Annex 6.1

Assessment of Potential Environmental Impacts of Alternative Scenarios of Supply Chain Arrangements

(ERM)

1 INTRODUCTION

1.1 PURPOSE OF THE APPRAISAL

1.1.1 The Environmental Statement (ES) establishes, in *Chapter 6*, that there are few sites available with the necessary features for the development of a marine energy park in the UK, and only the Able Marine Energy Park (AMEP) site is capable of supporting a significant development. The proposed AMEP site has been selected as a robust solution on both technical and policy bases and is unique in its size and optimal location.

1.1.2 As noted in *Chapter 6* of the ES, given the scale of development required to support the offshore wind sector, ports cannot necessarily be considered as alternatives to each other, as many facilities will be required to service this industry. Nevertheless, in order to demonstrate that there is no alternative solution that could provide the same facilities as AMEP with less environmental impact, it is important to examine comparable facilities that could be brought forward as an alternative to the proposed Project, and deliver an equivalent manufacturing and construction port cluster.

1.1.3 *Chapter 6* of the ES identifies a number of UK ports with the potential to be developed to serve the offshore wind industry in some capacity. Some of these demonstrably have insufficient land available, and others have constraints which militate against their suitability as true alternatives to AMEP.

1.1.4 However, it is noted in the ES that a combination of smaller sites could potentially provide a distributed facility of similar capacity to AMEP and its associated supply chain. In the absence of any single site that could be brought forward as a reasonable alternative to AMEP, there are two broad potential alternatives:

- manufacturing and construction sites distributed along the east coast of the UK; and
- manufacturing and construction sites distributed across the UK and the continent.

1.1.5 Whilst these two solutions could themselves have a number of alternatives within their scope, one reasonable option for each has been developed in order to make an informed comparison of relevant environmental impacts. These are presented in further detail in *Chapter 2* of this report.

1.2 METHODOLOGY

1.2.1 A desk-based study has been undertaken, drawing on data from a range of sources in order to understand the comparative environmental impacts associated with each of the three solution scenarios.

1.2.2 The study considers the potential for significant environmental effects of the alternatives, with respect to their likely impacts on sensitive receptors. These include natural resources, people and built resources. In order to do this, the following environmental objectives are considered:

- biodiversity;
- landscape;
- cultural heritage; and
- socio-economic factors.

1.2.3 Where relevant, population and the presence of residential areas are taken as a proxy for other potential impacts, such as noise and impacts on health.

1.2.4 This study does not explicitly take into account any impacts associated with ship movements between the component sites in each of the distribution chains. A separate carbon assessment has been undertaken (given in *Annex 6.1*), which demonstrates the key difference between the supply chains in this respect.

1.2.5 Each scenario comprises a number of sites, or components. For each component the baseline is described in broad terms in order to identify where there is the potential for impacts to occur. This information is then presented for each scenario as a whole to identify potential current and future constraints and opportunities which may arise.

1.2.6 This assessment focuses on how the three scenarios impact on the key environmental objectives against a reference case of "do-minimum".

1.2.7 Importantly, the potential impacts of each scenario are described in their own right. There has been no attempt to "weight" any of the objectives, nor have the impacts been "added together" in an attempt to provide an overall conclusion as such a process would be highly subjective. Thus the conclusions are presented in a transparent manner that will enable consultees and other stakeholders to understand each element of the appraisal.

1.3 STRUCTURE OF THE REPORT

1.3.1 Following this introductory section, the report is structured in the following way:

- *Chapter 2* provides a description of the three scenarios that have been considered, and includes a brief summary of the main baseline features of the component parts of each scenario.

- *Chapter 3* gives the results of the assessment undertaken for each component within these scenarios.

- *Chapter 4* sets out a summary of the potential impacts of each scenario as a whole.

2 THE POTENTIAL SOLUTIONS

2.1 THE SCENARIOS

2.1.1 There are three scenarios being considered for the purposes of this assessment, one of which includes AMEP and a potential supply chain.

2.1.2 Each scenario has an equal cumulative production capacity of:

- 600 nacelles per year
- 400 towers per year
- 400 sets of blades per year
- 50 foundations
- 150 000 T of supply chain components
- construction and export of 500 complete offshore wind turbines (OWTs) per year.

2.1.3 The first scenario includes the proposed Project, as follows:

- Scenario 1: All required manufacturing and construction at AMEP, with potential supply chain facilities at sites such as Able Seaton Port and Tyne Renewable Energy Park.

2.1.4 If AMEP is not consented, two potential alternatives have been identified which take into account that another development site of the same scale as AMEP does not exist in the UK, as follows:

- Scenario 2: An equivalent quantum of development on a number of sites along the east coast of Britain.

- Scenario 3: An equivalent quantum of development partly based in the UK and partly based on the continent.

2.1.5 Each scenario is presented in full below.

2.1.6 These scenarios are based on the premise that Greenport Hull and the Port of Sheerness developments are likely to proceed and therefore would be proposed in addition to AMEP (or the alternative solutions), not as an alternative.

2.1.7 Taking into account the need for manufacturing to be in relatively close proximity to Round 3 Offshore Wind Farm sites, in particular Dogger Bank, Hornsea and Norfolk, and the size of land parcel necessary for production, the spread of development considered in the scenarios above is considered reasonable.

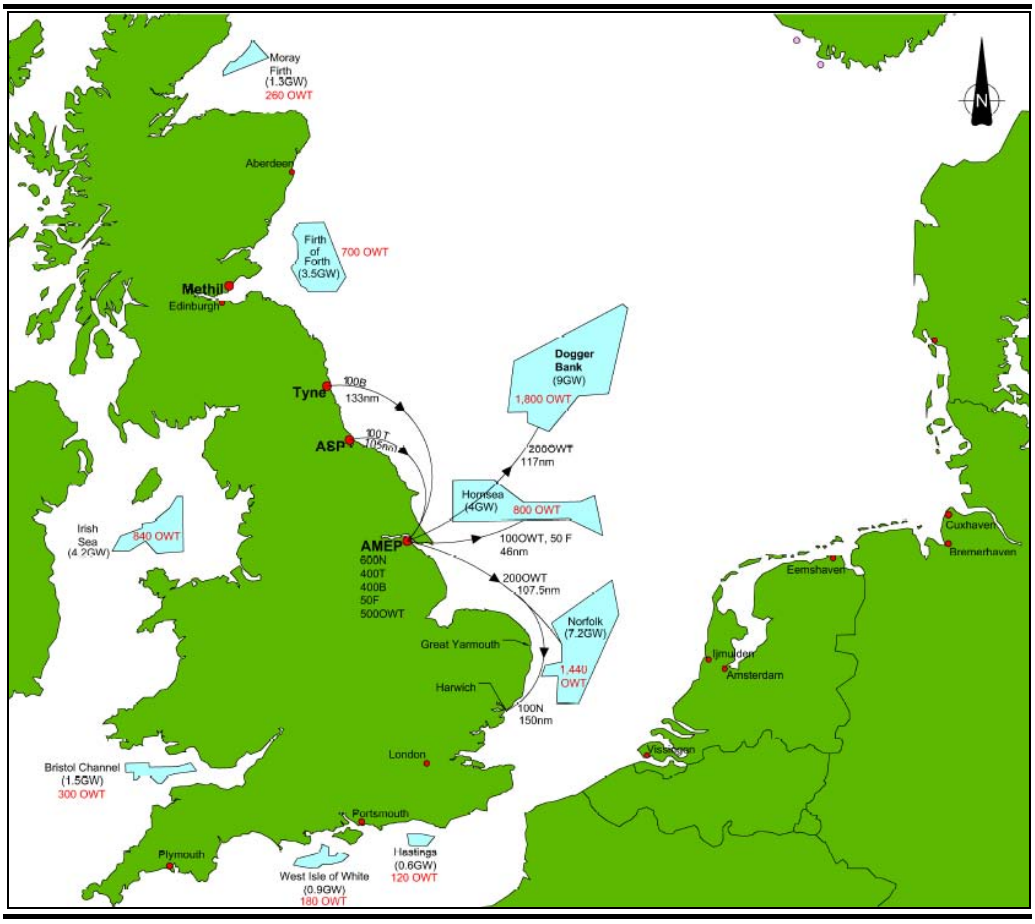
2.2 *SCENARIO 1: AMEP AND SUPPLY CHAIN*

2.2.1 The component sites which comprise Scenario 1 are presented in *Table 2.1* and *Figure 2.1*. It is important to recognise that the two component sites to the north of AMEP would only be required for expanding the supply chain should the onsite land at AMEP all be used. As such, this is a suggested supply chain, for assessment purposes only.

Table 2.1 Scenario 1: AMEP and Supply Chain

Component	Site available	Assumed activity
AMEP	322 ha with up to 1 200m quayside to be developed. Application for Marine Energy Park to be made to IPC.	600 nacelles per year 400 towers per year 400 sets of blades per year 50 foundations 150 000 T supply chain Components Construction of 500 OWT per year plus the export of 100 nacelles per year
Able Seaton Port	51 ha site with existing quayside of 300 m. Range of existing uses includes: platform de-commissioning, construction, ship breaking and repair, recycling and waste transfer.	100 towers per year
Tyne Renewable Energy Park	Available developable area of 80 ha with 700 m quayside in Neptune Energy Park. Offshore Technology Park adjacent offers 800 m quayside.	100 sets of blades per year

Figure 2.1 Scenario 1: AMEP and Supply Chain



2.3 SCENARIO 2: UK DISTRIBUTED SITES

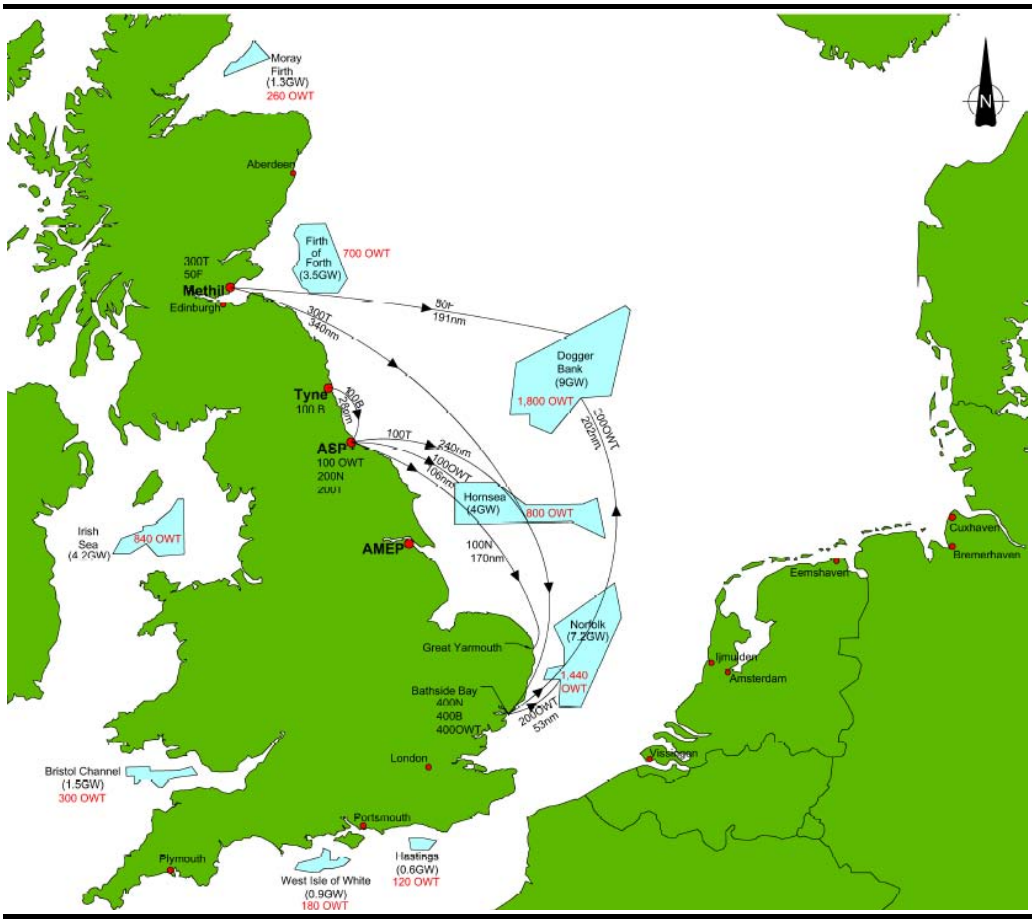
2.3.1 The component sites which comprise Scenario 2 are presented in *Table* 2.2 and *Figure 2.1*.

Table 2.2 Scenario 2: UK Distributed Sites

Component	Site available	Assumed activity
Bathside Bay (Harwich)	Planning consent for reclamation of 113 ha and construction of 1 400 m quayside for development of a container terminal, which expires in 2016. Change of use from container terminal would require amendment to existing consent or new consent.	2 nacelle manufacturers: 400 nacelles per year 2 blade manufacturers: 400 sets of blades per year 100 000 T supply chain components per year Construction of 400 OWTs per year

Component	Site available	Assumed activity
Able Seaton Port	51 ha site with existing quayside of 300 m. Range of existing uses includes: platform de-commissioning, construction, ship breaking and repair, recycling and waste transfer.	200 nacelles per year 50 000 T supply chain components per year Construction of 100 OWTs per year
Tyne Renewable Energy Park	Available developable area of 80 ha with 700 m quayside in Neptune Energy Park. Offshore Technology Park adjacent offers 800 m quayside.	100 sets of blades per year
Able Middlesbrough Port	Available developable area of 16 ha with 350 m quayside.	200 towers per year
Methil	54 ha Energy Park site, with 20 ha available for bespoke development. Total of 345 m quayside over two quays.	300 towers per year 50 foundation structures
Great Yarmouth	Newly developed outer harbour facilities with 22 ha available developable area and 1 000 m of quayside.	100 nacelles imported per year from Able Seaton Port

Figure 2.2 Scenario 2: UK Distributed Sites



2.4 SCENARIO 3: UK AND CONTINENT DISTRIBUTED SITES

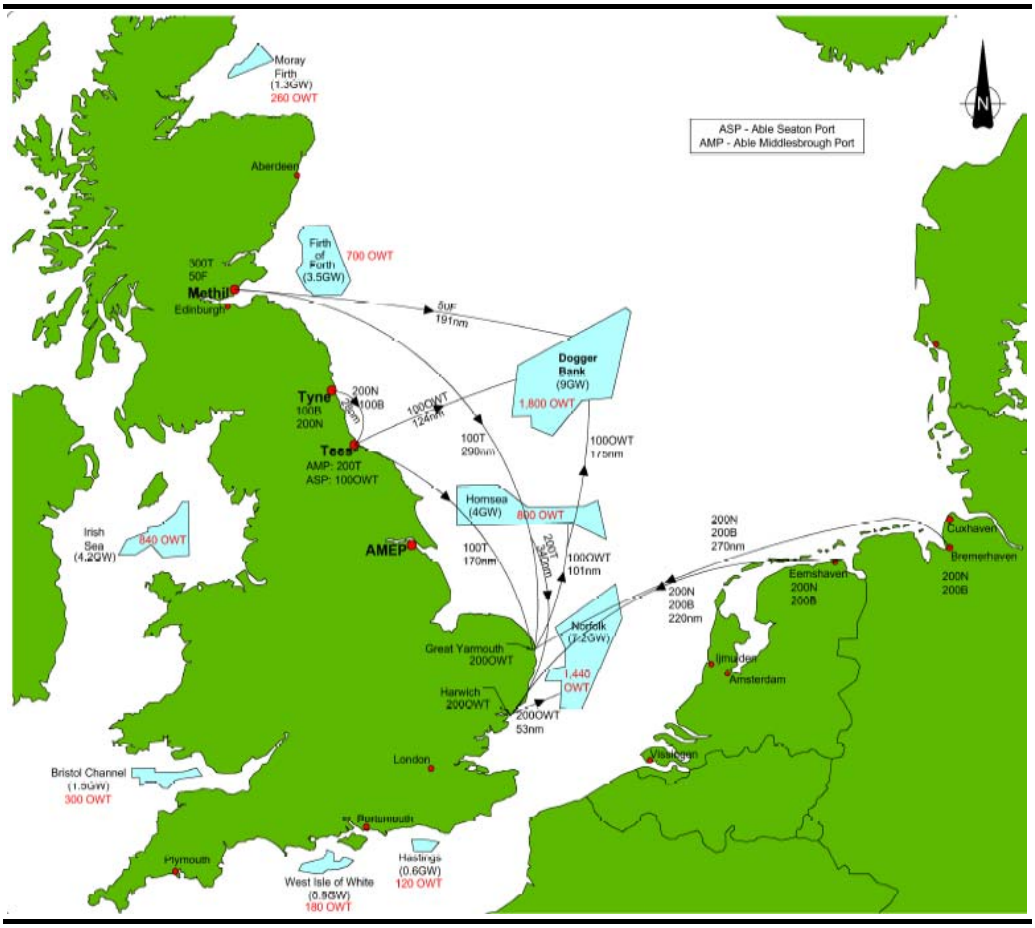
2.4.1 The component sites which comprise Scenario 3 are presented in *Table* 2.1 and *Figure 2.3*.

Table 2.3 Scenario 3: UK and Continent Distributed Sites

Component	Site available	Assumed activity
Bathside Bay (Harwich)	Planning consent for reclamation of 113 ha and construction of 1 400 m quayside for development of a container terminal, which expires in 2016. Change of use from container terminal would require amendment to existing consent or new consent.	Construction of 200 OWTs per year

Component	Site available	Assumed activity
Able Seaton Port	51 ha site with existing quayside of 300 m. Range of existing uses includes: platform de-commissioning, construction, ship breaking and repair, recycling and waste transfer.	Construction of 100 OWTs per year
Tyne Renewable Energy Park	Available developable area of 80 ha with 700 m quayside in Neptune Energy Park. Offshore Technology Park adjacent offers 800 m quayside.	100 sets of blades per year 200 nacelles per year
Able Middlesbrough Port	Available developable area of 16 ha with 350 m quayside	200 towers per year
Methil	54 ha Energy Park site, with 20 ha available for bespoke development. Total of 345 m quayside over two quays.	300 towers per year 50 foundation structures
Great Yarmouth	Newly developed outer harbour facilities with 22ha available developable area and 1 000 m of quayside.	Construction of 200 OWTs per year
Eemshaven, Netherlands	56 ha port site with 20 ha available for development with 1 150 m quayside. Existing high quality industrial and logistics operating in port area.	200 nacelles per year 200 sets of blades per year 150 000 T supply chain components per year
Bremerhaven, Germany	60 ha being developed for offshore turbine manufacturing, with 20 ha available for development. New offshore terminal to be constructed with 500 m quayside. At least an additional 60 ha identified for further manufacturing development.	200 nacelles per year 200 sets of blades per year

Figure 2.3 Scenario 3: UK and Continent Distributed Sites



3 ASSESSMENT OF SCENARIOS

3.1 POTENTIAL ENVIRONMENTAL IMPACTS

3.1.1 For each component of the scenarios, potential environmental impacts have been considered. As set out in *Chapter 1*, these fall under the four general categories of:

- biodiversity;
- landscape;
- cultural heritage; and
- socio-economics.

3.1.2 Under these categories, a number of specific areas have been assessed in determining the environmental baseline of the sites, along with the potential impacts which could arise should these sites be developed as part of a proposed supply chain for the offshore wind farm industry.

3.1.3 These impacts have been considered at a relatively high level for the purposes of this comparative exercise, and further examination and consultation with the appropriate regulatory bodies would be required to provide a detailed environmental assessment.

3.1.4 The three scenarios considered in this report comprise a number of potential individual development and supply chain component sites, as set out in *Chapter 2*.

3.1.5 The baseline and potential environmental impacts of each individual site are considered in turn. Although the baseline and potential impacts of AMEP are considered in detail in the ES, they are summarised here as part of this exercise.

Table 3.1 Environmental Baseline

Biodiversity
The following lie proximate to the potential development site: **Humber Estuary SSSI –** Nationally important site with a series of nationally important habitats. Comprises the estuary itself (with its component habitats of intertidal mudflats and sandflats and coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters. Also of national importance for geological interest at South Ferriby Cliff and coastal geomorphology of Spurn. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. Also nationally important for a breeding colony of grey seals, river lamprey and sea lamprey, a vascular plant assemblage and an invertebrate assemblage. **North Killingholme Haven Pits SSSI –** Three lagoons support a number of rare invertebrates including the tentacled lagoon-worm *Alkmaria romijni* and the spire snail *Hydrobia neglecta*. These pits are also important for migratory and wintering birds and attract many scarce species. **Humber Flats, Marshes and Coast SPA –** Comprises extensive wetland and coastal habitats within the Humber Estuary. The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. It also supports important breeding populations of terns and raptors in summer. **Humber Estuary SAC -** Humber is the second-largest coastal plain estuary in the UK. Habitats within the estuary include Atlantic salt meadows and a range of sand dune types in the outer estuary, together with subtidal sandbanks, extensive intertidal mudflats, glasswort beds and coastal lagoons. **Humber Estuary Ramsar Site -** The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed in places by limited areas of grazing marsh in the middle and outer estuary. On the north Lincolnshire coast the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The Estuary regularly supports internationally important numbers of waterfowl in winter and nationally important breeding populations in summer. **Humber Estuary Important Bird Area –** Important for breeding raptors and waders and wintering wildfowl and waders. It regularly holds 160,700 wintering and 69,100 passage waterbirds.
Landscape
No national designation. The site is already in industrial use and is surrounded by industrial scale development.
Cultural heritage
No scheduled monuments within 1 km of the approximate centre of the site.
Socio-economic
Residential - There are a number of single dwellings within 1 km of the approximate centre of the site (on land, not including offshore area of reclamation). **Existing use -** Lies within an existing industrial area adjacent to an existing port area and areas of arable land. **Deprivation –** The site falls across two LSOA code areas. Part of the site is rated 13,667 out of 32,482 on multiple deprivation scale in English Indices of Deprivation 2010 (with 1 being poorest quality of life and 32,482 being best). The remainder of the site is rated 17,327 out of 32,482.
Issues scoped out
Landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.3 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary (without mitigation)
Biodiversity		
Birds within Humber Estuary SSSI	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Geology within Humber Estuary SSSI	Potential damage during construction period	Temporary
	Potential damage or loss of strata during operation activities	Permanent
Mammals within Humber Estuary SSSI	Potential disturbance during construction period	Temporary
	Potential disturbance during operation activities	Permanent
Birds within North Killingholme Haven Pits SSSI	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Invertebrates within North Killingholme Haven Pits SSSI	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Habitats within Humber Flats, Marshes and Coast SPA	Potential disturbance of habitats during construction period	Temporary
	Potential disturbance during operation	Permanent
Birds within Humber Flats, Marshes and Coast SPA	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Habitats within Humber Estuary SAC	Potential disturbance of habitats during construction period	Temporary
	Potential disturbance during operation	Permanent
Birds within Humber Estuary Important Bird Area	Potential disturbance of birds during construction period	Temporary

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary (without mitigation)
	Potential disturbance from light or new structures during operation	Permanent
Birds within Humber Estuary	Potential disturbance and displacement as a result of land reclamation	Permanent
Habitats within Humber Estuary	Potential disturbance and displacement as a result of land reclamation	Permanent
Socio-economic		
Regeneration	Potential regeneration benefits through increased employment and economic activity of a site within bottom 50 percent of multiple deprivation index	Permanent
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

3.3 ABLE SEATON PORT, TEES

Table 3.4 Environmental Baseline

Biodiversity
The following lie within 1 km of the approximate centre of the potential development site: **Seal Sands SSSI –** Internationally important concentrations of shelduck. Sizeable flocks of mallard, teal and widgeon, pochard, goldeneye and tufted duck. Important concentrations of knot and redshank. Mudflats also used by wading birds at high tide as roosting sites. **Seaton Dunes and Common SSSI –** Range of habitats include sandy, muddy and rocky foreshore; dunes, dune slacks and dune grassland; relict saltmarsh, grazed freshwater marsh with dykes, pools and seawalls. Dune flora includes nationally rare rush-leaved fescue *Festuca juncifolia* and sea couch *Agrophyron pungens*. Two nationally rare species of beetle *Hydnobius perrisi* and *Philonthus atratus*. Also rare spider *Silometopus incurvatus*. Important winter feeding and roost sites for sanderling, knot, ringed plover, turnstone, oystercatcher, dunlin and grey plover. Teesmouth population of sanderling exceeds internationally important levels with almost half feeding and roosting in Seaton Dunes and Common SSSI. Nationally significant populations of other wading birds. **Tees and Hartlepool Foreshore and Wetlands SSSI –** These coastal areas support the internationally important population of wildfowl and waders on the Tees Estuary. In winter the site supports nationally important numbers of purple sandpiper, sanderling and shoveler. Other birds regularly feed and roost on parts of this site. Saltholme and Dorman's Pools and Haverton Hole support a nationally important assemblage of breeding birds which includes shoveler, pochard, little ringed plover and great crested and little grebe. **Teesmouth and Cleveland Coast SPA –** Includes a range of coastal habitats which provide feeding and roosting ground for important numbers of waterbirds in winter and during passage periods. Little tern breed on beaches in the summer. Sandwich

Tern are abundant on passage. **Teesmouth and Cleveland Coast Ramsar Site -** Site encompassing a range of sand and mudflats, rocky shore, saltmarsh, freshwater marsh and sand dunes. Together these habitats support internationally important numbers of waterbirds. **Teesmouth National Nature Reserve –** coastal reserve with a range of habitats including intertidal mud and sand flats, sand dune systems, saltmarsh and grazing marsh. **Teesmouth and Cleveland Coast Important Bird Area –** Comprises the Tees Estuary, nearby marshes, rocky and sandy beaches on either side of the mouth of the Estuary and surrounding damp grassland.
Landscape
No national designation. The site is already in industrial use and is surrounded by industrial scale development.
Cultural heritage
No scheduled monuments within 1 km of the approximate centre of the site.
Socio-economic
Residential - There are no residential areas within 1 km of the approximate centre of the site. **Existing use -** Lies within an existing industrial area. **Deprivation –** Rated 17,010 out of 32,482 on multiple deprivation scale in English Indices of Deprivation 2010 (with 1 being most poor quality of life and 32,482 being best).
Issues scoped out
Landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.5 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Biodiversity		
Birds within Seal Sands SSSI	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Habitat within Seaton Dunes and Common SSSI	Potential disturbance during start up period	Temporary
	Potential disturbance during operation activities	Permanent
Fauna within Seaton Dunes and Common SSSI	Potential disturbance during start up period	Temporary
	Potential disturbance during operation activities	Permanent
Birds within Seaton Dunes and Common SSSI	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Birds within Tees and Hartlepool Foreshore and Wetlands SSSI	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth and Cleveland Coast SPA	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth and Cleveland Coast Ramsar Site	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth National Nature Reserve	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth and Cleveland Coast Important Bird Area	Potential disturbance of birds during start up period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Socio-economic		
Regeneration	Potential significant regeneration benefits through increased employment and economic activity of a site within bottom 25 percent of multiple deprivation index	Permanent
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

Table 3.6 Environmental Baseline

Biodiversity
There are no sites of biodiversity significance within 1 km of the approximate centre of the site.
Landscape
No national designation. The site is already in industrial use and is adjacent to industrial scale development.
Cultural heritage
No scheduled monuments within 1 km of the approximate centre of the site.
Socio-economic
Residential - There are a number of residential areas within 1 km of the approximate centre of the site. **Existing use -** Lies within an existing industrial area. **Deprivation –** Rated 209 out of 32,482 on multiple deprivation scale in English Indices of Deprivation 2010 (with 1 being most poor quality of life and 32,482 being best).
Issues scoped out
Biodiversity, landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.7 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Socio-economic		
Population and human health	Potential disturbance through noise and vibration during construction period	Temporary
	Potential disturbance from light or noise during operation	Permanent
Regeneration	Potential significant regeneration benefits through increased employment and economic activity of a site within bottom 25 percent of multiple deprivation index	Permanent
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

3.5 PORT OF GREAT YARMOUTH

Table 3.8 Environmental Baseline

Biodiversity
There are no sites of biodiversity significance within 1 km of the approximate centre of the site.
Landscape
The site lies within an existing port area adjacent to industrial development.
Cultural heritage
No scheduled monuments within 1 km of the approximate centre of the site.
Socio-economic
Residential - There are a number of residential areas within 1 km of the approximate centre of the site. **Existing use -** Lies within an existing industrial area, proximate to tourist / recreational attractions. **Deprivation –** Rated 1,166 out of 32,482 on multiple deprivation scale in English Indices of Deprivation 2010 (with 1 being most poor quality of life and 32,482 being best).
Issues scoped out
Biodiversity, landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.9 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Socio-economic		
Population and human health	Potential disturbance through noise and vibration during construction period	Temporary
	Potential disturbance from light or noise during operation	Permanent
Tourism	Potential impact on tourism at nearby tourist attractions	Temporary (construction) Permanent (operation)
Regeneration	Potential significant regeneration benefits through increased employment and economic activity of a site within bottom 25 percent of multiple deprivation index	Permanent
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

Table 3.10 Environmental Baseline

Biodiversity
The following lie within 1 km of the potential development site: **Tees and Hartlepool Foreshore and Wetlands SSSI –** These coastal areas support the internationally important population of wildfowl and waders on the Tees Estuary. In winter the site supports nationally important numbers of purple sandpiper, sanderling and shoveler. Other birds regularly feed and roost on parts of this site. Saltholme and Dorman's Pools and Haverton Hole support a nationally important assemblage of breeding birds which includes shoveler, pochard, little ringed plover and great crested and little grebe. **Teesmouth and Cleveland Coast SPA –** Includes a range of coastal habitats which provide feeding and roosting ground for important numbers of waterbirds in winter and during passage periods. Little tern breed on beaches in the summer. Sandwich Tern are abundant on passage. **Teesmouth and Cleveland Coast Ramsar Site -** Site encompassing a range of sand and mudflats, rocky shore, saltmarsh, freshwater marsh and sand dunes. Together these habitats support internationally important numbers of waterbirds. **Teesmouth and Cleveland Coast Important Bird Area –** Comprises the Tees Estuary, nearby marshes, rocky and sandy beaches on either side of the mouth of the Estuary and surrounding damp grassland.
Landscape
No national designation. The site is already in industrial port use and is surrounded by industrial scale development.
Cultural heritage
No scheduled monuments within 1 km of the site.
Socio-economic
Residential - There are currently no residential areas within 1 km of the approximate centre of the site. However, it is recognised that there are proposals for a large development at Middlehaven, which would include residential development. For the purposes of assessment only existing development has been considered. **Existing use -** Lies within an existing industrial area. **Deprivation –** Rated 31 out of 32,482 on multiple deprivation scale in English Indices of Deprivation 2010 (with 1 being most poor quality of life and 32,482 being best).
Issues scoped out
Landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.11 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Biodiversity		
Birds within Tees and Hartlepool Foreshore and Wetlands SSSI	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth and Cleveland Coast SPA	Potential disturbance of birds during construction period	Temporary

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth and Cleveland Coast Ramsar Site	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Teesmouth and Cleveland Coast Important Bird Area	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Socio-economic		
Regeneration	Potential significant regeneration benefits through increased employment and economic activity of a site within bottom 25% percent of multiple deprivation index	Permanent
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

3.7 BATHSIDE BAY

Table 3.12 Environmental Baseline

Biodiversity
The following lie within 1 km of the potential development site: **Stour Estuary SSSI –** Nationally important for 13 species of wintering waterfowl and three species on autumn passage. Also of national importance for coastal saltmarsh, sheltered muddy shores, two scarce marine invertebrates and a vascular scarce plant assemblage. The Estuary also includes three nationally important geological sites. **Stour and Orwell Estuaries SPA –** include extensive mud-flats, low cliffs, saltmarsh and small areas of vegetated shingle on the lower reaches. Also includes an area of low-lying grazing marsh at Shotley Marshes. In summer, the site supports important numbers of breeding avocet, while in winter they hold major concentrations of waterbirds, especially geese, ducks and waders. The geese also feed, and waders roost, in surrounding areas of agricultural land outside the SPA. **Stour and Orwell Estuaries Ramsar Site –** A wetland of international importance comprising extensive mudflats, low cliffs, saltmarsh and small areas of vegetated shingle on the lower reaches. Provides habitats for an important assemblage of wetland birds in the non-breeding season and supports internationally important numbers of wintering and passage wildfowl and waders. Also holds several nationally scarce plants and British Red Data Book invertebrates.
Landscape
No national designation. The site is a currently undeveloped bay which adjacent to an existing international port and container terminal. However the bay itself is not currently used for industrial activities.
Cultural heritage

The following lie within 1 km of the potential development site: **Napoleonic coastal battery -** The monument includes the buried remains of a coastal battery on the north western side of the Harwich peninsula, located beneath Stour Road and the verge which separates it from the Dovercourt Bypass. **Harwich High Lighthouse -** a brick built lighthouse situated towards the south eastern corner of the historic town of Harwich. Listed Building Grade II*, was constructed in 1818 as one of a pair of leading lights signalling the safe approach to Harwich Harbour. **The Harwich Redoubt -** a fortified gun tower, or redoubt. Listed Grade II*, built between 1807 and 1809 to protect this important deep water harbour in the event of invasion or attack by Napoleon's forces. **Beacon Hill Fort -** a late 19th and 20th century coastal artillery fortification. Includes the buried and standing remains of a succession of coastal artillery batteries and associated military installations within two areas of protection located on Beacon Hill.
Socio-economic
Residential - There are a number of residential areas within 1 km of the site. **Existing use –** Currently un-reclaimed bay adjacent to an international port terminal. **Deprivation –** Rated 6,674 out of 32,482 on multiple deprivation scale in English Indices of Deprivation 2010 (with 1 being most poor quality of life and 32,482 being best). Rating taken at nearest on-land point.
Issues scoped out
No aspects scoped out

Table 3.13 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Biodiversity		
Birds within Stour Estuary SSSI	Potential disturbance of birds during construction period	Temporary with potential for permanent disturbance
	Potential disturbance from light or new structures during operation	Permanent
	Loss of feeding and wading ground through land reclamation required for operation	Permanent
Habitats within Stour Estuary SSSI	Potential disturbance of habitats during construction period	Temporary with potential for permanent disturbance
	Loss of habitats through land reclamation required for operation	Permanent
Geology within Stour Estuary SSSI	Damage to important geological strata during construction	Permanent
	Damage to important geological strata through land reclamation required for operation	Permanent
	Potential disturbance from	Permanent

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
	light or new structures during operation	
Birds within Stour and Orwell Estuaries SPA	Potential disturbance of birds during construction period	Temporary with potential for permanent disturbance
	Potential disturbance from light or new structures during operation	Permanent
	Loss of feeding and wading ground through land reclamation required for operation	Permanent
Birds within Stour and Orwell Estuaries Ramsar Site	Potential disturbance of birds during construction period	Temporary with potential for permanent disturbance
	Potential disturbance from light or new structures during operation	Permanent
	Loss of feeding and wading ground through land reclamation required for operation	Permanent
Flora within Stour and Orwell Estuaries Ramsar Site	Potential disturbance during construction period	Temporary with potential for permanent disturbance
	Loss of flora through land reclamation required for operation	Permanent
Landscape		
Adjacent residential areas	Visual intrusion during construction	Temporary
	Visual intrusion during operation period	Permanent
Cultural heritage		
Napoleonic coastal battery	Potential impact on setting of monument	Permanent
Harwich High Lighthouse	Potential impact on setting of monument	Permanent
Harwich Redoubt	Potential impact on setting of monument	Permanent
Beacon Hill Fort	Potential impact on setting of monument	Permanent
Socio-economic		
Population and human health	Potential disturbance through noise and vibration during construction period	Temporary
	Potential disturbance from light or noise during operation	Permanent
Regeneration	Potential significant	Permanent

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
	regeneration benefits through increased employment and economic activity of a site within bottom 25% percent of multiple deprivation index	
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

3.8 METHIL

Table 3.14 Environmental Baseline

Biodiversity
The following lie within 1 km of the potential development site: **Firth of Forth SSSI –** Important for the variety of coastal habitats. The estuary contains extensive invertebrate-rich intertidal mudflats which provide feeding grounds for nationally and internationally important numbers of wintering and migratory birds, including waders, large numbers of wildfowl, shelduck and pink-footed geese. Includes mudflats and saltmarshes which support scarce plants and providing feeding and roosting grounds for birds, which are also a natural coastal defence. **Firth of Forth SPA –** Comprises a range of coastal and intertidal habitats, including saltmarshes, dune systems, maritime grasslands, heath and fen, cliff slopes, shingle and brackish lagoons. The flats support rich invertebrate fauna. The Firth is of major importance for a rich assemblage of waterbirds in migration period and throughout winter, including divers, se-ducks, geese, other ducks, waders and terns. Some species, notably sea-ducks and divers, feed, loaf and roost in open waters of the estuary. **Firth of Forth Ramsar Site –** large coastal area comprising a complex of estuaries, mudflats, rocky shorelines, beaches and saltmarshes. It is considered to act as a single ecological unit. Several large urban areas are adjacent to the site and these include several areas of heavy industry. The Forth is one of the most important shipping areas in Scotland. The site is important for a large number of wintering waders and wildfowl, many in nationally and internationally important numbers. **Firth of Forth Important Bird Area -** large areas of intertidal flats and inshore waters, in addition to saltmarsh and sand-dune systems, maritime grassland, heath and fen.
Landscape
No national designation. The site is currently used for industrial activities and is adjacent to existing port facilities. There does not appear to be any permanent industrial-scale buildings on the site at present. The site lies within an area known as Fife Energy Park.
Cultural heritage
There are no scheduled monuments identified within 1 km of the site.
Socio-economic
The site is currently in industrial use, adjacent to existing harbour facilities. There are a number of residential developments within 1 km of the site. **Residential -** There are a number of residential areas within 1 km of the site. **Existing use -** Lies within an existing industrial area adjacent to port facilities. **Deprivation –** Rated 1280 out of 6505 on multiple deprivation scale in Scottish Indices of Deprivation 2009(with 1 being most poor quality of life and 6505 being best).

Issues scoped out
Cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.15 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Biodiversity		
Birds within Firth of Forth SSSI	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Other fauna within Firth of Forth SSSI	Potential disturbance of habitats during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Coastal defences	Potential damage to important natural coastal defences	Permanent
Birds within Firth of Forth SPA	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Invertebrates within Firth of Forth SPA	Potential disturbance of birds during construction period	Temporary
	Potential disturbance during operation	Permanent
Birds within Firth of Forth Ramsar Site	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Important Bird Area	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
	Potential disturbance to feeding and wading ground	Permanent
Landscape		
Adjacent residential areas	Visual intrusion during construction	Temporary
	Visual intrusion during operation period	Permanent
Socio-economic		
Population and human health	Potential disturbance through noise and vibration	Temporary

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
	during construction period	
	Potential disturbance from light or noise during operation	Permanent
Regeneration	Potential significant regeneration benefits through increased employment and economic activity of a site within bottom 25% percent of multiple deprivation index	Permanent
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

3.9 EEMSHAVEN, NETHERLANDS

Table 3.162 Environmental Baseline

Biodiversity
The following lie proximate to the potential development site: **Waddenzee SAC –** This area comprises estuary, sandbanks, mudflats and sandflats which support three protected species of fish and two protected species of mammals. **Waddenzee SPA –** This area supports 50 protected species of birds. **Hund und Paapsand SAC and SPA –** This estuary supports 17 protected species of birds and one protected species of mammal.
Landscape
The site is already in industrial port use and is surrounded by industrial scale development.
Cultural heritage
No scheduled heritage sites or monuments identified at or proximate to the site.
Socio-economic
Residential - There are no residential areas within 1 km of the site. **Existing use -** Lies within an existing industrial area. **Deprivation –** Key economic area of region. Deprivation indices unavailable.
Issues scoped out
Landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.17 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Biodiversity		
Fish within Waddenzee SCI	Potential disturbance during construction period	Temporary
	Potential disturbance from new activity during	Permanent

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
	operation	
Mammals within Waddenzee SCI	Potential disturbance during construction period	Temporary
	Potential disturbance from light or new structures and activity during operation	Permanent
Birds within Waddenzee SPA	Potential disturbance of birds during construction period	Temporary
	Potential disturbance from light or new structures during operation	Permanent
Birds within Hund und Paapsand Birds SCI and SPA	Potential disturbance during construction period	Temporary
	Potential disturbance from new activity during operation	Permanent
Mammals within Hund und Paapsand SCI and SPA	Potential disturbance during construction period	Temporary
	Potential disturbance from new activity during operation	Permanent
Socio-economic		
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

3.10 BREMERHAVEN, GERMANY

Table 3.18 Environmental Baseline

Biodiversity
The following lie proximate to the potential development site: **Weser Bei Bremerhaven SAC –** This area of estuary supports three protected species of fish. **Unterweser SAC and SPA –** This area supports 71 protected species of birds.
Landscape
The site is undeveloped industrial land proximate to industrial scale development.
Cultural heritage
No scheduled heritage sites or monuments identified at or proximate to the site.
Socio-economic
Residential - There are no residential areas within 1 km of the site. **Existing use -** Lies within an existing industrial area. **Deprivation –** Key economic area of region. Deprivation indices unavailable.
Issues scoped out
Landscape and cultural heritage issues have been scoped out as it is considered unlikely that development would give rise to significant adverse or positive impacts.

Table 3.19 Assessment of Potential Environmental Impacts

Environmental receptor	Potential effect (without mitigation)	Permanent / Temporary
Biodiversity		
Fish within Weser Bei Bremerhaven SAC	Potential disturbance during construction period	Temporary
	Potential disturbance from new activity during operation	Permanent
Birds within Unterweser SAC and SPA	Potential disturbance during construction period	Temporary
	Potential disturbance from light or new structures and activity during operation	Permanent
Socio-economic		
Local employment	Potential positive impact on local employment	Temporary (construction) Permanent (operation)

4.1.1 This chapter provides a summary of the potential environmental impacts of Scenario 2 (manufacturing and construction sites distributed along the east coast of the UK) and Scenario 3 (manufacturing and construction sites distributed across the UK and the continent) compared against Scenario 1 (AMEP and potential supply chain). For each scenario, the potential impacts of each component site on environmental receptors have been identified. The summary of the impact of each scenario identifies positive impacts (denoted by a tick) and potential adverse impacts (denoted by a cross). Regeneration impacts have been scaled, with one tick indicating some regeneration benefit of sites in the bottom 50 percent of the multiple deprivation index and two ticks denoting potentially significant regeneration benefits for sites in the lowest 25 percent of the index.

4.1.2 Mitigation of adverse impacts has not been considered as part of this assessment.

Table 4.1 Potential Environmental Impacts (Scenario 1 and Scenario 2)

	Scenario 1			Scenario 2					
	AMEP	**Able Seaton Port**	**Tyne Renewable Energy Park**	**Bathside Bay**	**Able Seaton Port**	**Tyne Renewable Energy Park**	**Able Middlesbrough Port**	**Methil**	**Great Yarmouth**
Biodiversity									
Special Area of Conservation (SAC)	X								
Special Protection Area (SPA)	X	X		X	X		X	X	
Site of Special Scientific Interest (SSSI)	X	X		X	X		X	X	
Ramsar Site	X	X		X	X		X	X	
National Nature Reserve		X			X				
Important Bird Area	X	X			X		X	X	
Landscape									
Area of Outstanding Natural Beauty									
Cultural Heritage									
Scheduled Monument Protected Wreck Site World Heritage Site				X					
Socio-economic									
Regeneration	✔	✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔
Employment	✔	✔	✔	✔	✔	✔	✔	✔	✔
Tourism									X
Impact on nearby residential area			X	X		X		X	X

Table 4.2 Potential Environmental Impacts (Scenario 1 and Scenario 3)

	Scenario 1			Scenario 3							
	AMEP	**Able Seaton Port**	**Tyne Renewable Energy Park**	**Bathside Bay**	**Able Seaton Port**	**Tyne Renewable Energy Park**	**Able Middlesbrough Port**	**Methil**	**Great Yarmouth**	**Eemshaven, Netherlands**	**Bremerhaven, Germany**
Biodiversity											
Special Area of Conservation (SAC)	X									X	X
Special Protection Area (SPA)	X	X		X	X		X	X		X	X
Site of Special Scientific Interest (SSSI)	X	X		X	X		X	X			
Ramsar Site	X	X		X	X		X	X			
National Nature Reserve		X			X						
Important Bird Area	X	X			X		X	X			
Landscape											
Area of Outstanding Natural Beauty											
Cultural Heritage											
Scheduled Monument				X							

	Scenario 1			Scenario 3							
	AMEP	**Able Seaton Port**	**Tyne Renewable Energy Park**	**Bathside Bay**	**Able Seaton Port**	**Tyne Renewable Energy Park**	**Able Middlesbrough Port**	**Methil**	**Great Yarmouth**	**Eemshaven, Netherlands**	**Bremerhaven, Germany**
Protected Wreck Site World Heritage Site											
Socio-economic											
Regeneration	✔	✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔		
Employment	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Tourism									X		
Impact on nearby residential area			X	X		X		X	X		

4.2 SUMMARY OF ASSESSMENT

4.2.1 This assessment presents the potential environmental impacts of each component of the scenarios set out in *Chapter 2*. The purpose of the assessment is to identify potential environmental constraints and does not seek to establish an overall "best scenario", but to demonstrate the comparative benefits and adverse impacts between the AMEP scenario and the alternative scenarios presented above.

4.2.2 *Table 4.1* and *Table 4.2* present each of the alternative scenarios in comparison to the proposed AMEP development and this allows the cumulative potential impacts of the scenarios to be compared.

4.2.3 It is evident from this assessment that the AMEP scenario compares favourably with the alternative scenarios and there is no solution which stands out as providing an option with less potential adverse environmental impact than AMEP.

4.2.4 It could be suggested that the spread of potential environmental impact may be greater for those scenarios which include more sites. However, it is important to confirm that no weighting has been attached to any of the environmental objectives considered and therefore the spread of potential impacts does not necessarily equate to an overall increased adverse environmental impact.

4.2.5 All of the scenarios present a solution which could impact on designated ecological sites, including Natura 2000 sites, although Scenario 2 (UK distributed sites) does not encroach on a SAC.

4.2.6 It should be also noted that, in addition to the potential impacts on biodiversity, a number of the sites in the alternative scenarios lie proximate to residential and recreational areas. This could give rise to impacts on air quality, noise and general enjoyment, along with potential economic impacts on these areas.

4.2.7 Scenario 1 (AMEP and potential supply chain), which includes one site proximate to residential development, and does not include sites close to a tourist area, compares well against the alternative scenarios, which both include four sites adjacent to residential areas and one which is proximate to an area which has a strong tourist economy. It also includes sites which would benefit from economic and employment growth and aid regeneration of areas which fall into the lower percentiles of multiple deprivation indices.

4.2.8 It is recognised that there is the potential for significant regeneration benefits at component sites in the alternative scenarios. However, Scenario 1 couples regeneration benefits without having adverse impacts of some of the alternative scenario components, which are located proximate to sensitive residential and recreational areas.

4.2.9 In summary, this assessment demonstrates that each of the scenarios would have some adverse environmental impact and positive socio-economic impact. However, it is clear that the AMEP scenario is not out-performed by any of the alternative options and there is no scenario which provides a demonstrably 'better' environmental solution.

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A	18/08/2011	Preliminary Issue	MTC	WB	SP

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ERM

Project: ABLE Marine Energy Park

Client: ABLE UK Ltd

Title: Figure 3.1
Able Marine Energy Park

Scale:	Drawn	Checked	Approved
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Date	18/08/2011	18/08/2011	18/08/2011

Drawing No. ABLE_Humber.mxd

Revision:. A

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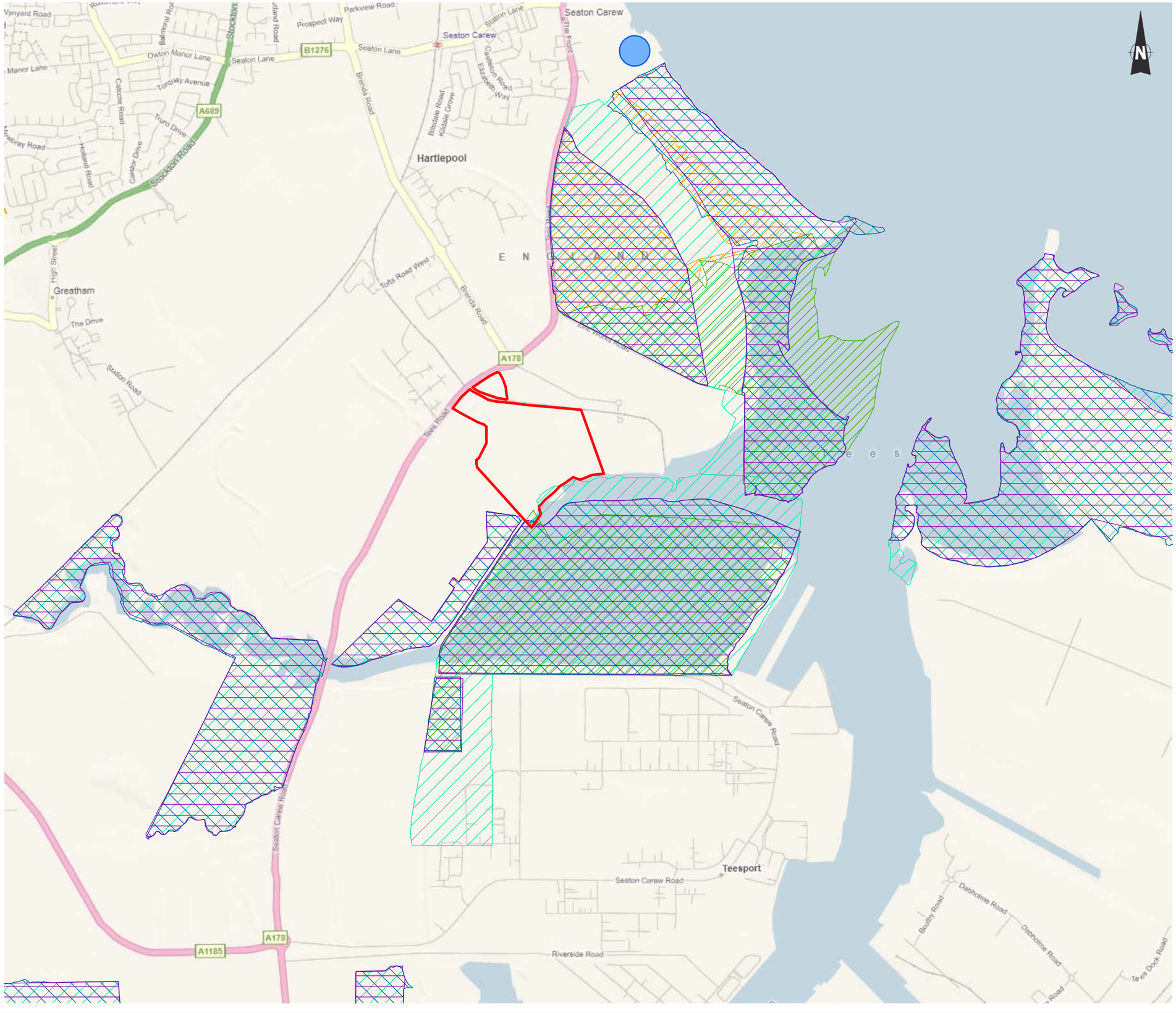

Key

- Alternative Site Boundary
- AONB
- SAC
- SPA
- RAMSAR
- SSSI
- NNR
- LNR
- Scheduled Monuments
- Protected Wrecks

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Project: ABLE Marine Energy Park

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Title: Figure 3.2
Seaton Port

Scale:	Drawn	Checked	Approved
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Date	18/08/2011	18/08/2011	18/08/2011

Drawing No. ABLE_SeatonPort.mxd

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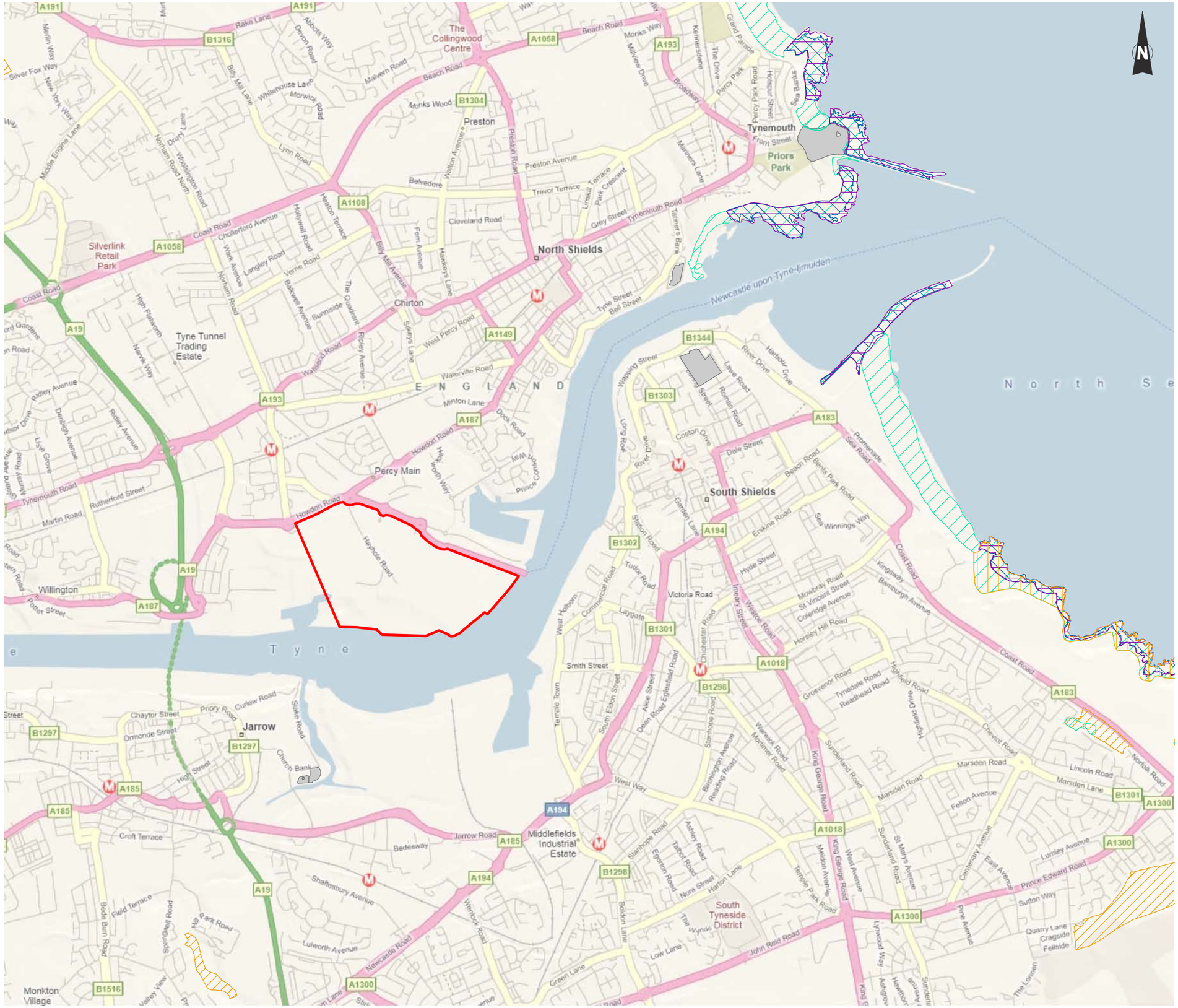

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Project: ABLE Marine Energy Park

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Title: Figure 3.3
Tyne Renewable Energy Park

Scale:	Drawn	Checked	Approved
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Date	18/08/2011	18/08/2011	18/08/2011

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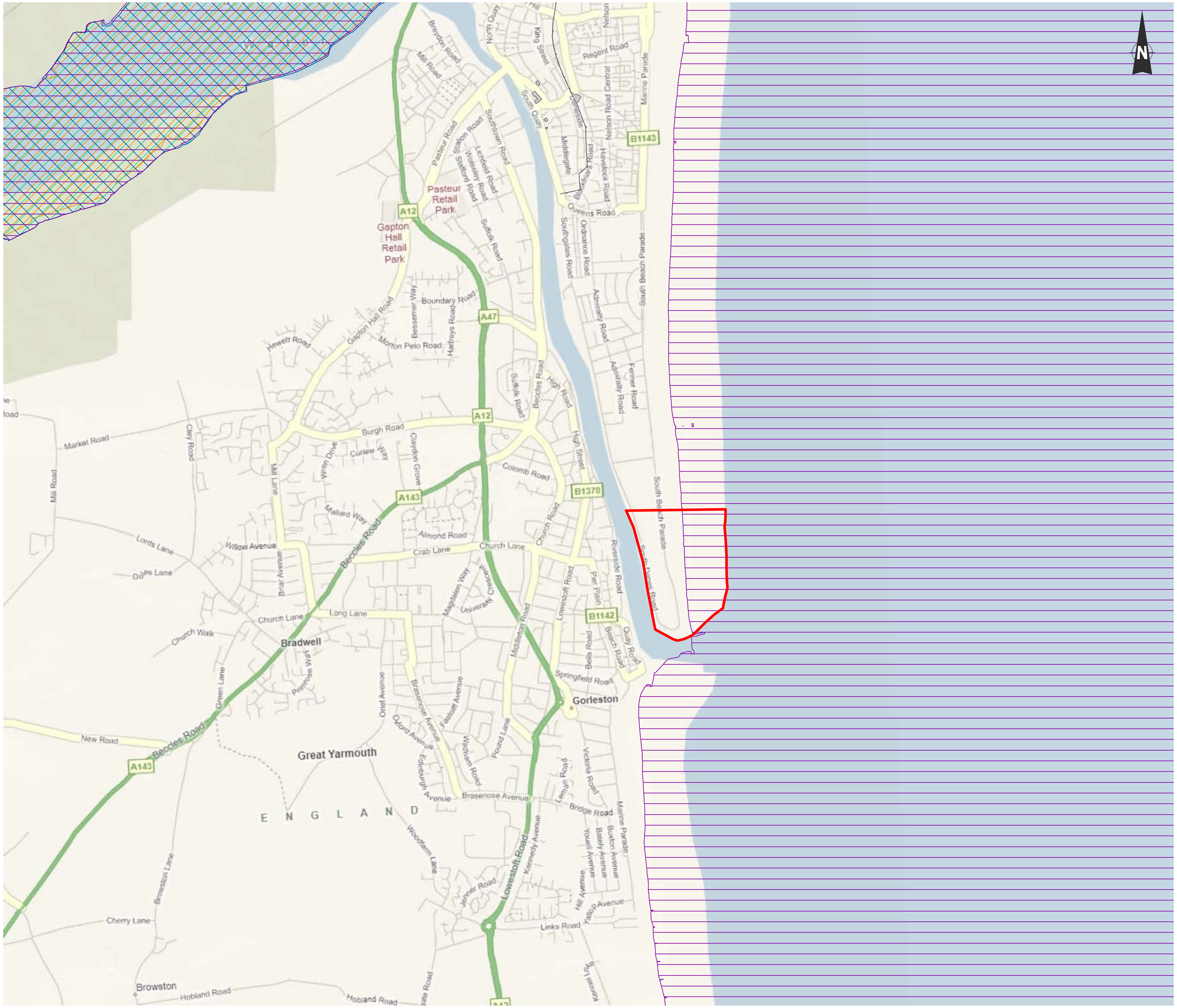

Key

- Alternative Site Boundary
- SAC
- SPA
- RAMSAR
- SSSI
- LNR
- Scheduled Monuments

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Project: ABLE Marine Energy Park

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Title: Figure 3.4
Port of Great Yarmouth

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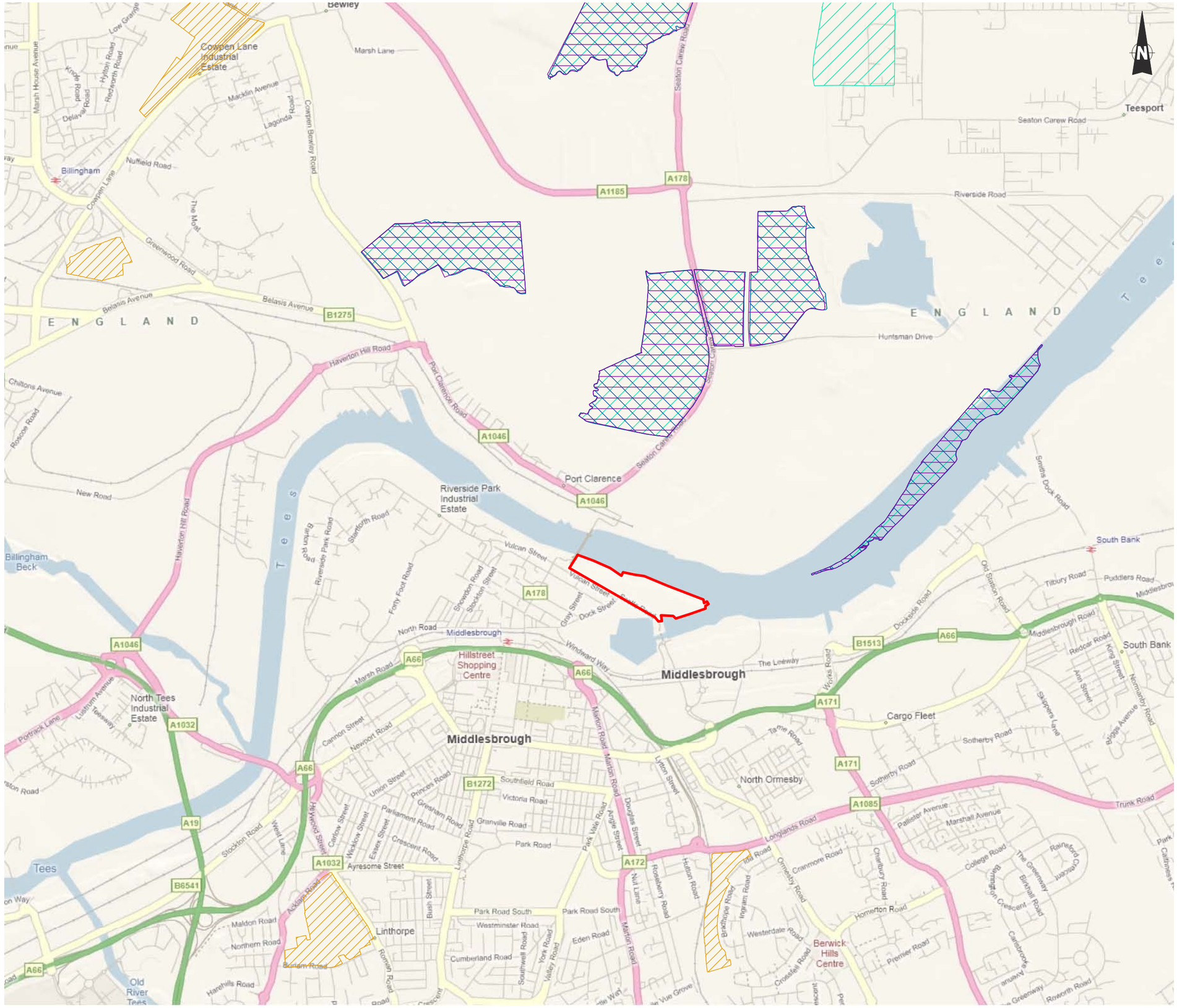

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Project: ABLE Marine Energy Park

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Title: Figure 3.5
Able Middlesbrough Port

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Date	18/08/2011	18/08/2011	18/08/2011

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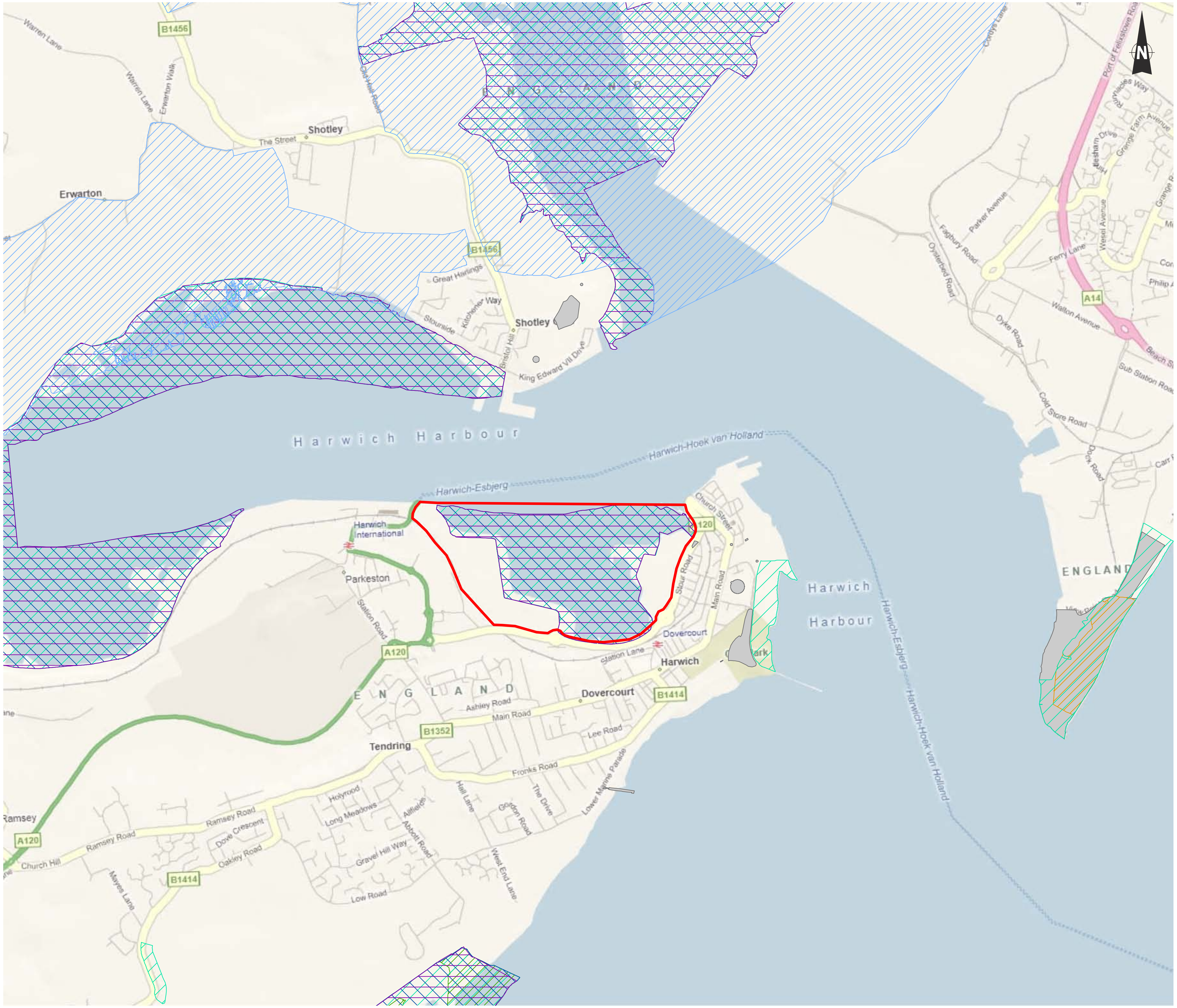

Key

- Alternative Site Boundary
- AONB
- SPA
- RAMSAR
- SSSI
- NNR
- LNR
- Scheduled Monuments

PROJECTION: British National Grid

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A	18/08/2011	Preliminary Issue	MTC	WB	SP

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Project: ABLE Marine Energy Park

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Title: Figure 3.6
Bathside Port

Scale:	Drawn	Checked	Approved
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Date	18/08/2011	18/08/2011	18/08/2011

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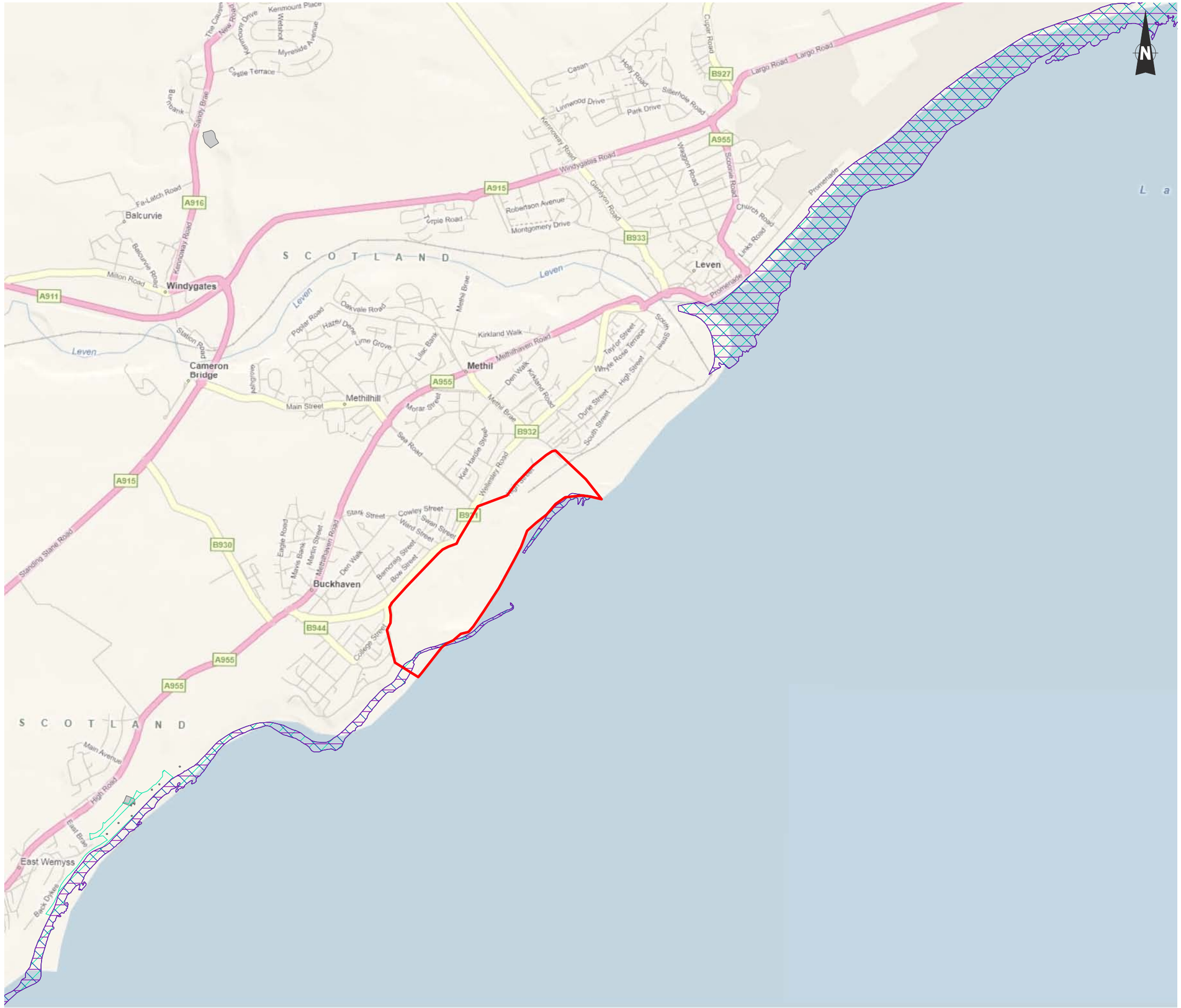

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Title: Figure 3.7
Methil Port

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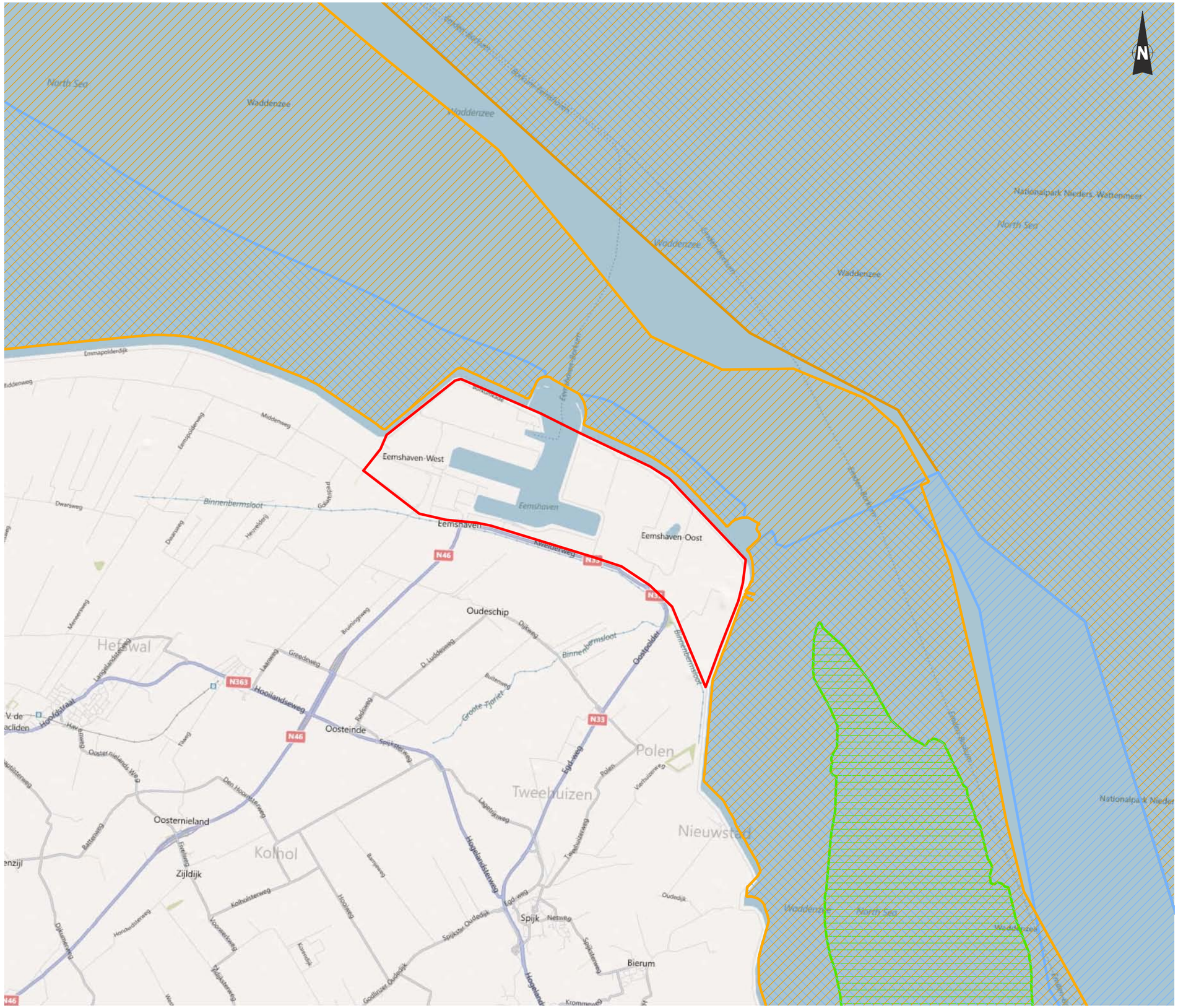

Key

- Alternative Site Boundary
- Birds Directive (SPA)
- Habitats and Directive Sites (SCI)
- Birds and Habitats Directive (C)

SOURCE: Bing Maps
PROJECTION: ETRS 1989 LAEA

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A	27/07/2011	Preliminary Issue	MTC	WB	SP

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Project: ABLE Marine Energy Park

Client: ABLE UK Ltd

Title: Figure 3.8 Eemshaven

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Date	28/07/2011	28/07/2011	28/07/2011

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Key

- Alternative Site Boundary
- Birds Directive (SPA)
- Habitats and Directive Sites (SCI)

SOURCE: Bing Maps
PROJECTION: ETRS 1989 LAEA

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A	18/08/2011	Preliminary Issue	MTC	WB	SP

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Project: ABLE Marine Energy Park

Client: ABLE UK Ltd

Title: Figure 3.9 Bremerhaven

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