gas fired power station (Tees Refining Ltd) at Bran Sands with harbour facilities.	Low risk at present until further information is available on the potential power station development.	None	None	None
Sewage Outfall (Figure A2) There is a sewage outfall pipe located within LA2 at its western end and in LA3.	None	Any cable route passing through or near to an operating sewage outfall would need to undertake sediment sampling and analysis. Regulatory constraints in the form of mitigation measures and/or monitoring may result. The sewage outfall present would need further investigation as to whether it is in use or not. If still in use this may limit the proximity of any cable route.	As LA2	None

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
Wrecks and obstructions (Figure A5) There are numerous charted wreck sites in and around the mouth of the Tees Estuary (relevant to LA1 and LA2) and in the wider coastal study area but further offshore. No protected wrecks are identified in the study area.	Potential construction constraint: may need to microsite the cable route to avoid wrecks following pre-construction survey and archaeological appraisal.	As LA1	Charted wrecks are further offshore where it will be easier to route around wrecks.	As LA3
Navigation (including anchoring) and Navigational Dredging (Figure A3) Numerous commercial and recreational vessel movements associated with the Tees Estuary and passing along the dredged channel. Navigational marker buoys present within LA1. There is a large anchoring ground that lies between the channel, the wind farm and the pipelines. On-going maintenance dredging activity in the estuary. Active from just inside the mouth of the Tees on the southern side out to approximately 4km offshore in a	The Teesside Port Authority (TPA) may object to any cable route that followed or was in close proximity to the approach channel into the estuary, for reasons of navigational safety, snagging by dredgers, and restrictions to future channel deepening. Any cable route crossing through the anchoring grounds is likely to receive objection from the TPA due to safety concerns.	The TPA may object to crossing the anchoring grounds and navigational safety due to the high level shipping routes in LA2 from the TPA.	None	None

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
north-easterly direction with a channel width of 250m.				
Disposal ground (Figure A2) There are two active disposal grounds in the northern extent of LA1 also in LA2.	Existing pipelines in the vicinity clearly avoid these grounds. Further consultation is advised, in order to establish whether the disposal grounds should be classed as hard constraints. For the purposes of initial route selection, it is recommended that avoidance is the best option. Sediment samples would need to be taken and analysed to ensure that any potential for re-suspension of contaminated sediments during trenching activities is fully assessed.	As LA1	None	None
Other man-made obstructions, tourism and recreation (Figures A3, A6) There is a slipway present and a small harbour area along the shoreline of LA1.	There may be concerns that the use of these facilities may be interrupted, curtailed or stopped altogether. Representations from users	None	The Environment Agency (EA) may seek reassurance that bathing waters will not be affected. Regulatory conditions and monitoring	Potential disruption to areas of importance for tourism and recreation may result in seasonal restriction requests. However, the popularity

Environmental Constraint	LA 1	LA2	LA3	LA4
	RISK TO CONSENT			
A Royal Yachting Association (RYA) sailing club is also located within LA1. The area within and adjacent to LA1 is also recognised as a RYA racing area. **Designated Bathing Waters** Two monitoring sites found in LA3, and Saltburn by Sea is a popular beach (LA4).	can be expected.		may be required.	and importance of the stretch of coast for tourism and surfing may mean that lengthy disruption to near-shore and intertidal areas result in heightened concerns.

4 JUSTIFICATION FOR CONSTRAINT WEIGHTINGS

4.1.1 The text below provides detail on the reasoning behind the weightings given to the development constraints for the four coastal area options in **Table 4.2**

4.1.2 **Bedrock:** The presence of intertidal or subtidal reduces as the further offshore the study area extends (based on the low level of confidence associated with the available data), and will need to be confirmed through detailed site survey. A moderate weighting has been applied (for LA2) on the assumption that the discrete outcrops will need to be avoided or will require more complex installation methodology.

4.1.3 **Coastal erosion**: May result in the need for increased cable protection measures (such as deeper burial or mattressing) or a high level of maintenance to future proof for erosion, which all have implications for consenting. Although no evidence of ongoing high levels of coastal erosion were found, the coastline can experience rapid draw down during storms (EDF Energy Ltd, 2004). Further investigations recommended.

4.1.4 **Sand dunes**: These features occur between LA2 and LA4. Their protected status (Potential Annex 1 Sand habitat) and vulnerability is likely to result in a requirement for drilling to avoid impacts on them. This has been achieved by a number of other developments in the vicinity and therefore, is considered only a moderate constraint.

4.1.5 **Fish spawning grounds**: Only plaice were identified as having potential for using LA4 for spawning. As the spawning ground for plaice is relatively large compared to the size of LA4 this was given a low weighting (Defra 2010).

4.1.6 **Nursery grounds for commercial fish species**: A number of species were identified as having potential nursery grounds within the areas. However their overall nursery grounds are relatively large compared to the near shore areas LA1 to LA4. A low weighting was therefore applied.

4.1.7 **Offshore wind farms**: The Teesside Offshore Wind Farm lies 1.5km off the coastline within LA2. Any export cabling routing through this feature will result in considerable consenting concern. Therefore, it is given a high ranking.

4.1.8 **Existing/consented cables/pipelines**: Where these occur they are highly restrictive with regard to parallel routes, but can be crossed if necessary and, therefore, are only considered a moderate consenting constraint.

4.1.9 **Out of service cables**: Where these occur they are highly restrictive with regard to parallel routes but can be crossed if necessary and therefore, not considered a high consenting constraint.

4.1.10 **Wrecks and obstructions**: All of these considerations will require avoiding during cable installation. However, it is likely that they can be accommodated within the cable route and avoided through micrositing. None of the wrecks are designated as protected wrecks. Therefore, whilst they may add to the complexity of the installation process they do not merit highest level weighting.

4.1.11 **Known archaeology**: No known sites of high archaeological importance have been identified at this juncture.

4.1.12 **Navigation**: the navigation channel, the density of shipping traffic and the anchoring grounds will pose significant consenting risk to LA1 and LA2, therefore, these are afforded high level importance.

4.1.13 **Maintenance dredging**: This particular constraint only applies to LA1 but is a major constraint as it creates a pinch point for landfall with regard to attempting to enter the mouth of the Tees Estuary. This constraint is seen as being a potential show-stopper and is, therefore, given the highest weighting.

4.1.14 **Sewage outfalls**: The presence of a sewage outfall will provide a localised restriction the landfall area and crossing such a feature is likely to be impractical. A weighting of moderate has, therefore, been applied.

4.1.15 **Disposal grounds**: The active disposal grounds have the potential to influence route selection within LA1 and LA2, therefore, they are afforded high weighting. The out of use disposal ground is less likely to result in such high concerns.

4.1.16 **Commercial static gear fishing**: Where such practices are highest (LA2, 3 and 4) consenting effort will be increased. However, their presence is not likely to warrant avoiding the areas. Consequently, a moderate ranking is assigned.

4.1.17 **Other man-made structures**: Although it would be most unlikely that any of the other miscellaneous man-made structures would be considered as potential landfall sites micrositing may be possible and therefore the weighting has been assessed as moderate.

4.1.18 **Tourism and recreation**: Any construction works in the proximity of Saltburn by the Sea has been identified of moderate concern given the potential disruption to key tourist trade and local recreational activity.

4.1.19 **Nature conservation designations:** For areas where there are no statutory nature conservation designations the weighting has been assessed as low. Where there are nature conservation designations, the weighting is moderate given the precedent from preceding projects (mitigation will be required but development is possible).

4.1.20 **rMCZs:** Runswick Bay rMCZ intersects with the study area for all LA options. Given the available space to the north for alternative routing options it is considered that avoidance may be requested by stakeholders. However, this is unlikely to pose a major concern to route selection or landfall decision making.

4.1.21 **Designated waters** (bathing & shellfish): Designated bathing waters may result in increased sensitivity from stakeholders with regard to potential effects on water turbidity and contamination from construction works. This is not likely to be a major consent risk and is judged as a moderate ranking.

4.1.22 **Heritage Coast**: The coastline (and inshore waters) in the south of LA4 have the potential to result in increased consenting effort to establish potential impacts on the feature, given the management measures in place for the site. Whilst no major impacts on the site would be anticipated the increased consenting effort warrants a moderate level ranking to be assigned.

Table 4.1 Development consideration weighting

Development consideration weighting	Weighting detail
High	Potentially significant consent risk, timing constraint, financial risk or technical challenge. May require significant time / cost to overcome.
Moderate	Potential consent risk, can be overcome / avoided with relative ease.
Low	No perceived significant risk.

Table 4.2 Summary of the key development considerations for landfall areas 1 – 4

Development Consideration	Landfall Area 1	Landfall Area 2	Landfall Area 3	Landfall Area 4
Environmental Considerations				
Potential for coastal erosion		X	X	X
Presence of sand dunes		X	X	X
Commercial fish spawning grounds				X
Commercial fish nursery grounds	X	X	X	X
Human Considerations				
Offshore wind farms	X	X		
Existing/consented/planned pipelines	X	X	X	X
Existing/consented/planned cables (active)	X	X	X	
Existing cables (out of service)	X	X	X	X
Wrecks and obstructions	X	X	X	X
Known archaeology	X			
Navigation (including anchoring)	X	X		
Maintenance dredging	X			
Sewage outfalls		X	X	
Disposal ground	X	X		
Static gear fishing ground	X	X	X	X
Other man-made obstruction	X			
Tourism and recreation				X
Designated Sites & Features				
Potential Annex I Habitat	X	X	X	X
Natura 2000 sites	X	X		

Development Consideration	Landfall Area 1	Landfall Area 2	Landfall Area 3	Landfall Area 4
SSSI	X	X		
Draft MCZs	X	X	X	X
Designated bathing water			X	
Heritage coast			X	X

5 CONCLUSIONS

5.1.1 Based on the available data used to inform this desk based study and described in **Table 3.4**, LA1 and LA2 are considered to have the greatest constraints.

5.1.2 The LA1 shoreline is limited by the presence of hard defences and interrupted by a number of existing facilities such as a slipway, a small harbour area and the RYA sailing club. A maximum of only 1km of its shoreline remains uninterrupted by any constraints. It is recommended that LA1 is avoided.

5.1.3 LA2 contains a number of anthropogenic and nature conservation constraints. The nature conservation constraints may be manageable due to the precedence set by the permissions gained for the Teesside Offshore Wind Farm (see **Tables 3.2** and **3.3**). However, this infrastructure, along with the anchoring and disposal grounds, severely limits the available space for cable routing. Given the potential need to bring a number of cables ashore, the capacity for LA2 to accommodate this is limited to a stretch of shoreline at the south-eastern end of LA2, interrupted by a sewage outfall, as well as the presence of subtidal and intertidal bedrock outcrops. It is recommended that LA2 is avoided.

5.1.4 LA3 is less constrained from an infrastructure, human activity and designated sites perspective. High intensity static gear fishing activity in this area is likely to be a manageable concern. Crossing of existing infrastructure will be required and, depending on the method used, may have implications for consenting. It is considered that this stretch of coast could accommodate landfall of a number of cables.

5.1.5 LA4 has similar physical and environmental constraints to that of LA3. This area has no associated nature conservation designations within it, but does have sand dune cliffs behind the intertidal area in the north-western half. The presence of the Heritage Coast is likely to lead to some concern, and may require avoidance given the apparent lack of constraints to the northern part of the area. A factor which may be of additional concern is the significant level of tourism and recreation in this area, especially towards Saltburn by the Sea.

5.1.6 In conclusion, it is considered that LA3 and the north-western extent of LA4 offer the most potential for bringing the cable ashore.

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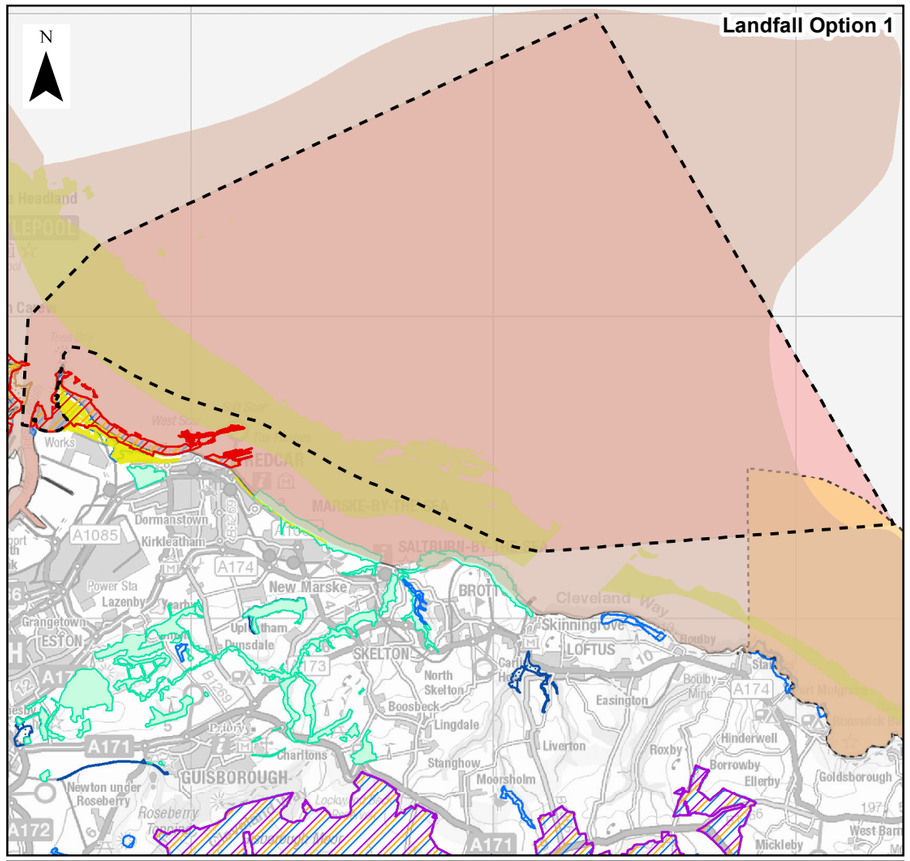
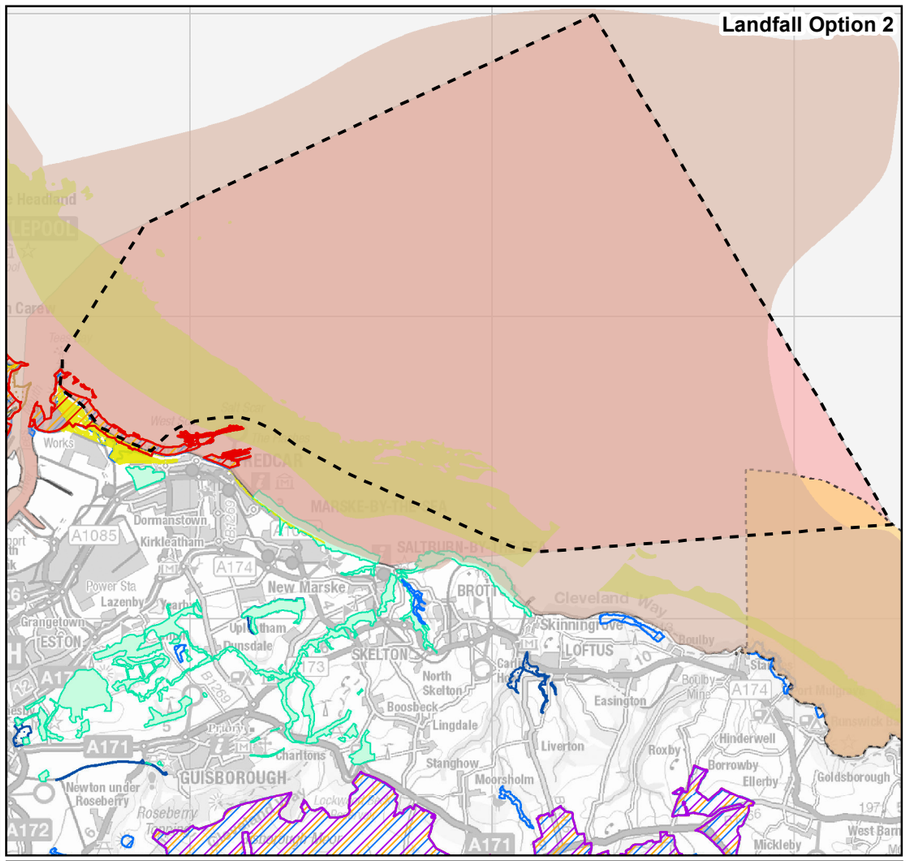
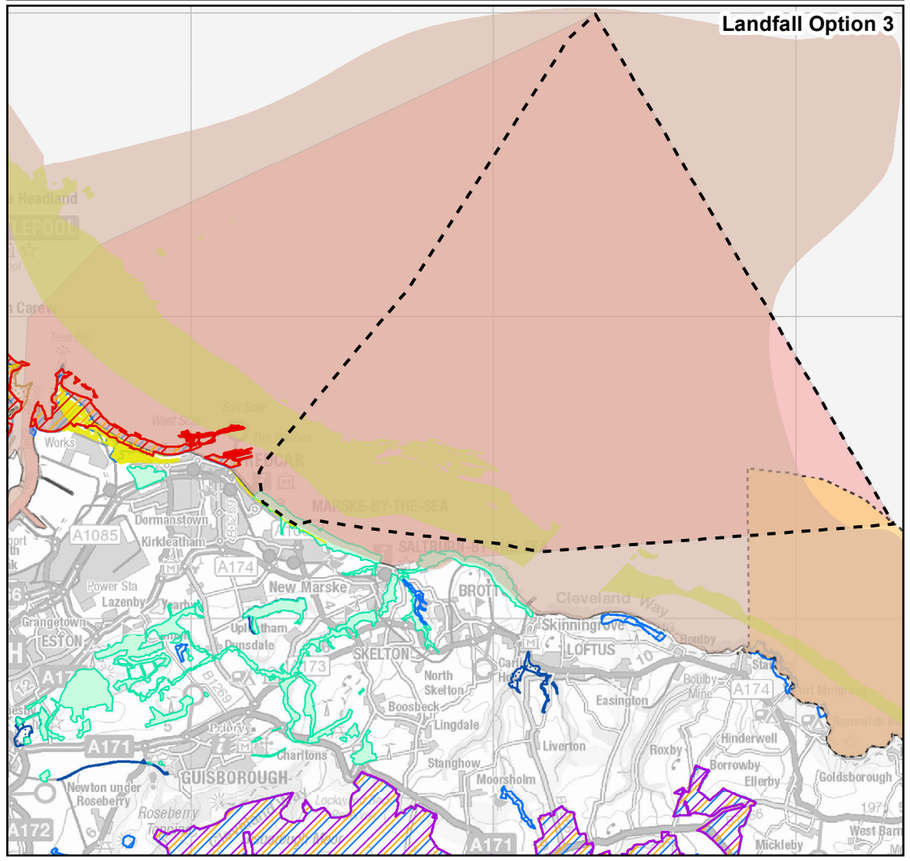
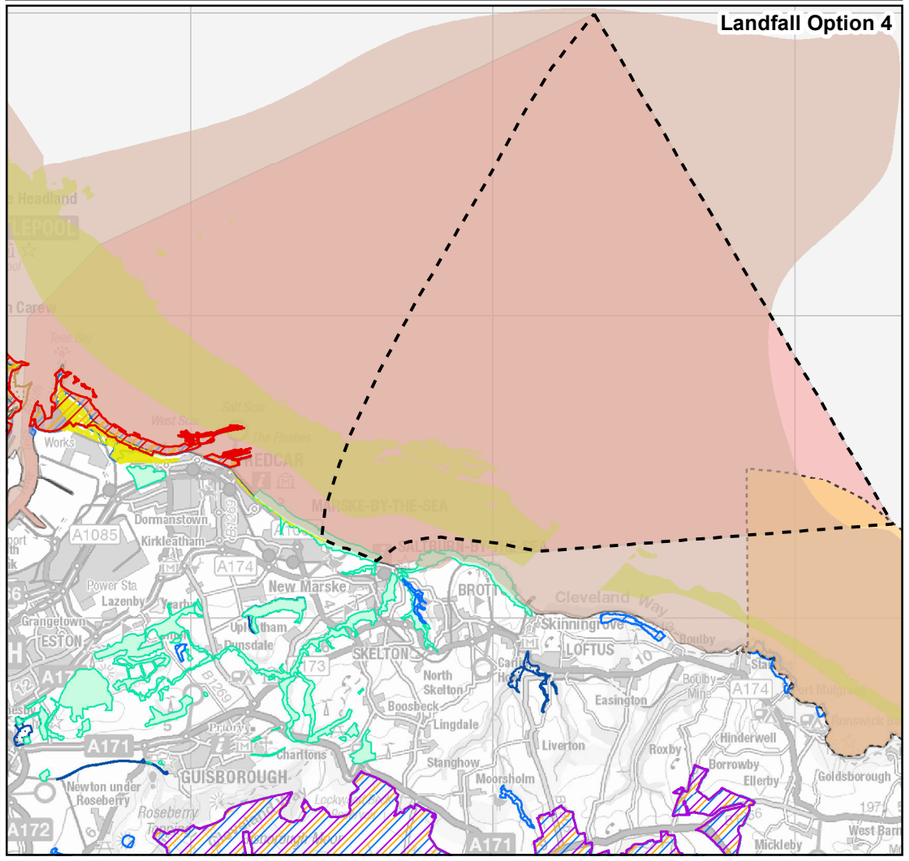
7 APPENDIX A: FIGURES A1 – A9









LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Ramsar Site
- Special Area of Conservation (SAC)
- Special Protected Area (SPA)
- Potential Annex 1 Sand Habitat
- Reef
- Potential Reef
- UK BAP Priority Habitat (Coastal Sand Dunes)
- Recommended Marine Conservation Zone (rMCZ)
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- Local Wildlife Site (LWS)
- Local Nature Reserve (LNR)
- RSPB Reserves

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PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A1: Designated sites and areas of conservation interest

VER	DATE	REMARKS	Drawn	Checked	Approved
0	19/12/2011	Draft	GMC	PG	
1	07/03/2012	Final	LW	AP	

DRAWING NUMBER: **9W7904/TPCCCA/A1/00**

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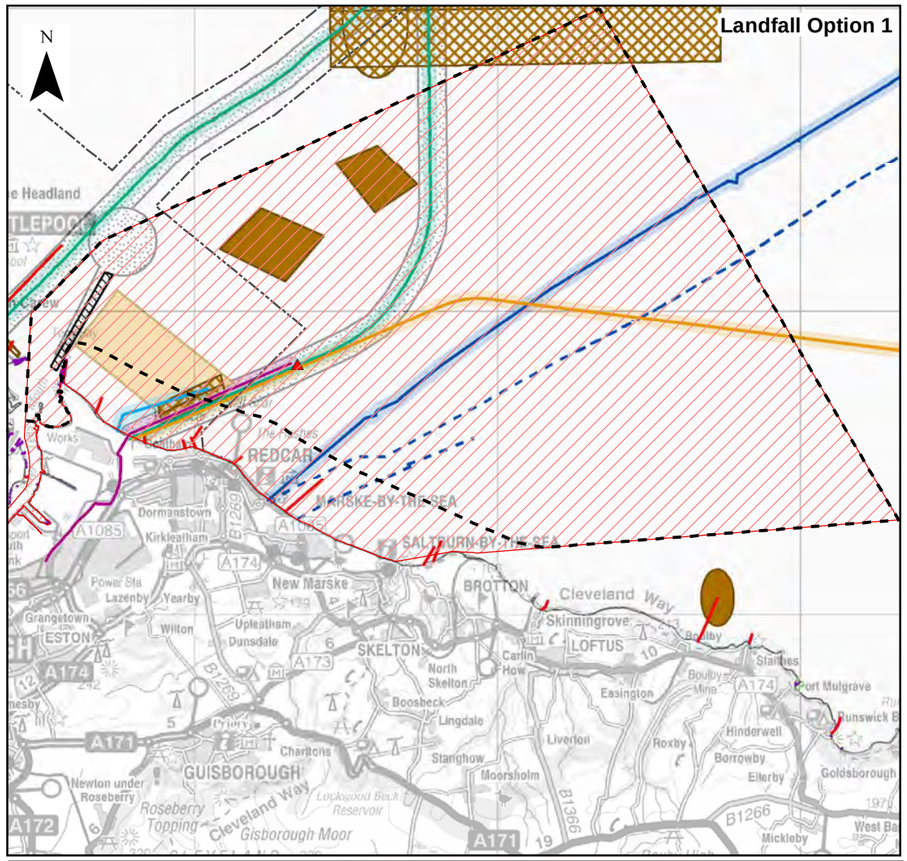

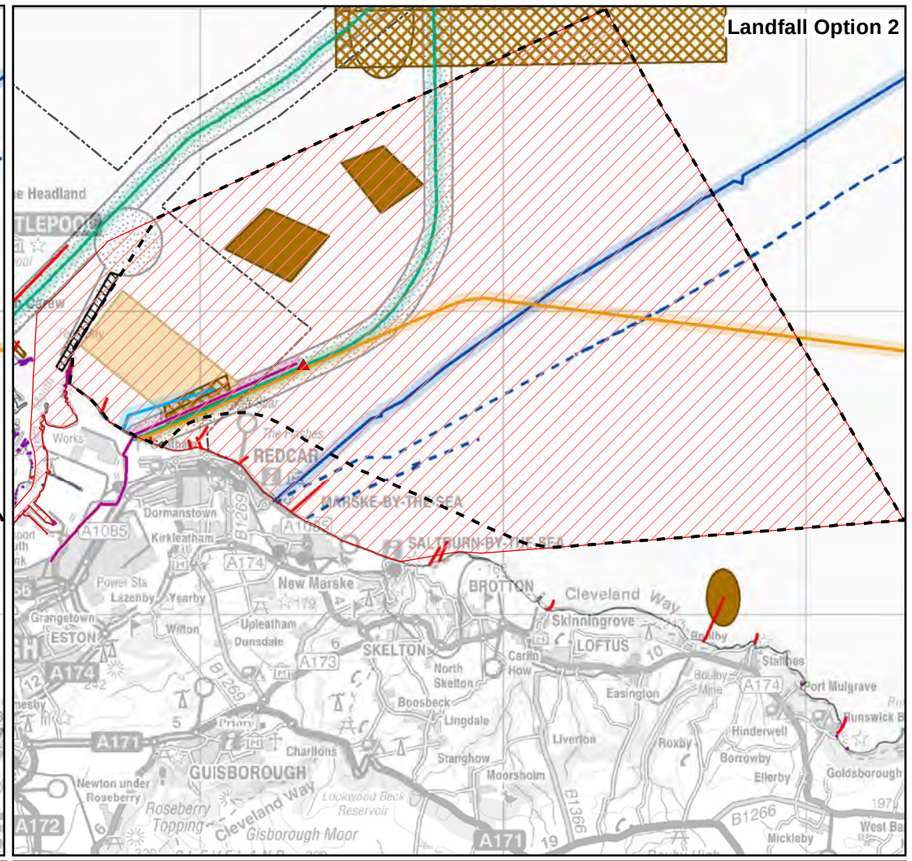

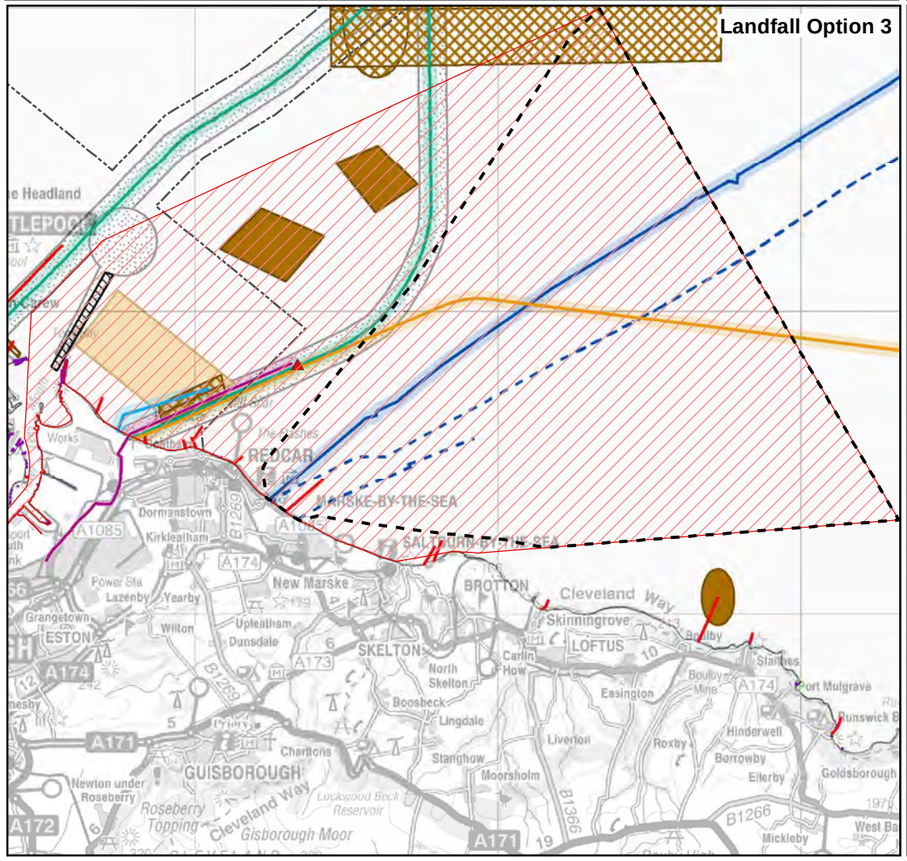

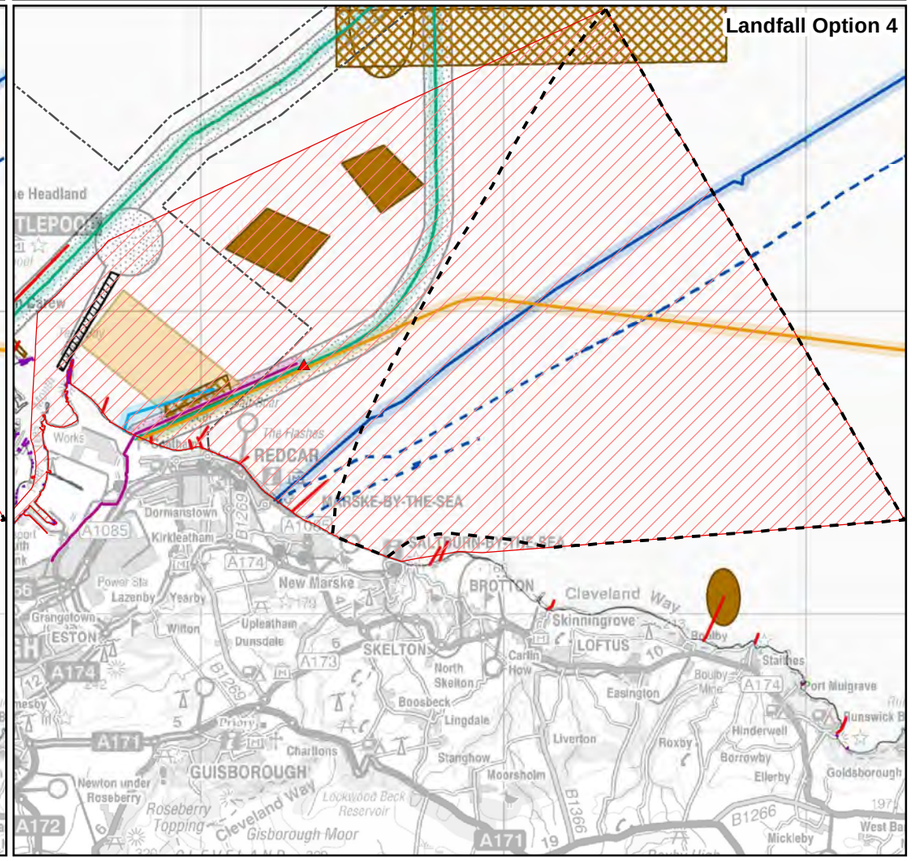

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Seabed Fastener
- Proposed CCS Pipeline
- Breagh Planned Pipeline
- Wind Farm Export Cable
- Cable
- Pipeline
- Outfall
- Out of Service Cable
- Wind Farm Export Cable 250m Buffer
- Cable 250m Buffer
- Pipeline 250m Buffer
- CCS Pipeline 250m Buffer
- Breagh Planned Pipeline 250m Buffer
- Teesside Offshore Wind Farm
- Tees Harbour Limits
- Anchoring Prohibited Area
- Dredging Area
- Shoreline Construction

Disposal Ground

Status

- Closed
- Open

Source:
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The Crown Estate, UK Deal, CEFAS, SeaZone

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PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A2: Physical Constraints

VER	DATE	REMARKS	Drawn	Checked	Approved
0	19/12/2011	Draft	GMC	PG	
1	07/03/2012	Final	LW	AP	

DRAWING NUMBER: **9W7904/TPCCCA/A2/00**

SCALE	1:202,700	PLOT SIZE	A3	DATUM	OSGB36	PROJECTION	BNG

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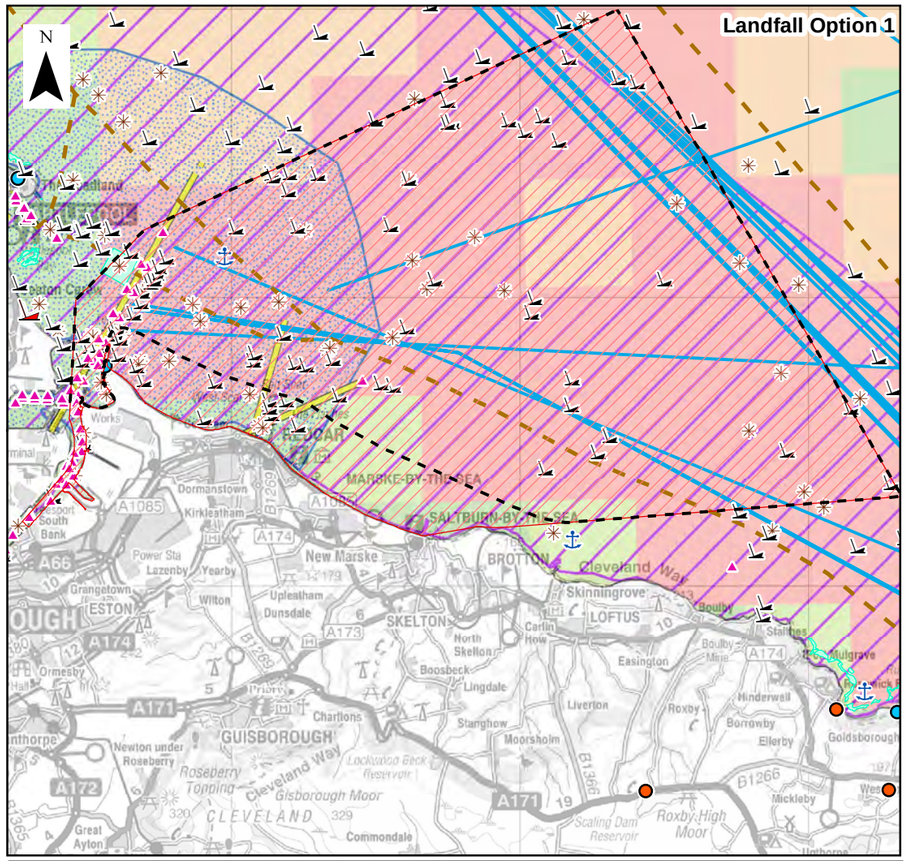

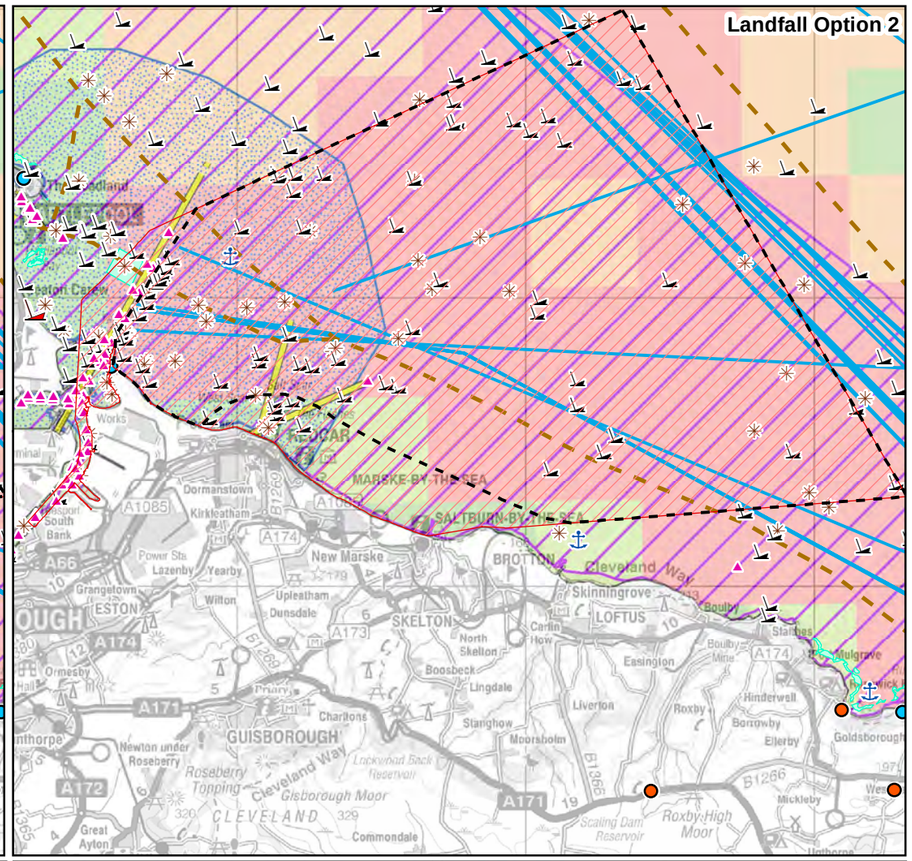

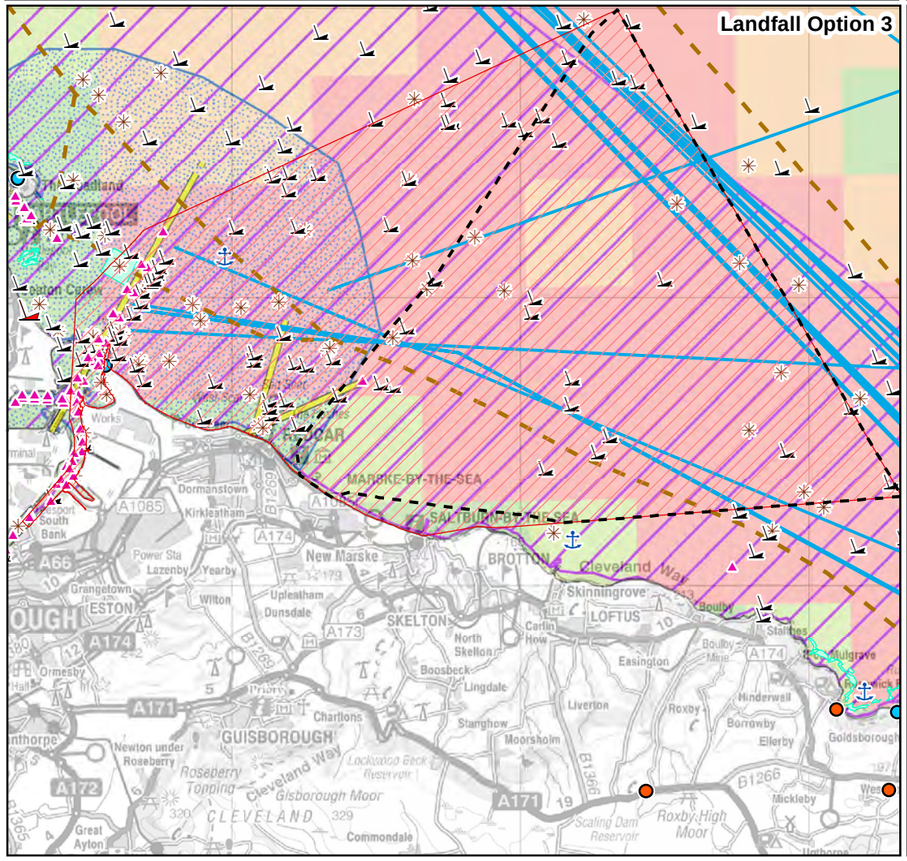

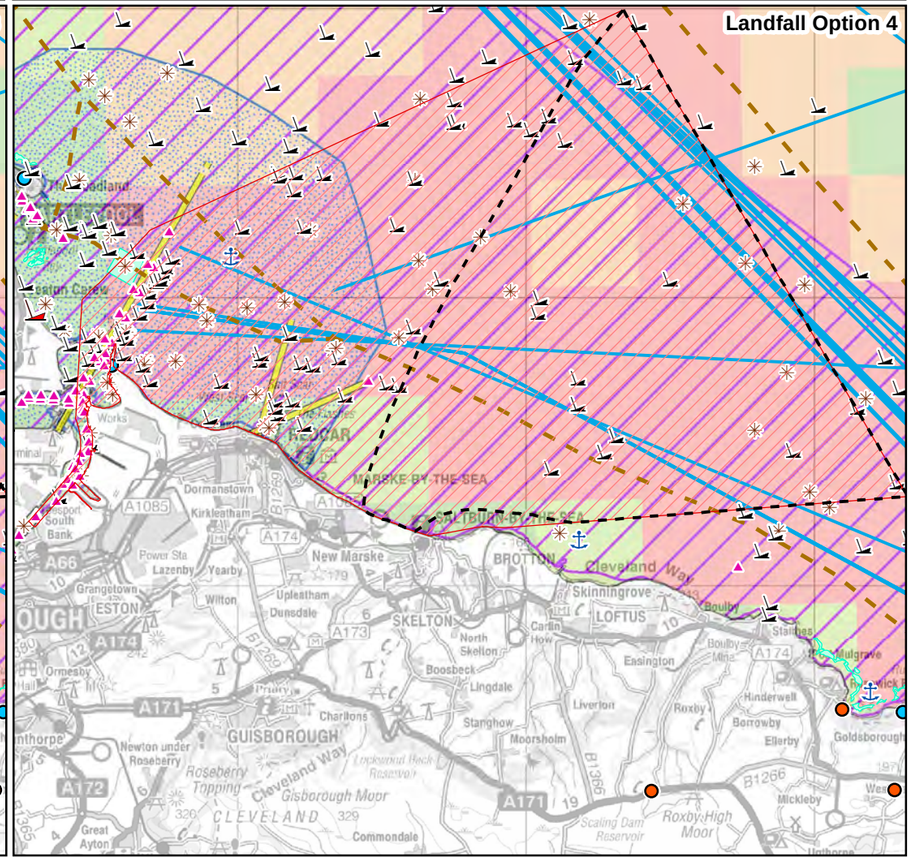

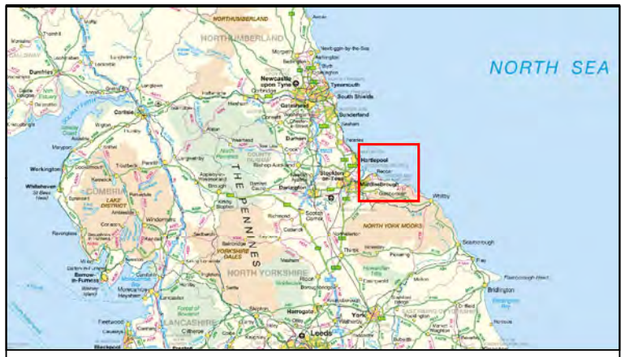

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Protected Wreck
- Anchorage Area
- Navigation Buoy
- Charted Wreck
- Obstruction
- RYA Training Centre
- RYA Sailing Club
- RYA Cruising Route
- Dredger Transit Routes
- Navigation Line
- Obstruction Area
- RYA Racing Areas
- RYA Sailing Areas

Shipping Density

Category

- Very Low
- Low
- Medium
- High
- Very High

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RYA, SeaZone

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PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A3: Shipping and Navigation

VER	DATE	REMARKS	Drawn	Checked	Approved
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1	07/03/2012	Final	LW	AP	

DRAWING NUMBER: **9W7904/TPCCCA/A3/00**

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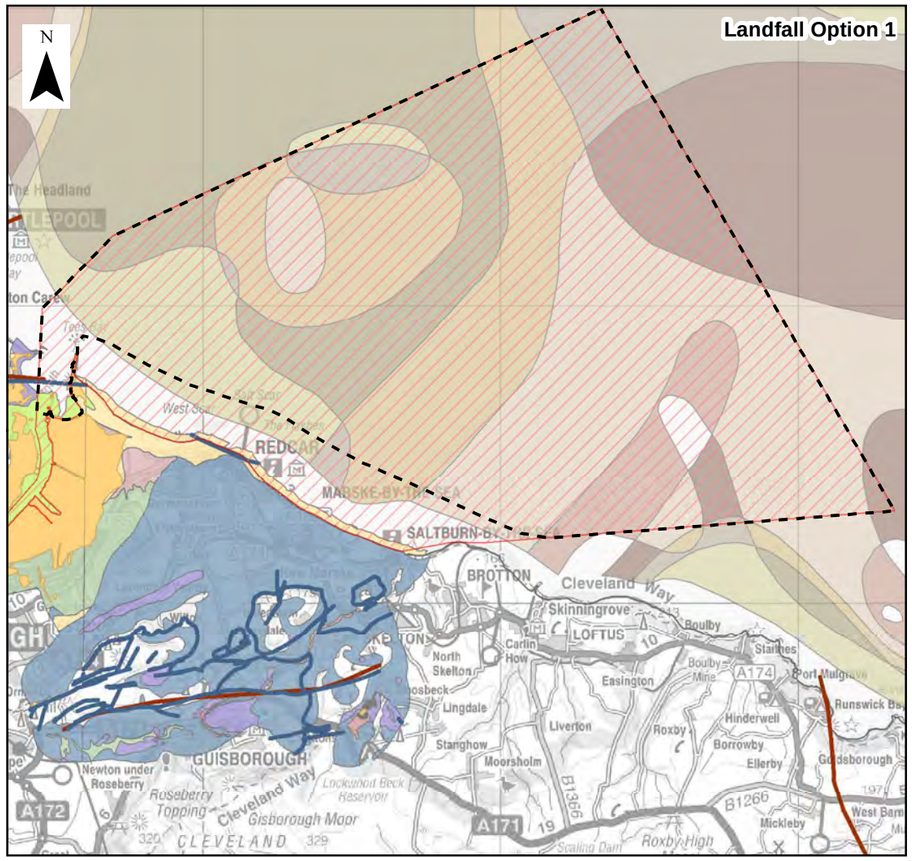

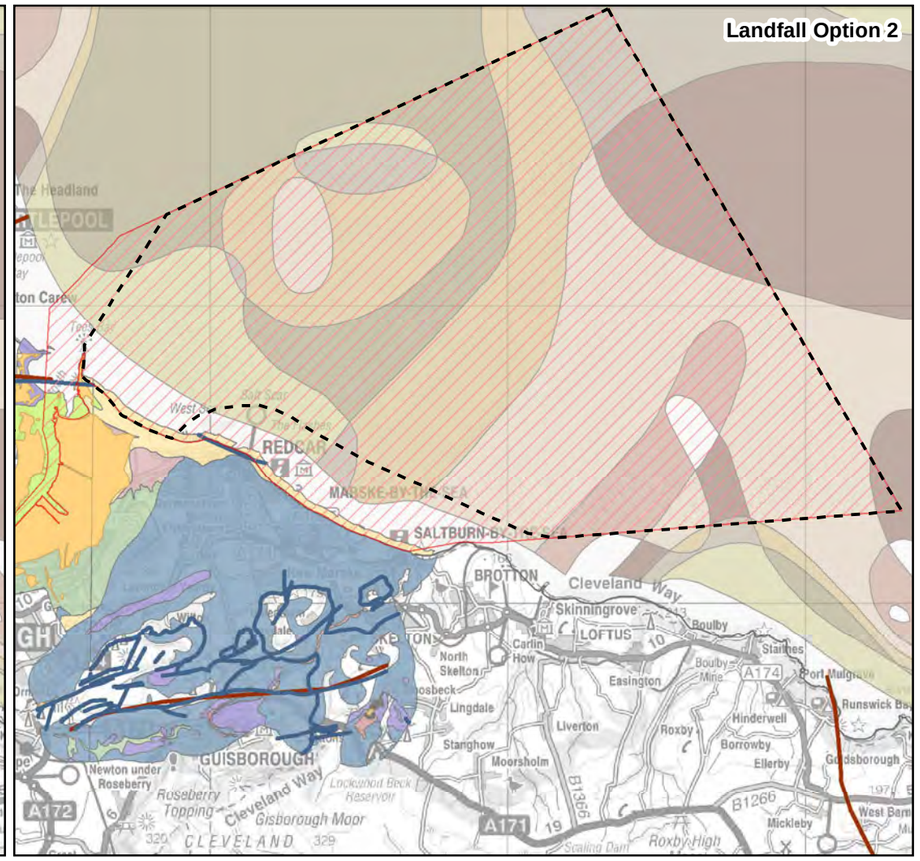

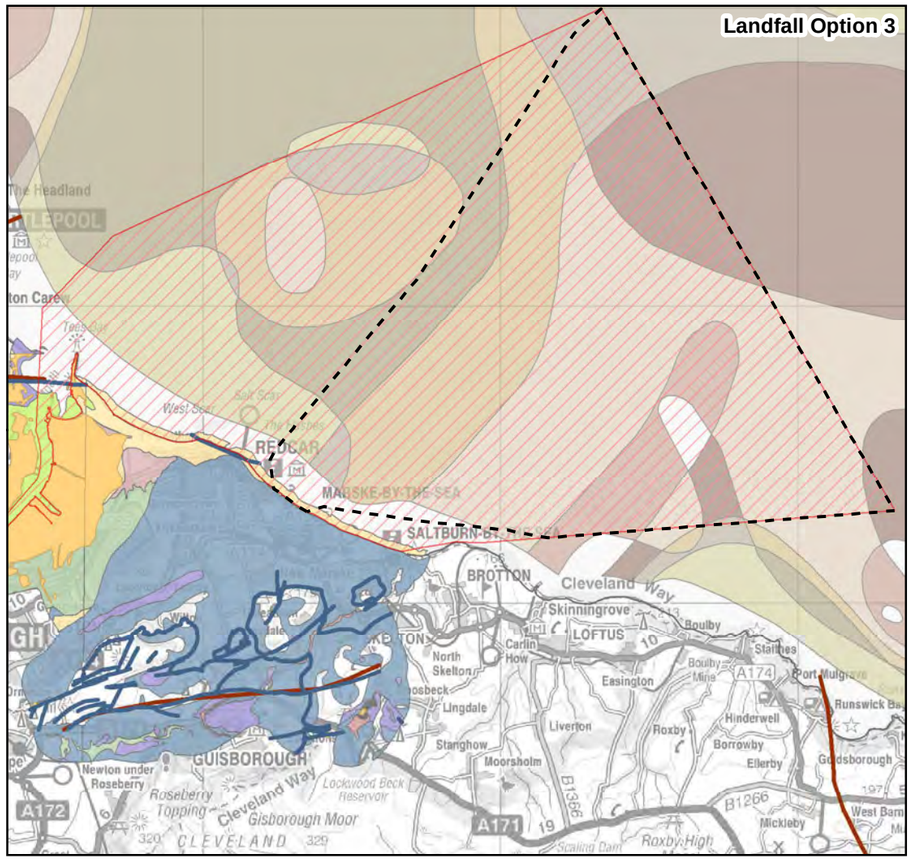

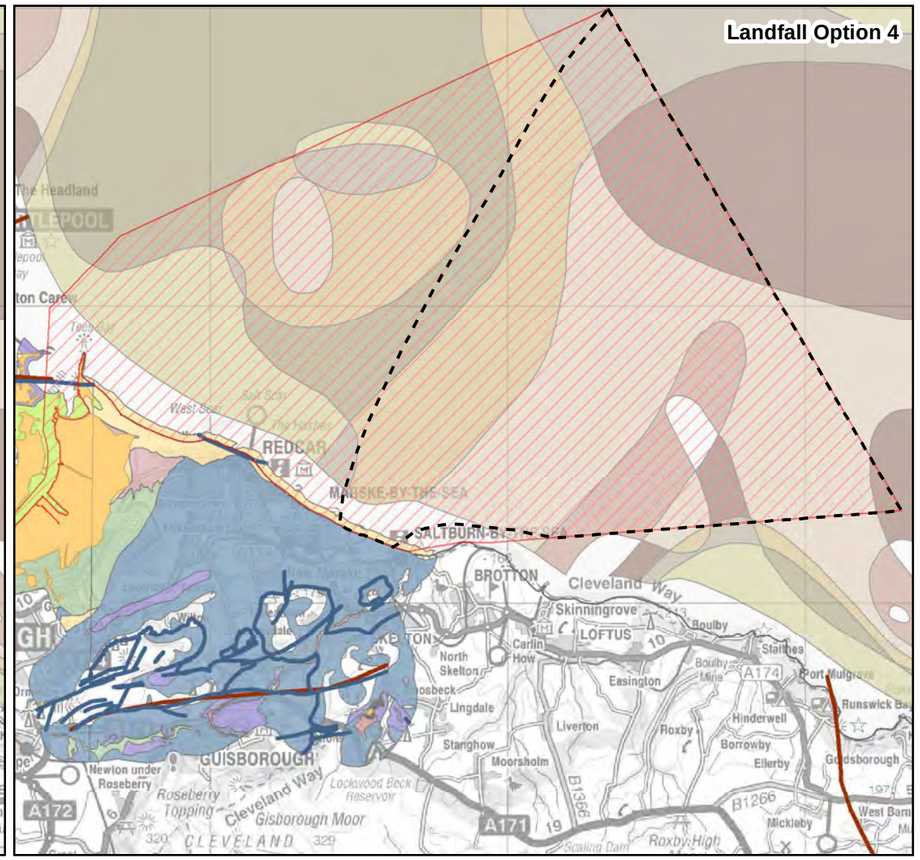

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Faults and Rock Segments
- Geological Fault Lines
- Artificial Ground

Offshore Geology: Sediments

- Gravelly Muddy Sand
- Gravelly Sand
- Muddy Sand
- Muddy Sandy Gravel
- Sand
- Slightly Gravelly Muddy Sand
- Slightly Gravelly Sand
- Slightly Gravelly Sandy Mud

Onshore Geology: Superficial Deposits

- Clay and Silt
- Clay, Silt, Sand and Gravel
- Diamicton
- Peat
- Sand
- Sand and Gravel
- Sand and Silt
- Sand, Silt and Clay

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SeaZone, BGS

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PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A4: Geology

VER	DATE	REMARKS	Drawn	Checked	Approved
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1	07/03/2012	Final	LW	AP	

DRAWING NUMBER:

9W7904/TPCCCA/A4/00

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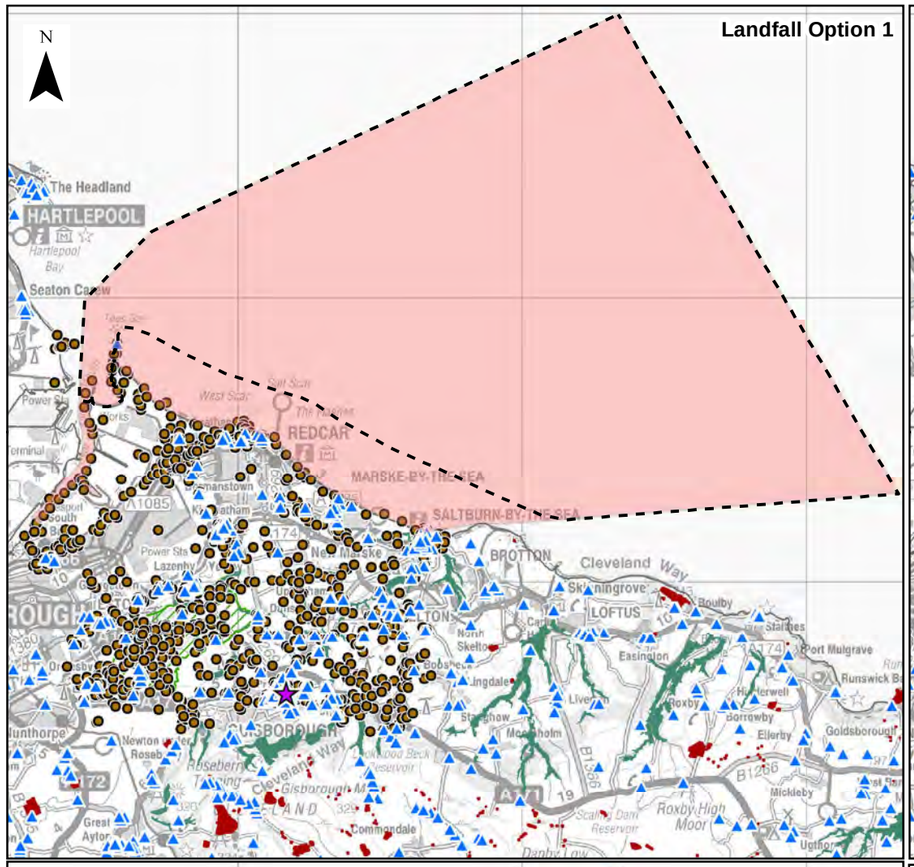

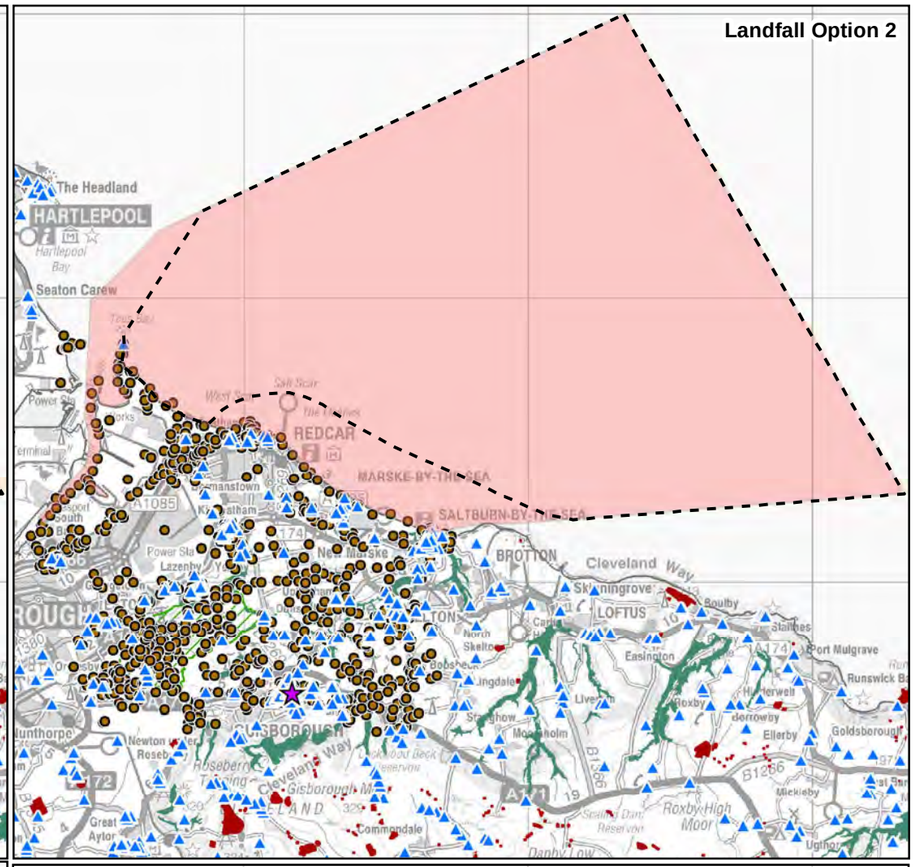

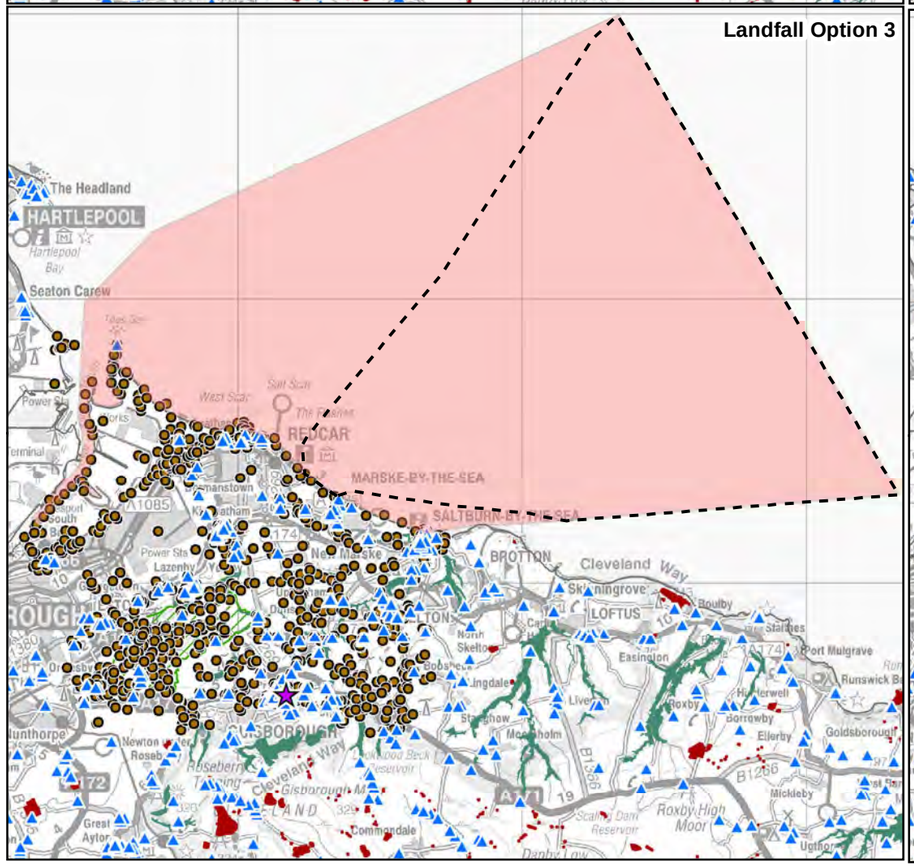

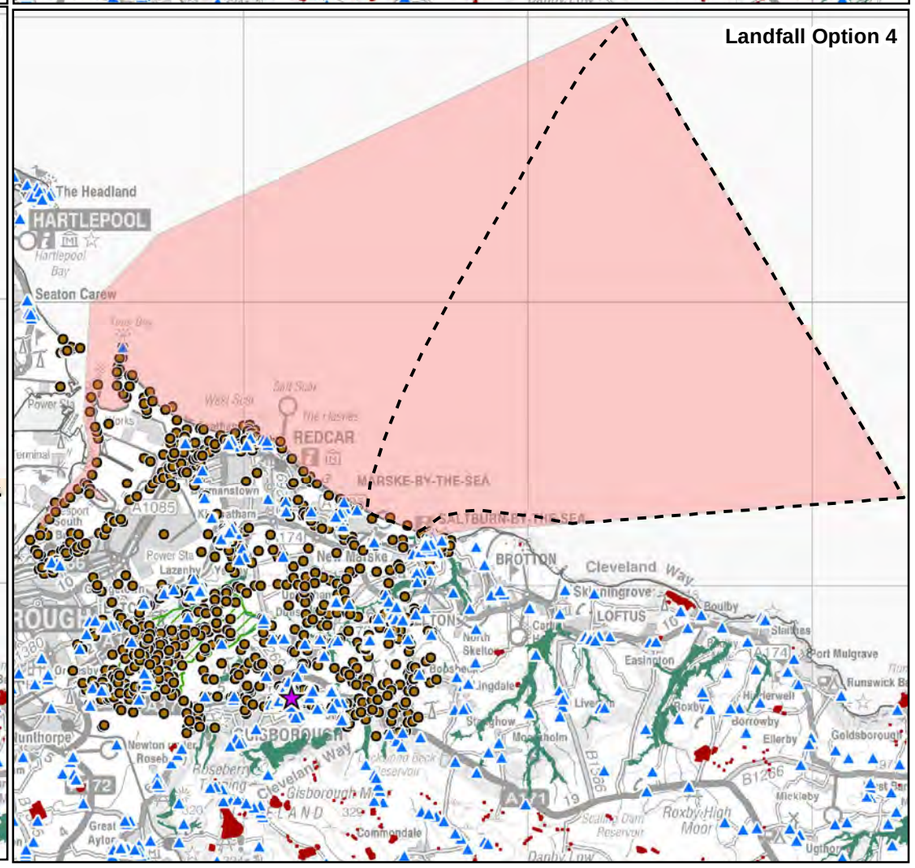

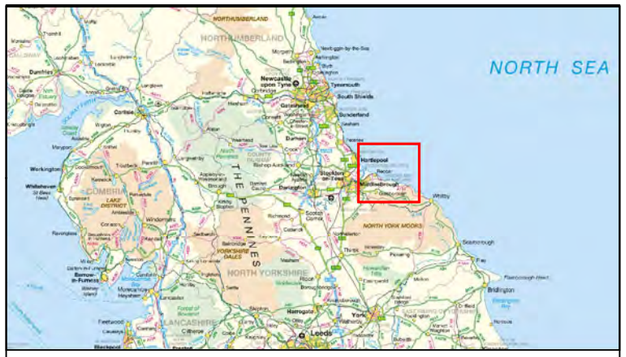

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Historic Environmental Record Point
- Listed Building
- Heritage Site
- Historic Landscape
- Ancient Woodland
- Scheduled Monument

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English Heritage

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PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A5: Archaeology

VER	DATE	REMARKS	Drawn	Checked	Approved
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1	07/03/2012	Final	LW	AP	

DRAWING NUMBER:

9W7904/TPCCCA/A5/00

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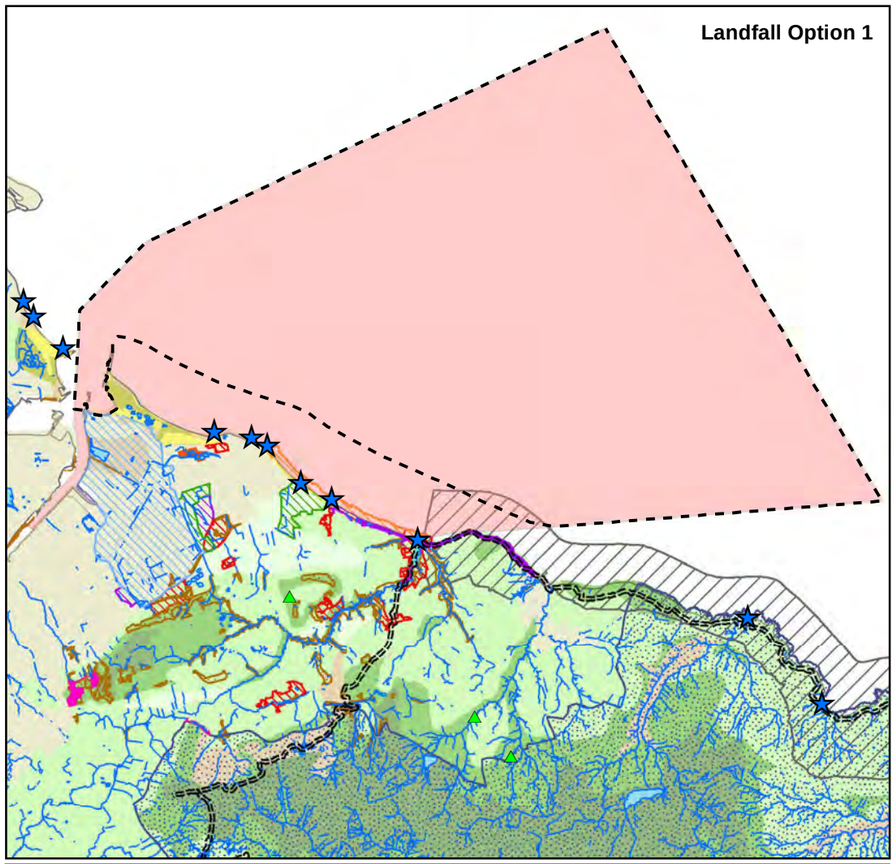

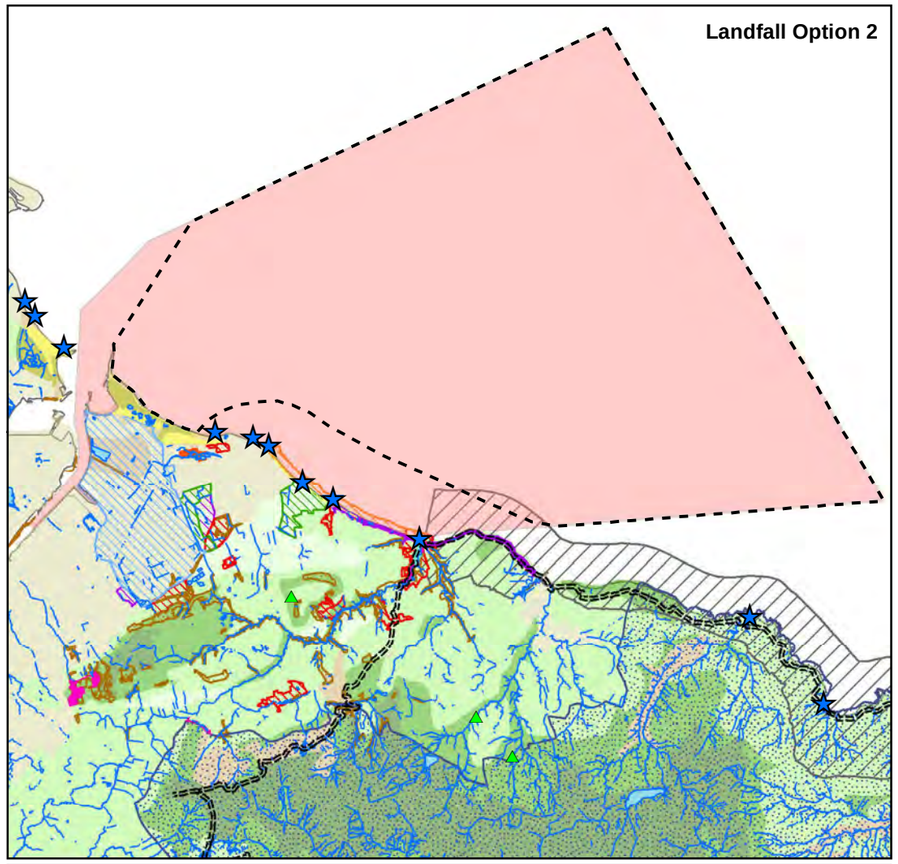

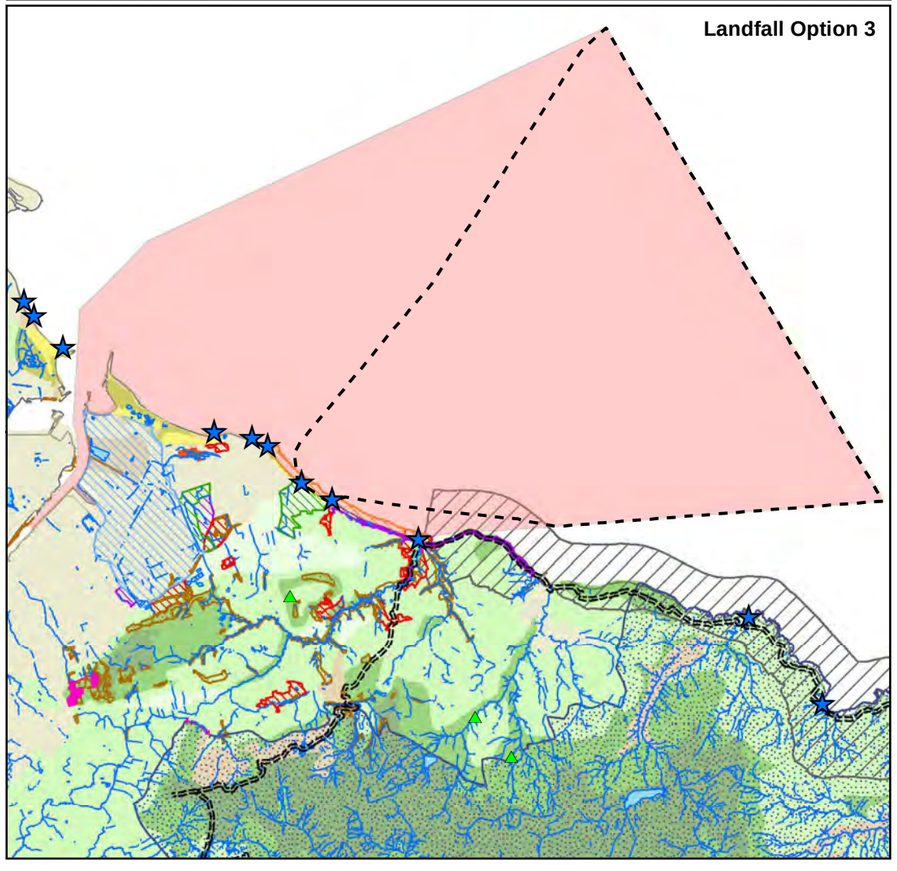

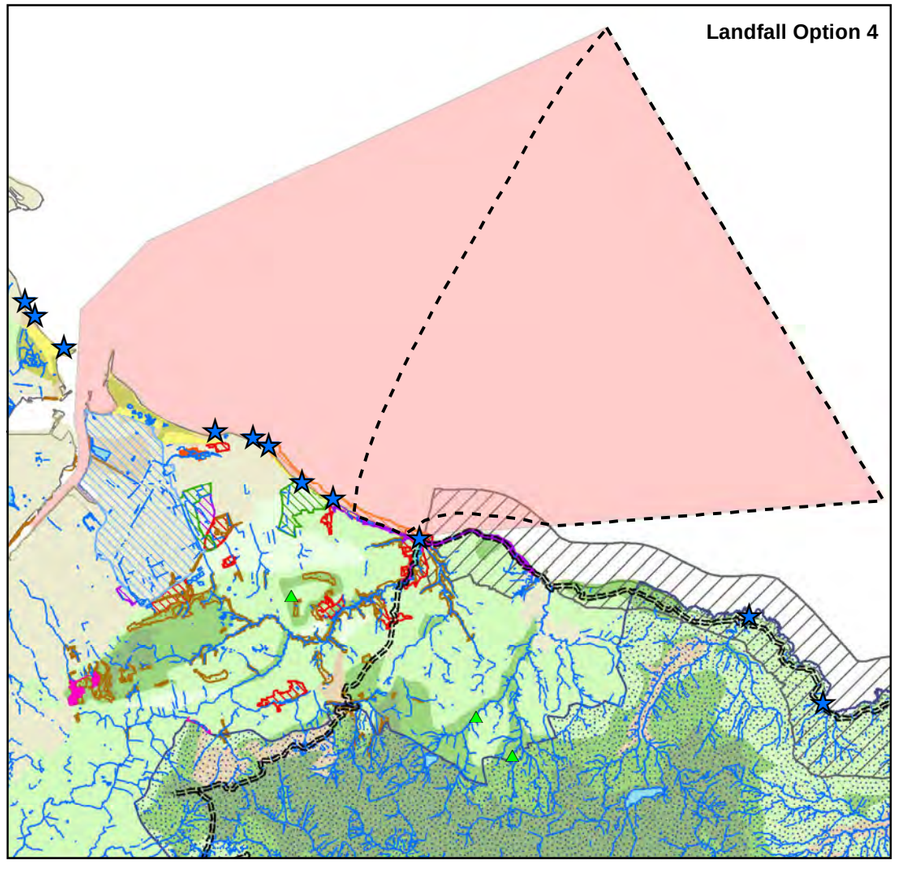

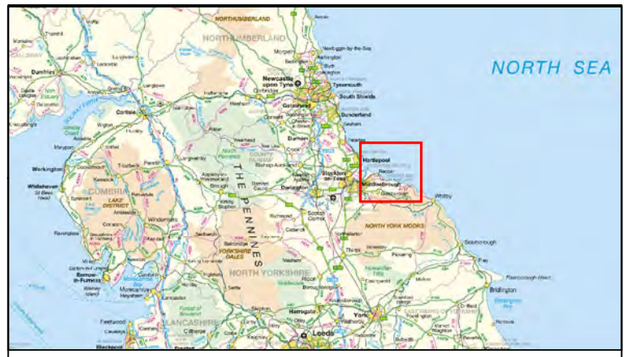

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Woodland Trust Sites
- Bathing Waters
- Rivers/Surface Water
- National Trails
- Mudflats
- Coastal/Floodplain Grazing Marsh
- Coastal Sand Dunes
- Deciduous Woodland
- Lowland Meadows
- Reedbeds
- Maritime Cliff/Slope
- Parks and Gardens
- Surface Water
- Heritage Coast
- National Park
- Country Park

Agricultural Land Classification

- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

Local Planning Policies

- Conservation Area
- Green Wedges
- Protecting Employment
- SINC
- Steel, Chemical and Port Related Industries

Source:
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English Heritage, Natural England, OS Opendata

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Kilometres

PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A6: Landscape

VER	DATE	REMARKS	Drawn	Checked	Approved
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1	07/03/2012	Final	LW	AP	

DRAWING NUMBER:

9W7904/TPCCCA/A6/00

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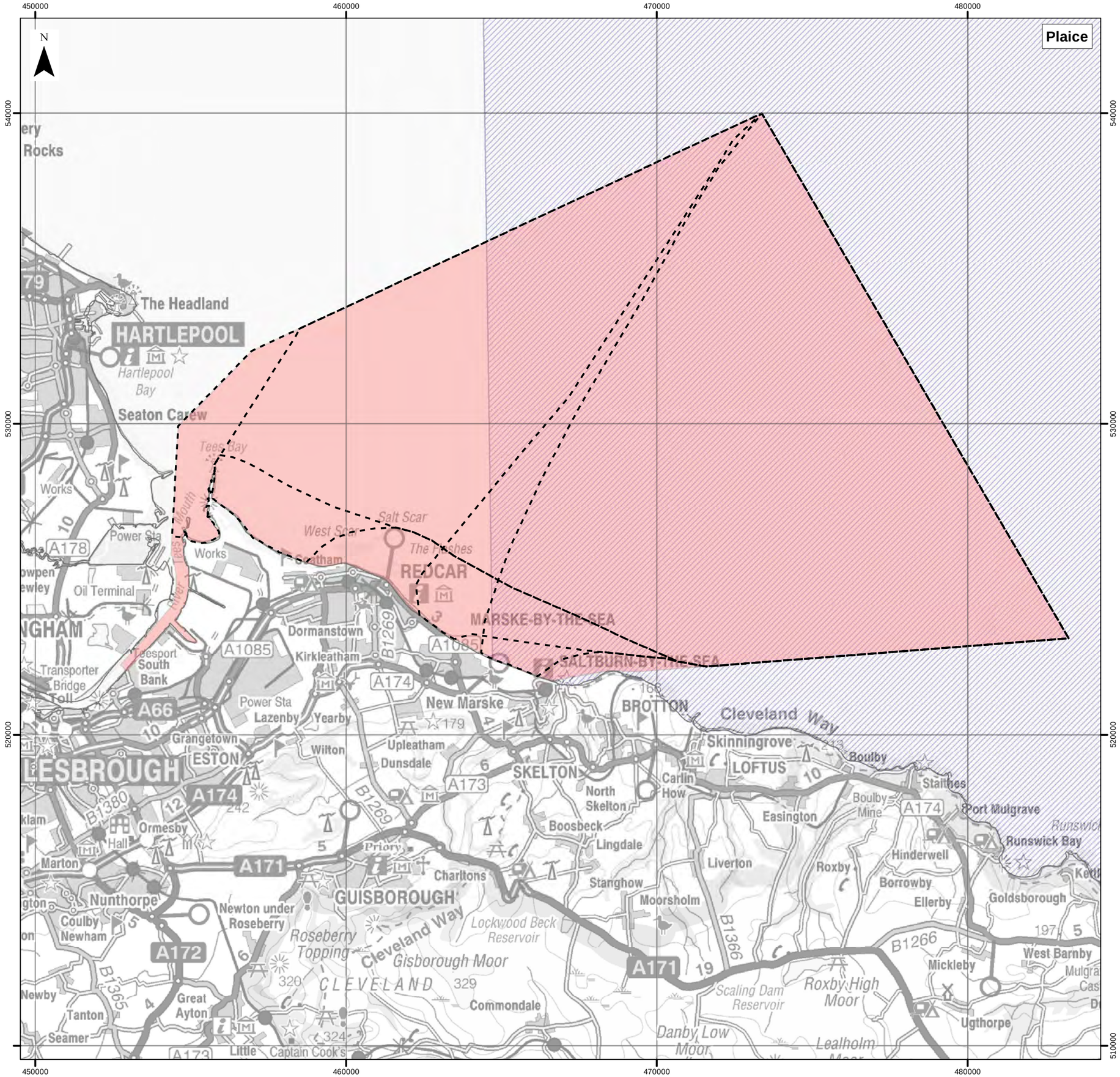

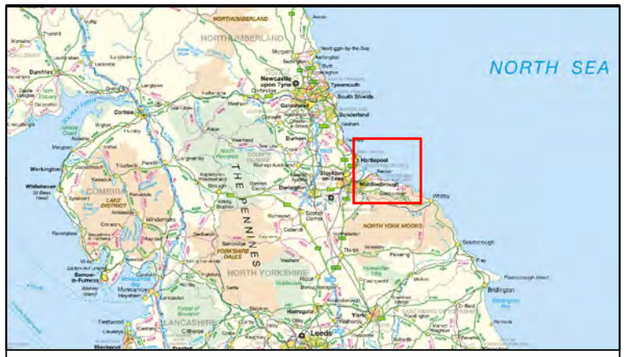

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area

Spawning Grounds - Plaice

Intensity

- High
- Low

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CEFAS

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Kilometres

PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A7: Fish Spawning Grounds

VER	DATE	REMARKS	Drawn	Checked	Approved
0	16/12/2011	Draft	GMC	PG	
1	07/03/2012	Final	LW	AP	

DRAWING NUMBER: **9W7904/TPCCCA/A7/00**

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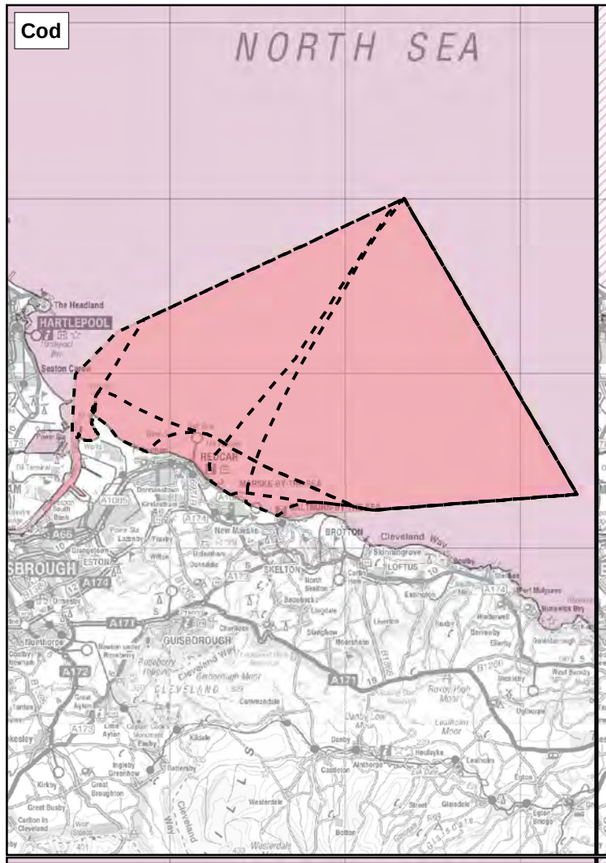

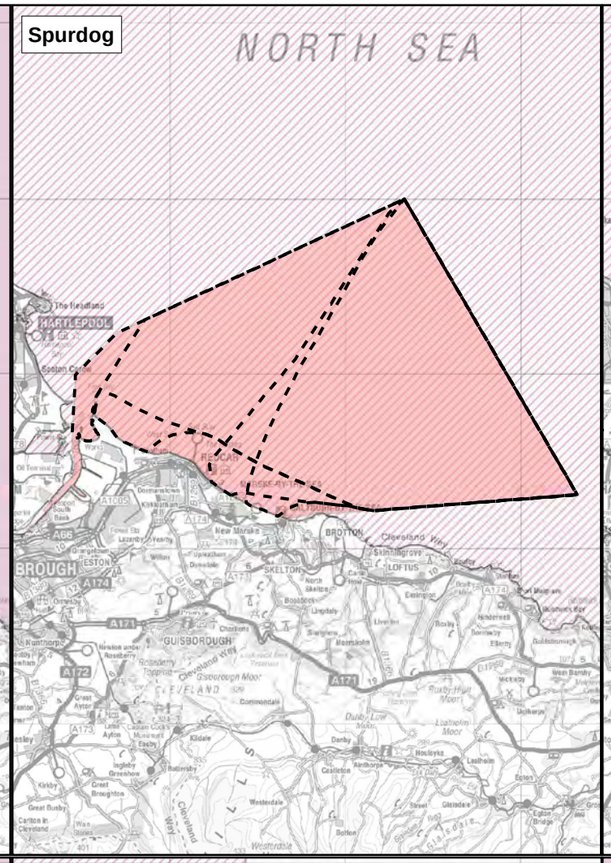

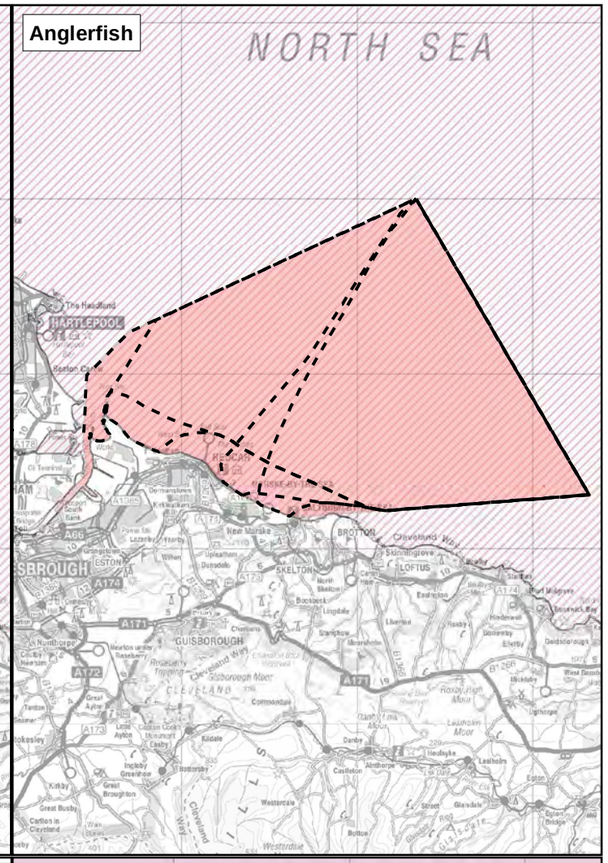

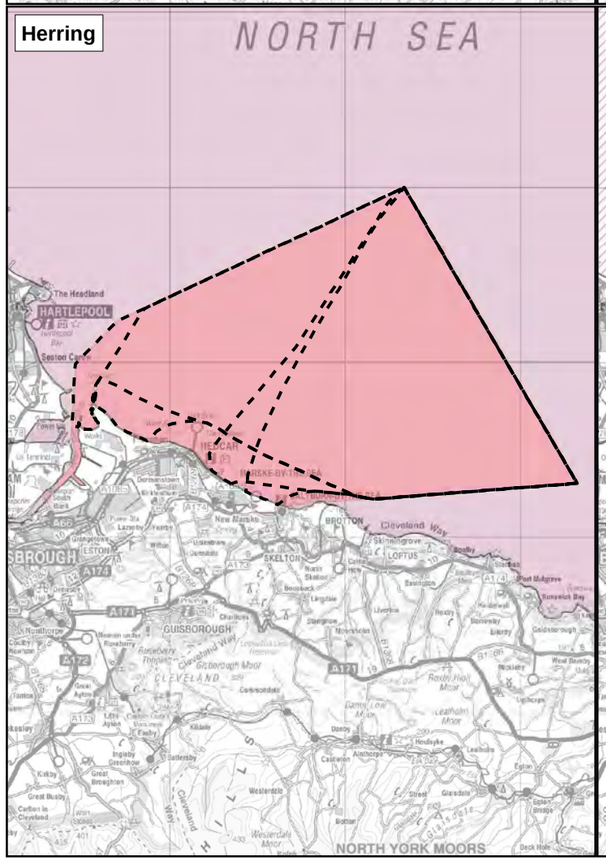

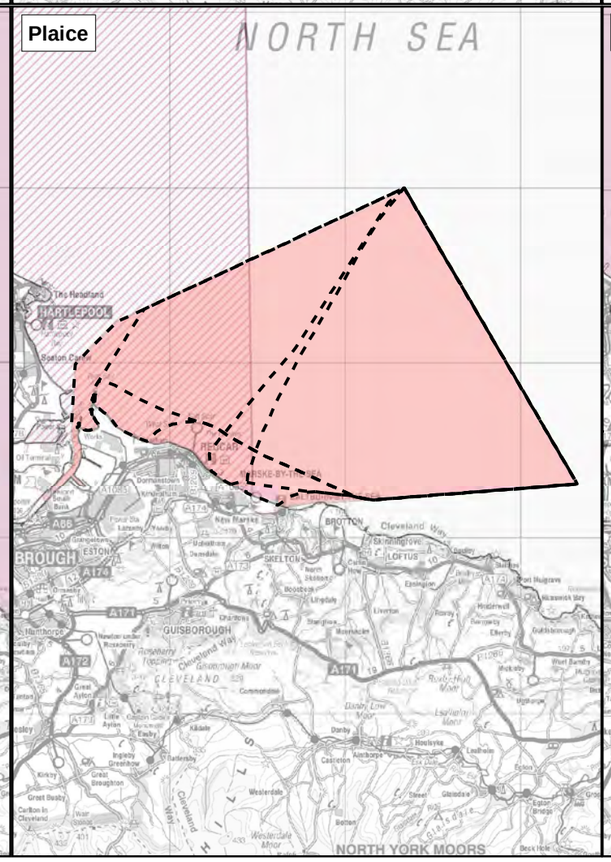

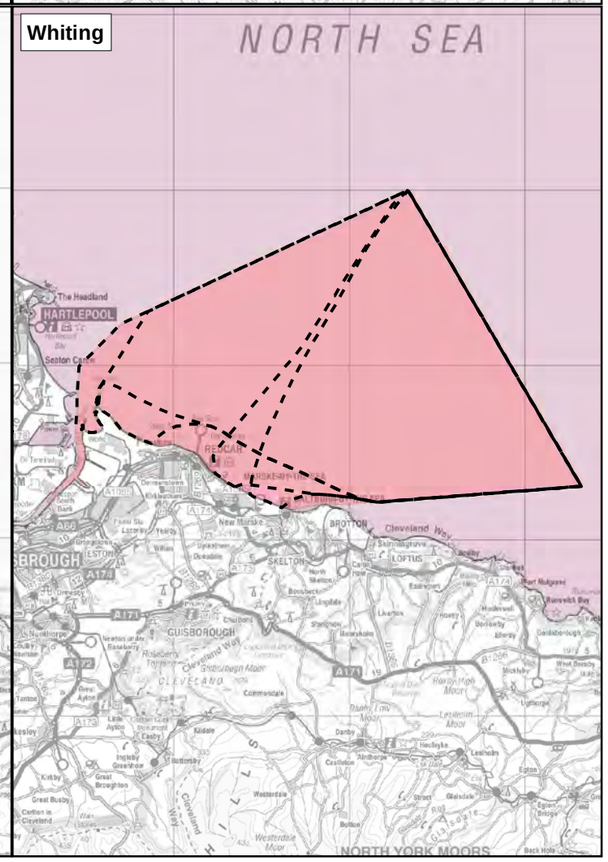

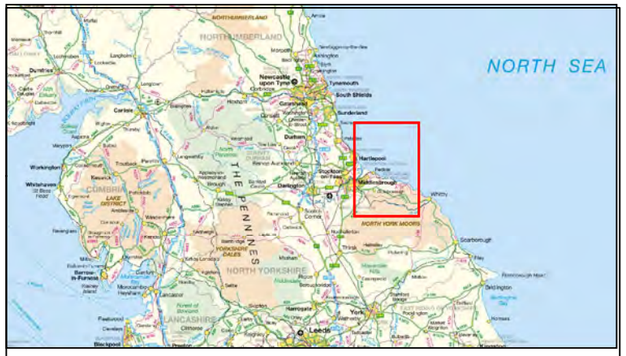

LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area

Nursery Grounds

Intensity

- High
- Low

Source:
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CEFAS

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Kilometres

PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

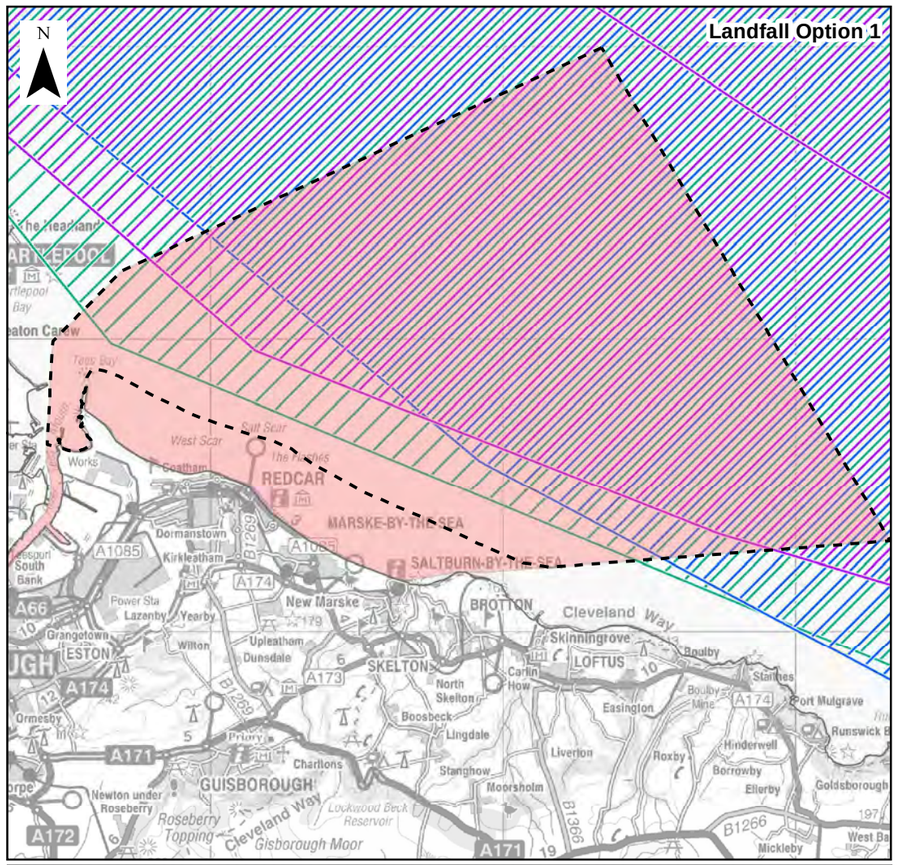
Figure A8: Fish Nursery Grounds

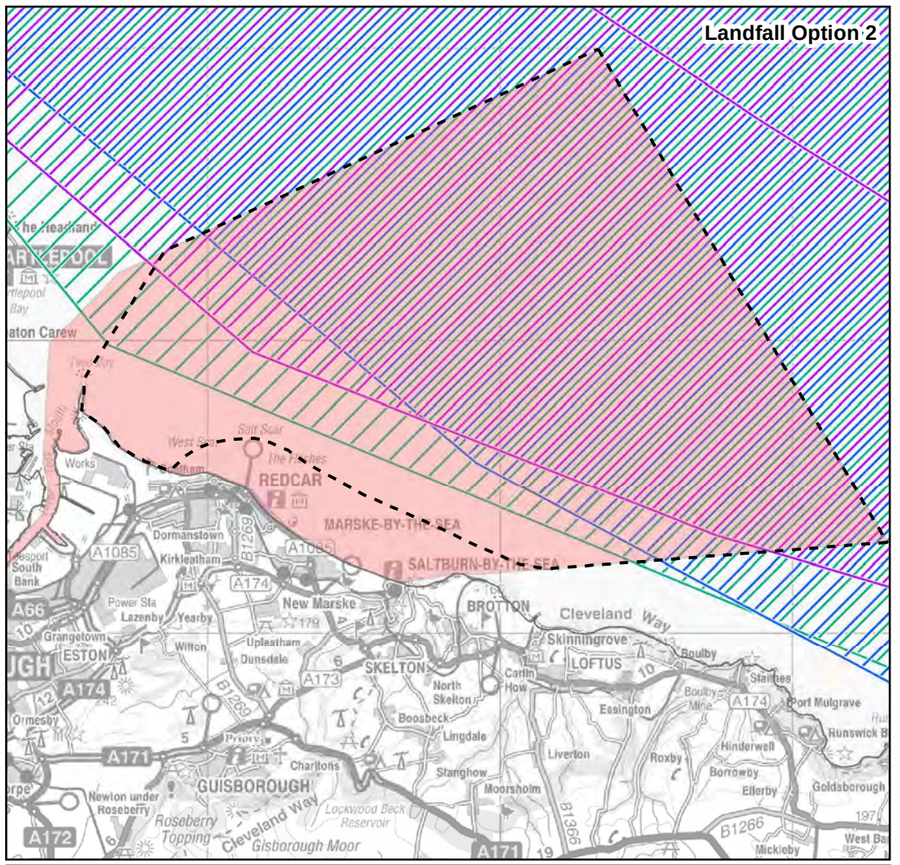
VER	DATE	REMARKS	Drawn	Checked	Approved
0	16/12/2011	Draft	GMC	PG	
1	07/03/2012	Final	LW	AP	

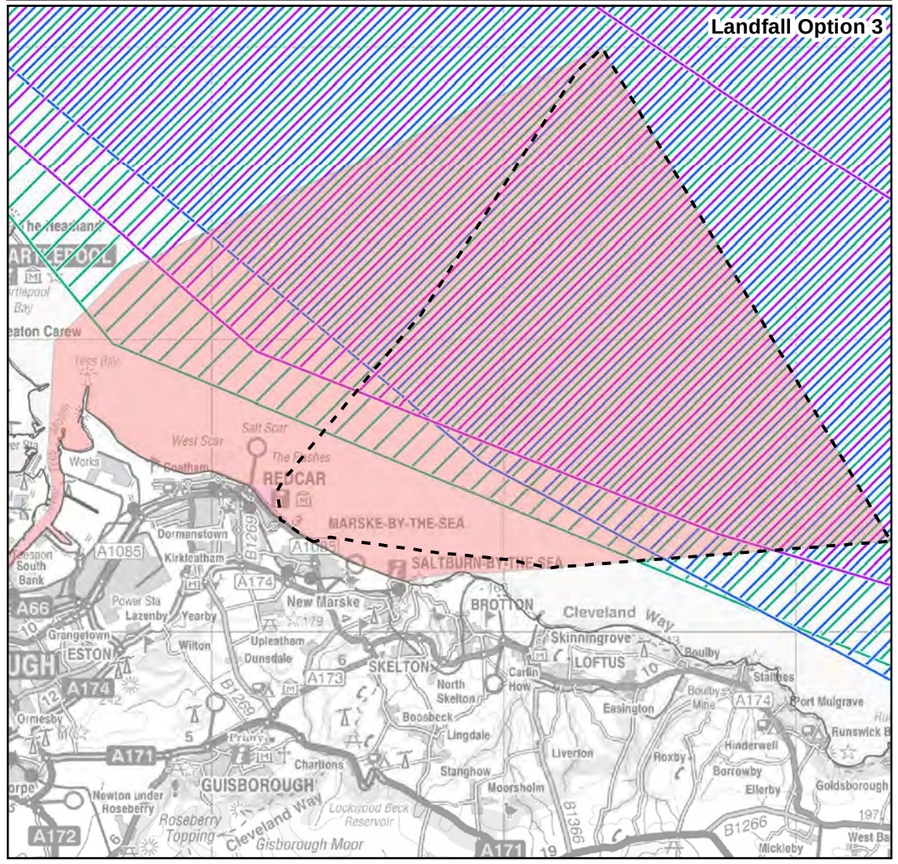
DRAWING NUMBER: **9W7904/TPCCCA/A8/00**

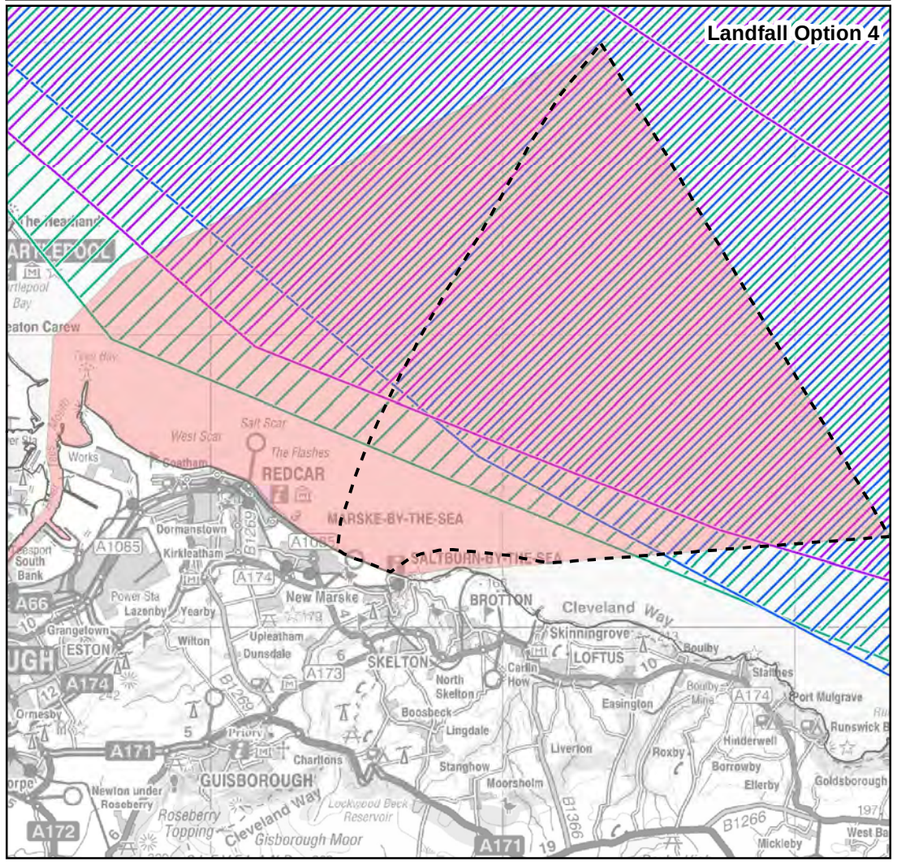
SCALE	1:350,000	PLOT SIZE	A3	DATUM	OSGB36	PROJECTION	BNG

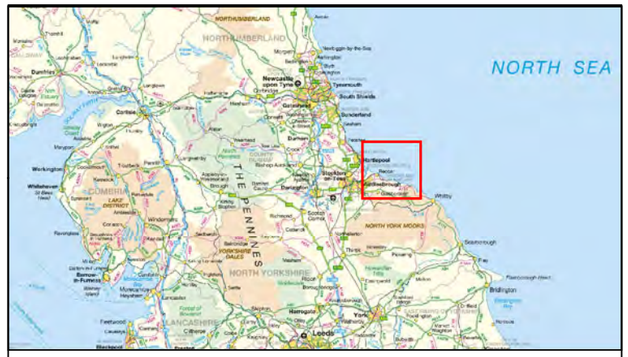
FOREWIND











LEGEND

- Nearshore Landfall Options
- Teesside Coastal Study Area
- Fishing Vessel Density: Potters and Whelkers
- Fishing Vessel Density: Other Trawlers
- Fishing Vessel Density: Long Liners

NB. No shellfish waters identified in the vicinity of areas 1 to 4

Source:
Ordnance Survey © Crown copyright and database right, 2012
Areas created by Forewind

0 1 2 4
Kilometres

PROJECT TITLE

DOGGER BANK R3 DEVELOPMENT

Dogger Bank Teesside Projects - Coastal Cable Corridor Assessment

DRAWING TITLE

Figure A9: Commercial Fisheries

VER	DATE	REMARKS	Drawn	Checked	Approved
0	16/12/2011	Draft	GMC	PG	
1	07/03/2012	Final	LW	AP	

DRAWING NUMBER: **9W7904/TPCCCA/A9/00**

SCALE	1:210,000	PLOT SIZE	A3	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

8 APPENDIX B: TEESSIDE OFFSHORE WIND FARM FEPA WORDING

Further to this a number of conditions were set out within the Food and Environmental Protection Act (1985) (FEPA) consent (Defra, 2007) granted for the project, which are directly relevant to bringing the cable ashore across the designated sites. They are:

- No equipment or plant will be stored within the SSSI boundary and access routes/schedules within the SSSI will be agreed with Natural England in advance;
- A detailed export and intra-array cable laying plan, including cable landfall works, should be presented to the Licensing Authority for approval at least four months prior to the proposed commencement of construction works, as indicated in the schedule required under condition 9.1 (condition 9.1 is a general condition relating to provision of a detailed schedule of planned construction and monitoring). The plan should use detailed geotechnical data to ascertain optimal cable burial depth along the length of the export cable (including works in the inter-tidal zone). This should be presented in conjunction with work undertaken to identify scour protection / armouring works required to protect the cable. The plan should detail the methods to be used for laying the cable, minimising where possible the use of jetting techniques. Cable laying in the vicinity of South Gare and Coatham Sands SSSI and Teesmouth and Cleveland Coast SPA shall not take place until such time as the Licensing Authority, in consultation with Cefas, Natural England and English Heritage, has approved the cable laying plan required under this condition.
- The Licence Holder must make every effort to ensure that the export cable in the intertidal zone is buried either by trenching or ploughing. If jetting is to be considered the written authorisation of the Licensing Authority should be sought four months prior to works commencing. In requesting that jetting be permitted the Licence Holder must submit details of e.g. predicted re-suspended sediment plumes, sensitive habitats and species and area affected so that the Licensing Authority in consultation with Cefas and Natural England can make an informed decision.
- If the use of jetting the export cable in the inter tidal zone is agreed, the Licence Holder will be required to carry out monitoring of suspended sediment concentrations within the area of jetting, and at a suitable control point outside the area. These monitoring reports must be forwarded to the Licensing Authority, Cefas and Natural England within one month of the completion of the jetting.
- The Licence Holder must ensure that if the export cable across the inter tidal zone is buried using trenching, the excavation and subsequent backfilling should be carried out in such a way as to maintain the sediment profile (i.e. surface sediments should be replaced at the surface and not mixed with those excavated from the bottom of the cable trench).

- The Licence Holder must ensure that no work associated with the cable installation, including the positioning of anchor points of any attendance vessels, is carried out in construction exclusion zones.

Further to the Natural England approach detailed above, the TBC's approach mentioned in LA1 should also be noted with regard to ornithological interests for LA2. It is highly likely that their stance will remain consistent and objections raised.

It is understood (RWE, 2010) that to avoid or minimise impacts on wintering birds; and disturbance to plants within Coatham Common installation works is required to take place in the period March to October. Construction work in the intertidal area outside of this period may therefore, be met with some form of resistance by the Statutory Nature Advisory Agencies, given this precedent.

Relevant FEPA conditions associated with the Breagh pipeline include:

- The Licence Holder must ensure that bunding and/or storage facilities are installed to contain and prevent the release of fuel, oils, and chemicals associated with plant, refuelling and construction equipment, into the marine environment. i.e. secondary containment should be used with a capacity of not less than 110% of the containers storage capacity.
- The Licence Holder must ensure that pre spoil disposal and post spoil removal sea bed surveys of the temporary spoil ground are to be conducted to demonstrate sea bed levels have been reinstated as far as is practical and are required to submit any reports to Natural England.
- The Licence Holder must ensure that all temporarily disposed of spoil is to be removed from the site as far as is practical and used to reinstate the dredged and trenched areas.
- The Licence Holder must ensure that a pre, during and post disposal/reinstatement surveys of Coatham Rocks is to be performed to assess sediment build up and are required to submit any reports to Natural England.
- The Licence Holder must ensure that if BAP priority habitats are found during any stage of the proposal then all disposing operations cease and a new temporary spoil ground is identified using Natural England's guidance.