SMart Wind

Hornsea Offshore Wind Farm Project One

Reports – Habitats Regulations Assessment Report

Information to Support the Appropriate Assessment for Project One

PINS Document Reference: 12.6

APFP Regulation 5(2)(g)

July 2013

smartwind.co.uk

SMart Wind Limited

Hornsea Offshore Wind Farm

Project One

Habitats Regulations Assessment Report:

Information to Support the Appropriate Assessment for Project One

---

Liability

This report has been prepared by RPS and Pelagica Environmental Consultancy with all reasonable skill, care and diligence within the terms of their contracts with SMart Wind Ltd or their subcontractor to RPS placed under RPS' contract with SMart Wind Ltd as the case may be.

Document release and authorisation record	
PINS Document Reference	12.6
Report number	UK04-050200-REP-0067
Date	July 2013
Client name	SMart Wind Limited
Client contact(s)	Chris Jenner Penny Pickett Rachael Mills Rosemary Tingle Liam Leahy Sheelagh Guilmartin Ditte Bilde

SMart Wind Limited

11th Floor

140 London Wall

London

EC2Y 5DN

Tel 0207 7765500

Email info@smartwind.co.uk

Table of Contents

Annexes

Table of Figures

Table of Tables

Glossary

Term	Definition
Abundance	The number of animals per unit area.
Appropriate Assessment	An assessment to determine the implications of a plan or project on a European site in view of the site's conservation objectives. An AA forms part of the Habitats Regulations Assessment and is required when a plan or project is likely to have a significant effect on a European site.
Annex I Habitat	Natural habitat types of community interest whose conservation requires the designation of special areas of conservation.
Annex II Habitat	Annex II Species - Animal and plant species of community interest whose conservation requires the designation of special areas of conservation.
Barrier Effect	The potential for birds to fly around an array of turbines causing an increase in the overall distance flown than would otherwise have been the case if the wind turbines had not been present.
Birds Directive	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the Conservation of Wild Birds.
Cetacean	A group of marine mammals that includes whales, dolphins and porpoises.
Collision risk modelling	Modelling undertaken to determine the potential number of birds at risk of collision from a wind farm.
Displacement	The potential for birds and other animals to avoid an area due to the presence of the wind turbines or from vessel activity.
Habitats Directive	Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended).
Habitats Regulations	The Conservation of Habitats and Species Regulations 2010 (as amended).
Habitats Regulations Assessment	A process that helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of a European site. The process consists of up to four stages: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI).
Likely Significant Effect	Any effect that may reasonably be predicted as a consequence of a plan or project that may affect the conservation objectives of the features for which the site was designated, but excluding trivial or inconsequential effects.
Natura 2000	A coherent European ecological network of special areas of conservation and special protection areas.
Offshore Habitats Regulations	The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended).

Term	Definition
Permanent Threshold Shift	Permanent hearing damage caused by very intensive noise or by prolonged exposure to noise.
Pinnipeds	A group of marine mammals that includes seals, walruses and sea lions.
Ramsar Convention	The Convention on Wetlands of International Importance especially as Waterfowl Habitat which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
Ramsar Site	Wetlands of international importance, designated under the Ramsar Convention.
Special Area of Conservation	A site of Community importance designated by Member States through a statutory, administrative and/or contractual act where the necessary conservation measures are applied for the maintenance or restoration, at a favourable conservation status, of the natural habitats and/or the populations of the species for which the site is designated.
Site of Community Importance	Defined in the Habitats Directive as sites which, in the biogeographical region or regions to which they belong, contribute significantly to the maintenance or restoration at a favourable conservation status of natural habitat type in Annex I or of a species in Annex II of the Habitats Directive and may also contribute significantly to the coherence of Natura 2000. The site may also contribute significantly to the maintenance of biological diversity within the biogeographic region or regions concerned. For animal species ranging over wide areas, SCIs shall correspond to the places within the natural range of such species which represent the physical or biological factors essential to their life and reproduction.
Special Protection Area	An area which has been identified as being of international importance for the breeding, feeding, wintering or the migration of rare and vulnerable species of birds found within European Union countries.
Subzone 1	The area within the Hornsea Zone where the location of the Project One offshore wind turbines will be sited. There will be up to 332 turbines (depending on turbine type) within Subzone 1, with turbine capacities ranging from 3.6 MW up to 8 MW being considered.
Temporary Threshold Shift	Temporary reduction of hearing capability caused by exposure to noise.

Acronyms

Acronym	Full term
AC	Alternating Current
CoCP	Construction Code of Practice
CRM	Collision Risk Modelling
cSAC	Candidate Special Area of Conservation
pSPA	Potential Special Protection Area
DCO	Development Consent Order
DP	Dynamic Positioning
EC	European Commission
EEA	European Environment Agency
EEZ	European Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
EMS	European Marine Site
EN	English Nature
EU	European Union
FCS	Favourable Conservation Status
GW	Gigawatt
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
INCA	Industry Nature Conservation Association
IPC	Infrastructure Planning Commission
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
LWT	Lincolnshire Wildlife Trust
MCA	Maritime and Coastguard Agency
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MNA	Marine Natural Area
MW	Megawatt

Acronym	Full term
NE	Natural England
NM	Nautical Mile
NSIP	Nationally Significant Infrastructure Project
PBR	Potential Biological Removal
PCoD	Population Consequences of Disturbance
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PTS	Permanent Threshold Shift
PVA	Population Viability Analysis
RIES	Report on the Implications for European Sites
ROV	Remotely Operated Vehicle
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCI	Site of Community Importance
SEA	Strategic Environmental Assessment
SEL	Sound Exposure Level
SMRU	Sea Mammal Research Centre
SNCB	Statutory Nature Conservation Body
SNH	Scottish Natural Heritage
SoS	Secretary of State
SOSS	Strategic Ornithological Support Services
SPA	Special Protection Area
SPV	Siemens Project Ventures
SSSI	Site of Special Scientific Interest
TCE	The Crown Estate
TTS	Temporary Threshold Shift
UK	United Kingdom
WeBS	Wetland Bird Survey
WTG	Wind Turbine Generator
WWT	Wildfowl and Wetlands Trust
ZEA	Zonal Environmental Assessment

EXECUTIVE SUMMARY

S.1 SMart Wind Ltd (hereinafter referred to as SMart Wind) on behalf of Heron Wind Limited, Njord Limited and Vi Aura Limited is promoting the development of Project One, comprising up to three offshore wind farms in the southern North Sea. The project will have a maximum generating capacity of 1,200 megawatts (MW).

S.2 Project One is the first of a number of wind farm projects planned for the Hornsea Zone to meet a target Zone capacity of 4 GW by the year 2020. Project One is classed as a Nationally Significant Infrastructure Project and therefore requires a Development Consent Order (DCO) under the Planning Act 2008.

S.3 Project One includes all offshore infrastructure (e.g., turbines, offshore substations, inter array and export cables) and onshore infrastructure required to connect to the existing National Grid substation at North Killingholme, North Lincolnshire. The offshore wind farm will be located in the southern North Sea, approximately 103 km to the east of the East Riding of Yorkshire coast. The proposed landfall site for the Project One export cables is located at Horseshoe Point, North Coates, Lincolnshire, within the Humber Estuary.

S.4 The purpose of this document is to assist the decision maker by providing information to inform the Habitats Regulations Assessment (HRA) for Project One and follows the Planning Inspectorate's (PINS) guidance contained in Advice Note 10: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects (NSIPs), (PINS, 2013). This document is prepared in accordance with both the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') and the Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds (the 'Birds Directive'). This document presents the information required to determine likely significant effects on European sites and their qualifying features and, where necessary, considers whether any such effects would affect the integrity of the European sites.

S.5 As part of ongoing consultation, statutory nature conservation bodies (SNCBs) were invited to respond to a number of documents, including the Scoping Report in November 2010 (SMart Wind, 2010), a Scoping Report Addendum produced in March 2012 (SMart Wind, 2012a), Preliminary Environmental Information Report (PEIR), (SMart Wind, 2012c), draft screening tables and proposed draft approach to the HRA, and the Draft Environmental Statement and HRA Report, (the latter, being two separate reports at the time, i.e., for offshore and onshore/Humber Estuary components). Consultation summaries are provided in Section 1.6.

S.6 This document was originally structured around the two assessments undertaken for the offshore components and the onshore/Humber Estuary components of Project One, which was an approach agreed with the relevant SNCBs. The two HRAs (Humber and Offshore) were original circulated to statutory consultees as two separate documents and have been discussed through two separate processes throughout the Project One lifetime. The original HRA structure of two separate reports was proposed and discussed with stakeholders due to the disparate nature of the intertidal and offshore receptors. However, as Project One evolved, these processes were aligned so that one HRA report would be submitted to PINS, and following advice from PINS (22 March 2013), a single integrated HRA Report has been prepared as part of the supporting information to the DCO application. The Offshore and Humber assessments have been drawn together in the overall conclusions in determining the effect on the conservation objectives and therefore site integrity of the Natura 2000 sites/features considered within this HRA.

Screening Assessment

S.7 The screening assessment was based on the results from desktop studies and site specific survey data (see Environmental Statement: Volume 5, Annex 5.4.1: Marine Mammal Technical Report; Annex 5.5.1: Ornithology Technical Report; Volume 6, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report; Volume 5, Annex 5.2.1: Benthic Ecology Technical Report; Volume 5, Annex 5.3.1: Fish and Shellfish Technical Report; Volume 6, Annex 6.3.8: Breeding Bird Survey) and the conservation objectives of the relevant European sites.

S.8 The assessment of likely significant effects (LSEs) presented within this HRA report has been based upon the maximum worst case scenarios for the Hornsea Project One with regard to the offshore and onshore components of Project One during the construction, operation and maintenance and decommissioning phases. These assessment scenarios are presented in Table 2.1 and have been selected as those having the potential to result in the greatest effect on the European sites and their qualifying features assessed within this HRA.

S.9 The screening of designated sites potentially affected by the onshore project components and cable laying in the Humber Estuary, focused on the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site and those Natura 2000 sites with potential connectivity to the Humber Estuary (i.e., sites with mobile features which are known to transit through the Humber Estuary).

S.10 The screening for the designated sites potentially affected by the offshore elements of Project One (wind turbines, inter-array cables and export cable route up to the Humber Estuary SAC/SPA/Ramsar site boundary), focused on the broad envelope of sites that were identified as having the potential to be affected by activities associated with the offshore components.

S.11 An initial screening exercise was undertaken to identify and select those European sites with designated qualifying features that may be potentially affected by the impacts of Project One. The criteria for inclusion of sites are described in paragraph 4.2.3. Identification of sites was further refined following advice from Infrastructure

Planning Commission (IPC)/PINS, Joint Nature Conservation Committee (JNCC) and Natural England during the Scoping Opinion (IPC, 2010; JNCC, 2011; PINS, 2012). Following the identification of European sites, it was possible to screen out those sites and qualifying features where the potential effects associated with an impact were considered to be not significant.

S.12 In determining the relevant plans or projects that should be considered in the in-combination assessment with Project One, a detailed screening exercise was carried out. The in-combination impacts that have been included in the screening assessment are those arising from existing and reasonably foreseeable activities as described in paragraph 3.2.26 *et seq*.

S.13 Based on the results of the screening assessment for both Project One alone and in-combination with relevant plans and projects, Table S.1 presents the Natura 2000 sites and qualifying features that have been screened in as having potential for LSEs.

Information to Support the Appropriate Assessment

S.14 As detailed in Table S.1, LSEs were predicted for offshore components of Project One for Annex II marine mammal species as follows:

- Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities;
- Behavioural disturbance from underwater noise from vessel noise and other activities;
- Physical injury from increased risk of collision with vessels; and
- Change in prey availability distribution/abundance.

S.15 Potential LSEs were predicted for grey seal for four Natura 2000 sites (Table S.1), of which two of these are transboundary sites. Installation of export cables for Project One is not predicted to affect accessibility of the Donna Nook breeding site to adult seals in the Humber Estuary SAC. In order to avoid potential for injury to individuals from this colony during the breeding season, the Developer commits to following best practice in accordance with latest guidance (JNCC, 2012) the detail of which will be established through consultation with statutory advisors on the Marine Mammal Mitigation Protocol (MMMP). The MMMP will inform the Code of Construction Practice (the provision for which is made within the draft Marine Licence for the Project).

S.16 The offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), are also not predicted to affect grey seal conservation objectives for the Humber Estuary and Berwick and North Northumberland Coast SACs assessed within this HRA. Due to the highly localised nature of the predicted impacts, and the small numbers affected, it is concluded that there will be no adverse effects on the integrity of the these sites as a result of the Project One development alone or in-combination with other plans and projects.

S.17 Grey seal is also a feature of two transboundary Natura 2000 sites within the southern North Sea. It is possible that grey seal from Dutch Dogger Bank and Klaverbank proposed Sites of Community Importance (pSCIs) may occur within the Project One offshore wind farm areas, either en-route or actively using the sites for foraging and other activities. However, tagging studies of grey seals in the Netherlands indicate that there is relatively low usage of the area compared to nearshore Dutch waters (Jak *et al.,* 2009). The risk of grey seals from these sites occurring within Project One is therefore low and it is predicted that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, on these sites.

S.18 Potential LSEs were predicted for harbour seal for The Wash and North Norfolk Coast SAC and the Dutch Dogger Bank and Klaverbank pSCIs (Table S.1). The offshore components of Project One are not predicted to affect harbour seal conservation objectives for The Wash and North Norfolk Coast SAC and transboundary sites. It is possible that harbour seal from these designated sites may occur within the Project One offshore wind farm areas, either on-route or actively using the sites for foraging and other activities. However, due to the highly localised nature of the predicted impacts, and the small numbers affected, it is concluded that there will be no adverse effects on the integrity of these European designated sites as a result of the Project One development, alone or in-combination, with other plans and projects.

S.19 Potential LSEs were predicted for harbour porpoise for 26 transboundary Natura 2000 sites (Table S.1). The offshore components of Project One are not predicted to affect harbour porpoise conservation objectives for non-UK transboundary sites assessed within this HRA. Due to the distance to Subzone 1 from the harbour porpoise Natura 2000 sites screened into this assessment, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (paragraph 5.2.192 *et seq.*), no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of these Natura 2000 sites. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (Section 5.6).

S.20 Potential LSEs were predicted on qualifying interests of the Flamborough Head and Bempton Cliffs SPA. These were due to additional mortality due to collisions with operational turbines (gannet and kittiwake); and displacement from foraging and loafing areas due to operational turbines and other infrastructure (gannet, kittiwake, herring gull, guillemot, razorbill and puffin). All of these species are within recognised maximum foraging range of Subzone 1 of Project One, or where beyond this (herring gull, razorbill), connectivity was assumed because the SPA is the closest breeding colony, and birds were present during the breeding season. A potential LSE due to collision mortality for gannets from the Firth of Forth Islands SPA was also predicted, since the colony is the next closest to Project One and birds may pass through the site on passage, or overwinter in the wider area. In all other cases, either no, or trivial levels of connectivity were predicted, which would not result in a LSE for any SPA qualifying features (see Annexes A and B).

S.21 The presentation of information to support the Appropriate Assessment in Section 5.4 showed that there will be no adverse effects on any European designated sites as a result of the ornithological impacts of Project One development (offshore components) alone or in-combination with other plans and projects. Predicted mortality was shown to be low in relation to SPA species populations, particularly due to Project One (in comparison with other projects), and this was supported by bespoke population modelling using most recent census data.

S.22 LSEs were predicted on the integrity of the Humber Estuary SAC and Ramsar site, River Derwent SAC related to the cable installation operations in subtidal and intertidal habitats in the vicinity of the Horseshoe Point landfall site, within the Humber Estuary. Temporary loss/disturbance of Annex I habitats for which the Humber Estuary SAC has been designated is predicted to occur due to cable burial operations, with a small proportion of the designated habitats within the SAC boundary affected. The effects on these habitats are summarised as follows:

- Temporary habitat loss/disturbance of approximately 0.75% of the total area of *Estuary* habitat within the SAC, with the majority occurring in the intertidal at the Horseshoe Point landfall (loss/disturbance within specific habitats discussed below) and a smaller proportion occurring in subtidal areas;
- Temporary habitat loss/disturbance of less than 1.68% of the *Mudflats and sandflats not covered by seawater at low tide* Annex I habitat within the Humber Estuary SAC;
- Temporary habitat loss/disturbance of approximately 7.8% of the *Salicornia and other annuals colonising mud and sand* Annex I habitat within the SAC; and
- Temporary habitat loss/disturbance of less 0.03% of *Embryonic shifting dunes* and *Shifting Dunes along the Shoreline with Ammophila arenaria ('white dunes')* Annex I habitats within the SAC.

S.23 Although a larger proportion of the *Salicornia and other annuals colonising mud and sand* Annex I habitat is expected to be affected by temporary habitat loss (compared to other qualifying habitats in the SAC), no long term reduction in the extent of this feature is expected due to the high recovery potential of this habitat and its component species. Furthermore, the baseline used to estimate the proportion of this habitat mapped within the SAC (last reported in 2003) is likely to be an underestimate, with a greater area of this habitat mapped during site specific surveys. Mitigation measures which will minimise effects on Annex I habitats and increase the rate of recovery for these habitats have been proposed and agreed with Natural England and increase the confidence in the conclusions made. These measures include:

- Restoration/reinstatement of affected habitats, including smoothing of sediments and avoiding surface sediment compaction to aid recovery of *Salicornia* following cable installation;
- Use of measures to reduce ground pressure along the access tracks to the intertidal to reduce the potential for destabilisation of sand dunes and restoration/reinstatement of sand dune habitats post construction; and
- Limiting installation activities to a well-defined construction area so that the extent of potential disturbance to SAC habitat features (and SPA features discussed below) will be minimised as much as possible.

S.24 Effects on the Annex II qualifying species for the Humber Estuary SAC (i.e., sea and river lamprey and grey seal) and the River Derwent SAC (i.e., sea and river lamprey only) are predicted to be minimal, with migration of lamprey species not likely to be affected during cable laying operations or during the operational phase of Project One. As discussed in paragraph S.15, grey seal populations, specifically the grey seal colony at Donna Nook, are not likely to be affected by cable laying operations within the Humber Estuary SAC.

S.25 LSEs were predicted on ornithological features of the Humber Estuary SPA and Ramsar, the Coquet Island SPA and Farne Islands SPA as a result of cable laying activities in the intertidal at the Horseshoe Point landfall site. The species identified with the potential for LSEs were bar-tailed godwit, golden plover, dunlin, knot, redshank, dark-bellied brent goose, sanderling, ringed plover, oystercatcher, grey plover and common tern (for the Coquet Island SPA and Farne Islands SPA only). Further information presented in the HRA predicted that adverse effects would not be expected for habitat loss, temporary disturbance and displacement and indirect effects (i.e., including loss of prey species and water quality effects) either for Project One alone or in-combination, with other projects in the vicinity of the Humber Estuary.

S.26 The implementation of a seasonal restriction, with cable laying activities only occurring in intertidal areas at Horseshoe Point between the April and September, inclusive, will ensure that cable laying activates occur at times when the populations of these species are low, particularly compared to winter peak populations. This seasonal restriction, together with the measures to be implemented for features of the Humber Estuary SAC and the temporary nature and limited extent of effects, increases the confidence in the conclusion that adverse effects on these features, and therefore the integrity of the Humber Estuary SPA and Ramsar, the Coquet Island SPA and the Farne Islands SPA, will not occur.

Table S.1 Natura 2000 sites and qualifying features screened into the HRA.

Species	Natura 2000 Site Name	Potential Impact
Annex I Habitats - Estuaries, Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Embryonic shifting dunes, Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes').	Humber Estuary SAC and Ramsar (UK)	Temporary reduction in extent of a number of SAC habitat features. Effects on water quality, including resuspension of contaminated sediments and increases in suspended sediment concentrations.
Annex II Species – River and Sea Lamprey.	Humber Estuary SAC and Ramsar (UK)	Disruption of lamprey migration during cable installation. Indirect effects on water quality.
Annex II Species - Grey seal (*Halichoerus grypus*).	Humber Estuary SAC and Ramsar (UK) Berwickshire and North Northumberland Coast SAC (UK) Doggersbank pSCI (Netherlands) Klaverbank pSCI (Netherlands)	Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities. Behavioural disturbance from underwater noise from vessel noise and other activities. Physical injury from increased risk of collision with vessels. Change in prey availability distribution / abundance.
Annex II Species - Harbour seal (*Phoca vitulina*).	The Wash and North Norfolk Coast SAC (UK) Doggerbank SCI (Germany) Doggersbank pSCI (Netherlands) Klaverbank pSCI (Netherlands)	
Annex II Species - Harbour porpoise (*Phocoena phocoena*).	Vlakte van de Raan pSCI (Belgium) NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany) Doggerbank SCI (Germany) Östliche Deutsche SCI (Germany) Sylter Außenriff SCI (Germany) Steingrund SCI (Germany) Helgoland mit Helgoländer Felssockel SCI (Germany) Hamburgisches Wattenmeer SCI (Germany) Unterelbe SCI (Germany) Borkum-Riffgrund SAC (Germany) Nationalpark Niedersächsisches Wattenmeer SCI (Germany) Gule Rev SAC (Denmark) Sydlige Nordsø SAC (Denmark) Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France) Bancs des Flandres pSCI (France) Recifs Gris-nez Blanc-nez pSCI (France) Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France) Baie de canche et couloir des trois estuaries pSCI (France) Doggersbank pSCI (Netherlands) Klaverbank pSCI (Netherlands) Vlakte van de Raan SAC (Netherlands)	

Species	Natura 2000 Site Name	Potential Impact
	Noordzeekustzone SAC (Netherlands) Noordzeekustzone II pSCI (Netherlands)	
SPA qualifying features – Bar-tailed godwit (*Limosa lapponica*), Golden plover (*Pluvialis apricaria*), Dunlin (*Calidris alpina alpina*), Knot (*Calidris canutus*), Redshank (*Tringa totanus*), Dark-bellied brent goose (*Branta bernicla bernicla*), Sanderling (*Calidris alba*), Ringed plover (*Charadrius hiaticula*), Oystercatcher (*Haematopus ostralegus*) and Grey plover (*Pluvialis squatarola*).	Humber Estuary SPA and Ramsar (UK)	Temporary habitat loss due to cable laying operations. Disturbance and displacement from noise, vibration and visual disturbance due to activities associated with cable laying. Indirect effects due to temporary reduction or redistribution of prey species due to disturbance during cable installation, or changes in water quality.
SPA qualifying features – Common tern (*Sterna hirundo*).	Farne Islands SPA (UK) Coquet Island SPA (UK)	Temporary habitat loss due to cable laying operations. Disturbance and displacement from noise, vibration and visual disturbance due to activities associated with cable laying. Indirect effects due to temporary reduction or redistribution of prey species due to disturbance during cable installation, or changes in water quality.
SPA qualifying features – Gannet (*Morus bassanus*), Kittiwake (*Rissa tridactyla*).	Flamborough Head and Bempton Cliffs SPA (UK)	Additional mortality due to collisions with operational turbines.
SPA qualifying features – Gannet (*Morus bassanus*), Kittiwake (*Rissa tridactyla*), Fulmar (*Fulmaris glacialis*), Herring gull (*Larus argentatus*), Guillemot (*Uria aalga*), Razorbill (*Alca torda*), Puffin (*Fratercula arctica*).	Flamborough Head and Bempton Cliffs SPA (UK)	Displacement from foraging and loafing areas due to operational turbines and other infrastructure.
SPA qualifying features – Gannet (*Morus bassanus*).	Firth of Forth Islands SPA (UK)	Additional mortality due to collisions with operational turbines. Displacement from foraging and loafing areas due to operational turbines and other infrastructure.

1 INTRODUCTION AND SCOPE

1.1 Introduction

1.1.1 SMart Wind Ltd (hereinafter referred to as SMart Wind) on behalf of Heron Wind Limited, Njord Limited and Vi Aura Limited is promoting the development of Project One, comprising up to three offshore wind farms in the southern North Sea. The project will have a maximum generating capacity of 1,200 megawatts (MW).

1.1.2 SMart Wind is a 50/50 joint venture between International Mainstream Renewable Power (Offshore) Limited (IMRPOL) and Siemens Project Ventures GmbH (SPV). IMRPOL is a group company of Mainstream Renewable Power Limited (Mainstream). Mainstream is a leading developer of large scale renewable energy projects that accelerate global progress towards a sustainable future. Siemens Project Ventures is a group company of Siemens Financial Services GmbH. Siemens is a global powerhouse in electronics and electrical engineering, operating in the industry, energy, healthcare and infrastructure sectors.

1.1.3 Project One is the first of a number of wind farm projects planned for the Hornsea Zone to meet a target Zone capacity of 4 gigawatt (GW) by the year 2020. Project One includes all necessary offshore and onshore infrastructure required to connect to the existing National Grid substation at North Killingholme, North Lincolnshire. The proposed landfall site for the Project One export cables is located at Horseshoe Point, within the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site. The location of Project One and its associated infrastructure are shown on Figure 1.1.

1.1.4 An introduction to Project One is set out in Volume 1, Chapter 1: Introduction and a detailed description of Project One is given in Volume 1, Chapter 3: Project Description of the Environmental Statement. The location of Project One and its associated infrastructure are shown on Figure 1.1.

1.1.5 Project One is classed as a Nationally Significant Infrastructure Project (NSIP) and therefore requires a Development Consent Order (DCO) under the Planning Act 2008. The DCO will include the principal consents for all of the main elements of infrastructure and associated development required for Project One and the DCO application will include full details of the development proposal.

1.2 Legislative Context and HRA Process

1.2.1 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the ‘Habitats Directive’) promotes the maintenance of biodiversity by requiring Member States to maintain or restore natural habitats and wild species listed in the Annexes to the Directive and by introducing protection for habitats and species of European importance. The Habitats Directive contributes to a coherent European ecological network of protected sites requiring Member States to designate Special Areas of Conservation (SACs) for habitats listed on Annex I and for species listed on Annex II of the Directive.

1.2.2 Article 6(3) of the Habitats Directive requires that *“Any plan or project not directly connected with or necessary to the management of [a Natura 2000] site but likely to have a significant effect thereon, either individually or in-combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives.”* This requirement is implemented in the UK through the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended) (the ‘Offshore Habitats Regulations’) for sites beyond 12 nm and the Conservation of Habitats and Species Regulations 2010 (as amended) (the ‘Habitats Regulations’) for sites onshore and within 12 nm.

1.2.3 Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the ‘Birds Directive’) aims to maintain the populations of wild bird species across their natural range and allows for the designation of Special Protection Areas (SPAs) for rare and vulnerable species listed in Annex I and regularly occurring migratory birds. Together, SACs and SPAs create a Europe-wide “*Natura 2000*” network of designated sites.

1.2.4 The Habitats Regulations incorporate SPAs into the definition of ‘European sites’ and, as a consequence, the protection afforded to European sites under the Habitats Regulations applies to SPAs designated under the Birds Directive.

1.2.5 UK Government policy (i.e., National Planning Policy Framework (DCLG, 2012)) also states that internationally important wetlands designated under the 1971 Convention on Wetlands of International Importance especially as Waterfowl Habitat (as amended) (the Ramsar Convention) (Ramsar sites) are afforded the same protection as SPAs and SACs for the purpose of considering development proposals that may affect them. The Government also affords the same level of protection to potential SPAs (pSPAs) and candidate SACs (cSACs).

1.2.6 Regulation 61 of the Habitats Regulations sets out the procedure for the assessment of the implications of plans and projects on European sites. Under Regulation 61, if the proposed development is not directly connected with or necessary to the management of a European site and is likely to significantly affect the site, the competent authority must undertake an “*Appropriate Assessment*” of the implications for that site in view of that site’s conservation objectives (Regulation 61(1)). The Planning Inspectorate’s (PINS’) Advice Note 10, Version 4, Habitat Regulations Assessment (PINS, 2013) recommends a four stage process:

- Stage 1 Screening - Test of Likely Significance: Determining whether the plan or project “either alone or in-combination with other plans and projects” is likely to have a significant effect on a European site(s);

- Stage 2 Appropriate Assessment: Where likely significant effects are identified during screening, determining whether, in view of the European site's conservation objectives, the plan or project would have an adverse effect (or risk of adverse effect) on the integrity of the site. If not, the plan can proceed;
- Stage 3 Alternatives: Where the plan or project cannot be shown to avoid an adverse effect on the integrity of a site, there should be an examination of alternative solutions; and
- Stage 4 Assessment of "imperative reasons of overriding public interest" (IROPI): If it is not possible to identify alternative solutions that would avoid an adverse effect on integrity, it will be necessary to establish IROPI. This is not considered a standard part of the process and will only be carried out in exceptional circumstances. In the event of a negative appropriate assessment compensatory measures must also be included with the Habitats Regulations Assessment (HRA) report, which are considered during Stage 4 if there are no alternatives identified during Stage 3.

1.2.7 The stages of the process are collectively referred to as the HRA to clearly distinguish from the appropriate assessment, which is a single step within the whole HRA process.

1.2.8 The integrity of a site is defined as the coherence of the site's ecological structure and function, across the whole of its area, which enables it to sustain the habitat, complex of habitats and/or population of species for which the site has been designated. An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant features as it did at the time of designation.

1.3 Purpose of this Document

1.3.1 The purpose of this document is to assist the decision maker by providing information to inform the HRA for Project One. It includes information required to determine likely significant effects (LSEs) on European sites and where necessary considers whether any such effects would affect the integrity of the European sites.

1.3.2 The Habitats Regulations require the competent authority (in this case the relevant Secretary of State) before authorising a project likely to have a significant effect on a European site '*to make an appropriate assessment of the implications for that site in view of that site's conservation objectives*'. Anyone applying for development consent for an NSIP must provide the competent authority with such information as may reasonably be required '*for the purposes of the assessment*' or '*to enable them to determine whether an appropriate assessment is required*'. This information normally takes the form of a HRA Report.

1.3.3 This document supports the DCO application for Project One and follows PINS' guidance contained in Advice Note 10: Habitat Regulations Assessment relevant to NSIPs (PINS, 2013). This document is prepared in accordance with both the Habitats and Birds Directives. In addition to the PINS guidelines, relevant guidelines published by (the former) English Nature (EN) on undertaking an appropriate assessment and determination of likely significant effect (i.e., Stage 1: Screening) were also considered. These guidelines provide details on how to undertake a HRA, including good practices on consultation, data collection, impact identification and assessment, recommendation of project modification and/or restriction and reporting (English Nature, 1997; English Nature, 1999).

1.3.4 Prior to awarding the Round 3 sites, The Crown Estate (TCE) carried out a plan level appropriate assessment of the implications for European sites (TCE, 2009). The key outcome of this plan level appropriate assessment was that the plan could be delivered without significant adverse effects on the integrity of European sites, provided that 'best practice' environmental measures are adhered to by project developers, and that individual projects are able to demonstrate no adverse effect on the integrity of European sites arising from their specific development plans. The plan level appropriate assessment provides a useful guidance document and assists identification of potential impacts on the European sites and qualifying features, in relation to developments within each zone.

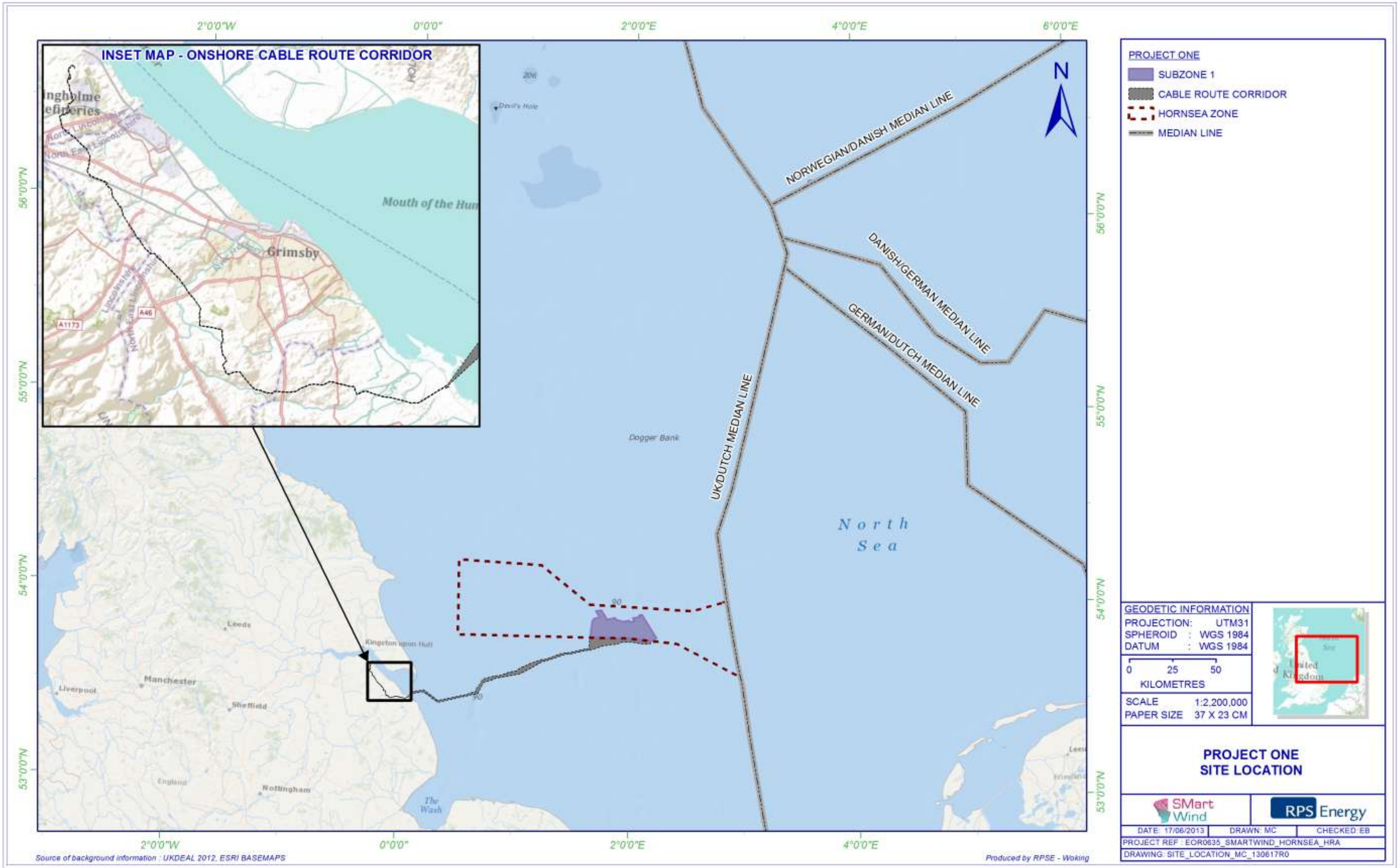


Figure 1.1 Location of Project One, Subzone 1, Export Cable Route and the Hornsea Round 3 Zone.

1.4 Structure of this Document

1.4.1 The structure of the HRA presented within this document follows the PINS recommended staged approach (PINS, 2013) (refer to paragraph 1.2.6). The objectives for Stage 1 (screening for likely significant effects) have included:

- Conducting a desk top study and obtaining background information to undertake a review of Natura 2000 sites which occur within the zone of influence of Project One;
- Reviewing activities associated with Project One which could potentially affect Natura 2000 sites and qualifying features;
- Identifying, whether areas of Natura 2000 sites and qualifying features occur within the zone of influence of Project One;
- Assessing the sensitivity and LSEs of Project One on the conservation status and conservation objectives of Natura 2000 sites and qualifying features.
- Assessing in-combination effects of Project One with other plans and projects in the area on Natura 2000 sites;
- Assessing the potential for inter-related effects to occur for qualifying features of Natura 2000 sites for the offshore and onshore (Humber) project components; and
- Screening out Natura 2000 sites and qualifying features which would not be significantly affected by Project One.

1.4.2 Based on the results from the screening assessment, information is provided within Sections 5 and 6 to inform an appropriate assessment (Stage 2), should the competent authority determine that one is required. The objectives of Stage 2 of the HRA have included:

- Review the potential significant effects of Project One identified during screening (Stage 1) on the integrity of Natura 2000 sites;
- Review the in-combination effects of Project One with other plans and projects identified during screening (Stage 1) on the integrity of Natura 2000 sites; and
- Identify appropriate mitigation measures to minimise potential significant effects on Natura 2000 sites and qualifying features.

1.4.3 This document has been structured around the two assessments undertaken for the offshore components and the onshore/Humber Estuary components of Project One and this approach has been agreed with the relevant statutory nature conservation bodies (see Section 1.6). The two HRAs (Humber and Offshore) were originally circulated to statutory consultees as two separate documents and have been discussed through two separate processes throughout the Project One lifetime. The original HRA structure of two separate reports was proposed and discussed with stakeholders due to the disparate nature of the intertidal and offshore receptors. However, as Project One evolved, these processes were aligned so that one planning application would be submitted to the PINS, and following advice from PINS (22 March 2013), it was agreed to produce a single HRA document as a supporting document to the DCO application (Table 1.1).

1.4.4 The potential for overlap between the two assessments within this HRA has been considered, particularly with respect to mobile species which may be affected by both cable installation within the Humber Estuary and construction, operation and/or decommissioning of offshore project components. The conclusions from the assessments of onshore and offshore Project One components have been drawn together in the overall conclusion on the assessment of effect on the conservation objectives for qualifying features of the Natura 2000 sites considered within the HRA, and therefore on site integrity.

1.4.5 This document provides the HRA of all offshore and onshore components of Project One and should be read in conjunction with other relevant Environmental Statement Chapters and Annexes, namely:

- Offshore Environmental Statement Volume 2:
  - Chapter 2: Benthic Subtidal and Intertidal Ecology and associated technical annex (Annex 5.2.1: Benthic Ecology Technical Report);
  - Chapter 3: Fish and Shellfish Ecology and associated technical annex (Annex 5.3.1: Fish and Shellfish Technical Report);
  - Chapter 4: Marine Mammals and associated technical annex (Annex 5.4.1: Marine Mammal Technical Report);
  - Chapter 5: Ornithology and associated technical annex (Annex 5.5.1: Ornithology Technical Report);
  - Chapter 6: Nature Conservation; and
  - Annex 4.5.3: Cumulative, Transboundary and Inter-related Effects Document.
- Onshore Environmental Statement Volume 3, Chapter 3: Ecology and Nature Conservation; and
- The Consultation Report for Project One.

1.5 Study Area and Scope

1.5.1 The study area and scope of the HRA for Project One comprises all offshore and onshore components associated with Project One activities as described in Section 2 and in the Environmental Statement Volume 1, Chapter 3: Project Description.

1.5.2 The offshore components of Project One are defined as those activities occurring up to the Mean Low Water Springs (MLWS), including construction, operation and decommissioning of the wind turbines, substations, accommodation platforms, inter-array cables and the export cable route. The onshore Project One components include subtidal cable installation works within the Humber Estuary and the intertidal and onshore sections of the cable route and associated onshore infrastructure through to the HVDC converter/HVAC substation site at North Killingholme and connection to the National Grid Substation.

1.5.3 The HRA considers qualifying features within Natura 2000 sites and mobile marine species from other European sites (e.g., fish species from other SACs and bird species from other SPAs) which may transit through Project One at certain periods of the year.

1.5.4 Baseline ecological characterisation for qualifying features of European Sites considered in this HRA has been defined across two study areas as follows:

- The Project One study areas – defined in the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology (paragraph 2.2.1 and Figure 2.1), Chapter 3: Fish and Shellfish Ecology (paragraph 3.2.1 and Figure 3.1), Chapter 4: Marine Mammals (paragraph 4.21 to 4.2.2 and Figure 4.1) and Chapter 5: Ornithology (paragraph 5.2.1 and Figure 5.1); and
- The southern North Sea study area – this regional ecological study area is also unique to each ecological discipline and was defined as the southern North Sea region and coincides with the southern North Sea Marine Natural Area (MNA), refer to Chapter 2: Benthic Subtidal and Intertidal Ecology (paragraph 2.2.1 and Figure 2.2), Chapter 3: Fish and Shellfish Ecology (paragraph 3.2.1 and Figure 3.2), Chapter 4: Marine Mammals (paragraph 4.2.3 and Figure 4.1) and Chapter 5: Ornithology (paragraph 5.2.1 to 5.2.6). In the case of ornithology, the regional study area extended to sites located greater than 770 km from Project One to encompass migrating birds.

1.5.5 All survey methodologies and designs for characterisation surveys were agreed with the relevant statutory nature conservation bodies as detailed in the topic specific Environmental Statement chapters. The Joint Nature Conservation Committee (JNCC) was also consulted in January 2010 regarding the approach to analyses of boat based survey data. This approach was approved by JNCC, as described in the Environmental Statement: Annex 5.4.1: Marine Mammal Technical Report and Annex 5.5.1: Ornithology Technical Report.

1.6 Consultation

1.6.1 As part of ongoing consultation, key stakeholders were invited to respond to a Scoping Report produced as part of the Environmental Impact Assessment (EIA) process in November 2010 (Phase 1 Consultation; SMart Wind, 2010) and a Scoping Report Addendum produced in March 2012 (Phase 2 Consultation; SMart Wind, 2012a). This HRA takes into consideration the Scoping Opinion issued by the Infrastructure Planning Commission (IPC), (now PINS), in December 2010 (IPC, 2010), the Second Scoping Opinion issued by PINS in May 2012 (PINS, 2012) and the relevant consultees responses within them.

1.6.2 Further consultation for the HRA with JNCC and Natural England was carried out in September 2011 (Phase 3 Consultation) and included presentation of the initial screening tables and a draft proposed approach to the HRA (see Annexes A, B and D). It should be noted that the initial screening table and draft approach in Annex D are presented as a record of consultation and do not represent the final HRA screening, which is fully discussed and detailed in Sections 3.2 and 4. These documents identified the European sites to be included, qualifying features likely to be screened in/out of the assessment based on the preliminary information available, potential impacts and potential mitigation measures. Also included were details of surveys/studies to be undertaken to inform the HRA. Further consultation with Natural England and JNCC in November 2011 provided feedback on the screening tables and the proposed approach documents, and this has informed the structuring and approach presented within this HRA report.

1.6.3 As Project One has evolved, the onshore and offshore Project One components have been aligned so that one planning application is to be submitted to PINS, and following advice from PINS (22 March 2013), a single integrated HRA Report has been prepared as part of the supporting information to the DCO application.

1.6.4 The following European Union (EU) Ministries were consulted in relationship to the potential for transboundary impacts during both Phase 3 Consultation Preliminary Environmental Information Report (PEIR) and Phase 4 Consultation (Draft Environmental Statement and Draft HRA):

- Belgium environmental ministry representatives:
  - Flemish Government;
  - étage 2/3;
  - Ministry of Brussels;
  - Federale Overheidsdienst Mobiliteit en Vervoer;
  - Royal Belgian Ship-owners Association; and
  - Ministry of Wallonia.
- Danish environmental ministry representatives:

- Danish Ministry of the Environment;
- Danish Maritime Authority;
- Danmarks Rederiforening; and
- Danish Maritime Authority.

▪ German environmental ministry representatives:
- Federal Ministry for the Environment Nature Conservation and Nuclear Safety;
- Wasser-und Schifffahrtsverwaltung des Bundes;
- Verband Deutscher Reeder; and
- Bundesamt für Seeschifffahrtund Hydrographie.

▪ French environmental ministry representatives:
- Ministère des Affaires étrangères;
- Armateurs de France;
- Préfecture Maritime de la Manche et de la Mer du Nord; and
- Secrétariat Général de la Mer.

▪ Dutch environmental ministry representatives:
- Ministry of Housing Spatial Planning and Environment;
- Rijkswaterstaat North Sea - Dutch Ministry of Infrastructure and Environment;
- Rijkswaterstaat - Ministerie van Verkeer en Waterstaat;
- Royal Association of Netherlands Ship owners; and
- Ministry of Transport, Public Works and Water management.

▪ Norwegian environmental ministry representatives:
- Ministry of Environment;
- Norges Rederiforbund; and
- Norwegian Maritime Directorate.

▪ Portuguese environmental ministry representatives:
- Ministère des Affaires étrangères.

▪ Republic of Ireland environmental ministry representatives:
- Department of Environment.

▪ Spanish environmental ministry representatives:
- Ministerio de Medio Ambiente y Medio Rural y Marino.

▪ Swedish environmental ministry representatives:
- Implementation & Enforcement Department.

1.6.5 From the above comprehensive list of EU ministries and representatives consulted, only those responses that were received, namely from the Rijkswaterstaat North Sea and the Bundesamt für Seeschifffahrt und Hydrographie, are presented in Table 1.1.

1.6.6 Table 1.1 summarises the key comments raised by the consultees in the IPC Scoping Opinion, the Second Scoping Opinion issued by PINS, the Section 42 (Phase 4) consultation and further follow up meetings following the Phase 4 consultation, and describes which sections of the HRA report address each comment.

Table 1.1 Consultation undertaken to date with regard to the Habitats Regulations Assessment.

Consultee	Form of response	Date	Comment	How/where addressed
IPC/PINS	Scoping Opinion	December 2010 / May 2012	The Applicant should also be aware that the decision maker under the Planning Act 2008 has, as competent authority, a duty to engage with the Habitats Directive whether or not the decision maker is also licensing the activity. Therefore, the Applicant may wish to provide information within the Environmental Statement, which will assist the decision maker to meet this duty.	This document represents the HRA report to inform the appropriate assessment.
			We strongly recommend that there is a meeting between the applicant, JNCC, Natural England and the IPC to discuss the scope of the HRA, based on the information provided here, the zonal schedule and early information arising from desk studies and surveys.	Meetings held with JNCC/Natural England: 17 May 2011, 22 September 2011, 13 January 2012, 03 October 2012 and 22 November 2012.
			Stepwise approach to HRA should be followed.	Section 3 presents the HRA methodology and staged approach to the assessment in accordance with PINS Advice Note 10, Version 4, Habitat Regulations Assessment (PINS, 2013).
			Given the movements of birds between SPAs across the North Sea, it will be necessary to consider the potential impact of Zone 4 developments on the interest features of such mainland European coastal SPAs too.	European coastal SPAs considered in Screening Assessment (see Section 4.2).
PINS	Meeting to discuss Hornsea Project One and Project Two	22 March 2013 and follow up discussions in June and July 2013	The HRA assessment as currently drafted is divided into separate offshore and onshore reports and queried whether the project as a whole had been adequately considered as the appropriate assessment would need to look at the project as a whole. It was also pointed out that other previous projects had commonly presented a single assessment.	The offshore and onshore (Humber) HRAs have been combined into a single HRA for Project One (this document). A draft combined HRA report and supporting RIES was issued to PINS on 24.06.2013 seeking specific comment on the structural content of the report. SMart Wind received detailed comment from PINS on the draft HRA report on 05.07.2013, and responded in letter form (on 19.07.2013), setting out how comments had been addressed in the final HRA documentation.
			PINS stated that they would need to produce a single Report on the Implications for European Sites (RIES) and that it was expected that applicants now provide the initial draft of the RIES as part of the HRA information supporting any application.	The draft RIES and PINS matrices for Project One are presented in Annex L.
JNCC/Natural England	Meetings	December 2010	Scoping response recommending the need for a HRA for Project One.	This HRA Report has been compiled for onshore and offshore components of Project One.
			Also included was a strong recommendation for the need for a meeting between the applicant, JNCC and Natural England to discuss scope of the HRA and early information from desk studies and surveys.	Initial meetings held between SMart Wind and Natural England/JNCC in May 2011 to discuss HRA, with further meetings held subsequently to provide updates on HRA, potential mitigation measures etc. (see below).

Consultee	Form of response	Date	Comment	How/where addressed
		17 May 2011	Natural England confirmed that the saltmarsh at Horseshoe Point is a key roosting area for over-wintering birds and reported that any landfall in the area would need to consider the use of HDD under approximately 100 m of saltmarsh, or a suitable alternative, between the months of April and September (later amended to avoid August and September where practicable), to remove any adverse impacts on the wintering bird population.	Effects of cable installation on over-wintering birds have been fully assessed in Sections 4.4 and 6.3, with discussion of seasonal restrictions in Section 6.4.
			Natural England reported the presence of a viable cockle bed immediately off the coast at Horseshoe point.	Effects on cockle beds are discussed in Section 6.2.
			JNCC/Natural England reported a requirement for a detailed breeding bird protocol and mitigation measures.	Discussion of seasonal restrictions on cable installation at the Horseshoe Point landfall is discussed in Section 6.4.
		22 September 2011	Meeting to discuss scope of HRA and early information from desk studies and surveys:	
			Submission of screening table and approach to HRA to Natural England and JNCC for agreement.	Screening table and draft approach to HRA has been presented in Annex D. Note: Annex D is presented as a record of consultation and does not represent the final HRA screening.
			Natural England recommended that bird surveys should continue until August 2012 where possible, and suggested if not possible, latest Wetland Bird Survey (WeBS) data for Horseshoe Point and a commitment to further survey work prior to construction may provide sufficient data to inform the impact assessment.	Ornithological surveys at Horseshoe Point were undertaken between September 2011 and August 2012 (see Section 3.2).
			Natural England reported a requirement for evidence to confirm proposed works would not cause significant disturbance to birds using the Humber SPA.	Effects of cable installation on over-wintering birds have been fully assessed in Sections 4.4 and 6.
			Natural England suggested a separate report for the HRA to help inform the IPCs assessment. Natural England suggested the initial report should be drafted without conclusions.	Conclusions have been included in the final HRA report (see Section 7).
			Natural England reported a preference for work at Horseshoe Point to be avoided during August. However, this would be informed by findings of wetland bird survey.	Discussion of seasonal restrictions on cable installation at the Horseshoe Point landfall is discussed in Section 6.4.
		03 October 2011	Natural England agreed that walking intertidal areas at low tide to observe wintering birds was not appropriate from a health and safety perspective.	See Volume 6, Annex 6.3.9: Wintering and Migratory Birds Survey for full details of intertidal bird survey methodologies.
		11 November 2011	Telephone conference to discuss screening table and approach to HRA as submitted to Natural England and JNCC in September 2011. Natural England agreed to the approach taken for the Humber/Onshore HRA, including screening table submitted.	Screening table and draft approach to Humber assessment for onshore Project One components has been presented in Annex D. Note: Annex D is presented as a record of consultation and does not represent the final HRA screening.
		05 January 2012	Update on HRA including data sources, likely significant effects and potential mitigation measures to reduce effects on qualifying features.	No actions from meeting.
		29 November 2012	Meeting with Natural England to discuss the findings of the HRA. Discussions included proposed construction operations, timing of works, access arrangements and working areas. Also discussed were proposed mitigation measures to reduce potential impacts on designated features.	No actions from meeting, feedback provided during Phase 4 consultation.

<table>
<tr><th>Consultee</th><th>Form of response</th><th>Date</th><th>Comment</th><th>How/where addressed</th></tr>
<tr><td>JNCC</td><td>Phase 3 Consultation</td><td>7 October 2012</td><td>JNCC note that both grey and harbour seals were recorded within the Hornsea Zone and are encouraged that the report relates these to three coastal Special Areas of Conservation. In line with the HRA process the impacts of the Hornsea development will need to be screened for LSE on any designated feature where an interaction is likely to occur from a plan or project.</td><td>Both species of seal addressed within this HRA (see Sections 4.3 and 4.4).</td></tr>
<tr><td rowspan="3">JNCC/Natural England</td><td rowspan="3">Phase 3 Consultation</td><td rowspan="3">12 September 2012</td><td>We advise that HRA is an important component in assessing the environmental effects of a development and that it is most usefully and robustly conducted alongside the EIA process. Whilst we welcome the information submitted in Chapter 13 of the current submission we would advise that the Phase 4 consultations would be most usefully conducted here. On review of Chapter 13, we advise that a transparent approach is undertaken outlining full justification for the screening out of designated sites or groups of designated sites.</td><td>Assessment considered within this HRA Report and justifications for the screening out of designated sites presented in Section 4.3 and 4.4, and Annexes A, B and D.</td></tr>
<tr><td>The potential for additional species that may use the site on passage that may form a component of an SPA should be considered. Full consideration should also be given to reasons why potentially relevant species might not have been recorded during survey. We recommend assessing potential impacts on all migrant species.</td><td>Migration modelling has been undertaken for 12 non-seabird species (seven waders and five wildfowl) that were selected in consultation with JNCC and Natural England (Section 4.3, paragraph 4.3.169)</td></tr>
<tr><td>Potential for LSE on qualifying features of the Flamborough Head and Bempton Cliffs SPA (kittiwake, gannet, guillemot, razorbill, and puffin) particularly as a result of cumulative impacts.

It may be necessary to undertake potential biological removal (PBR) modelling for SPA features being vulnerable to collision risk (e.g., kittiwake and gannet). In cases in which PBR modelling indicates an LSE on an SPA population, population viability analysis (PVA) modelling might be required to inform an appropriate assessment.</td><td>Flamborough Head and Bempton Cliffs SPA included in Screening Assessment (see Annex A). Further consultation was undertaken with JNCC on the shadow appropriate assessment.

PBR has been undertaken for the key qualifying interests of the Flamborough Head and Bempton Cliffs SPA population (Annex J). PVA of kittiwake associated with Flamborough Head and Bempton Cliffs SPA has been undertaken (Section 5.4 and Annex K).</td></tr>
<tr><td rowspan="6">JNCC/Natural England</td><td rowspan="6">Letter: Phase 4 consultation (Humber HRA report)</td><td rowspan="6">5 February 2013</td><td>Letter response from Natural England following Phase 4 consultation. Main comments included the following:</td><td>Refer below.</td></tr>
<tr><td>Adverse effect in-combination could not be ruled out for certain SAC Annex I habitats and SPA bird species based on information presented in draft HRA.</td><td>Further information on the relevant species has been provided in Sections 5.4 and 6.3 and Annexes A, B and F.</td></tr>
<tr><td>Efforts to reduce effects on intertidal habitats (including saltmarsh) would be welcomed.</td><td>Effects on intertidal habitats have been reduced as much as practically possible. Effects on saltmarsh habitats will be avoided where possible (see Section 6.2).</td></tr>
<tr><td>Conclusions to relate to adverse effects on feature integrity.</td><td>Assessment has been altered to refer to adverse effects (see Sections 6.2 and 6.3).</td></tr>
<tr><td>Natural England proposed a construction window of 1 May to 31 August until further information is provided.</td><td>Further information and clarifications to justify the proposed construction window have been provided in Sections 2.3 and 4.4.</td></tr>
<tr><td>Concerns about repeat disturbance of certain habitats due to phased installation.</td><td>Potential for repeat disturbance of SAC habitats has been assessed in Section 6.2 (specifically paragraph 6.2.16)</td></tr>
</table>

Consultee	Form of response	Date	Comment	How/where addressed
			Concerns about impacts on cockle beds (and consequent impacts on SPA features).	Further information on impacts on cockle beds has been presented in Section 6.2.
			Natural England is not concerned about potential for LSE on the common tern population of Coquet Island or Farne Islands SPA.	No action necessary (see paragraphs 6.3.100 *et seq*. and 7.3.49 *et seq*.)
			Recommendation that export cables are buried to depths of 1.5 m or greater to reduce electromagnetic fields (EMF) effects on lamprey species.	Burial depths are discussed in paragraph 2.3.3 and, with particular reference to effect on lamprey, in paragraph 6.2.44 *et seq*. Cable burial to a minimum depth of 1 m for inter-array cables and to a maximum depth of 3 m below stable seabed, subject to a cable burial assessment, for export cables and the majority of platform inter-connector cables within Subzone 1. Some inshore parts of the export cable route corridor may require burial to a maximum of 5 m depth. However, it cannot be guaranteed that 1.5 m (depth suggested by Natural England) of sediment will remain on the cable for the duration of the operational phase.
			Natural England agrees that a seasonal restriction will remove impact during sensitive periods for grey seals.	No action necessary (see paragraph 6.2.52 *et seq*.)
			Request that the Marine Management Organisation (MMO) should be consulted on the construction method statement and cable burial plan (including final mitigation measures and contingency plans).	Further detail on the submission of the cable specification and installation plan has been presented in Sections 2.3 and 6.4.
JNCC/ Natural England	Phase 4 (Humber HRA report): Letter response from SMart Wind to NE to Phase 4 comments followed by a meeting (25/03/2013) and a teleconference (4/04/2013)	March and April 2013	Updated information on phasing of cable installation.	Details of the indicative cable installation programme are provided in paragraph 2.3.26. Potential for repeat disturbance of SAC habitats has been assessed in Section 6.2 (specifically paragraph 6.2.16).
			Additional information on access requirements to the intertidal.	Proposed access arrangements are fully discussed in paragraph 2.3.23, with effects of access on SAC habitats fully assessed in Section 6.2.
			Clarification of outputs of physical processes modelling used to inform conclusions made in the HRA.	Further information on impacts on cockle beds, including physical processes modelling undertaken, has been presented in paragraph 6.2.2 *et seq*.
			Further SPA species specific information to support conclusions made and mitigation proposed.	Further information on the relevant SPA species, including alternative habitats available, has been provided in Sections 5.4 and 6.3 and Annexes A, B and F. This information is used to inform the mitigation measures presented in Section 6.4.
			Further information to support the conclusion that alternative habitats exist for SPA species.	Further information on the relevant SPA species, including alternative habitats available, has been provided in Sections 5.4, 5.5 and 6.3; and in Annexes A, B and F.
			Further information on mitigation measures to be employed, including use of an Ecological Clerk of Works to ensure cable installation is appropriately managed.	Mitigation measures are fully discussed in Section 6.4, including specific reference to how operations will be spatially managed.

Consultee	Form of response	Date	Comment	How/where addressed
JNCC/Natural England	Phase 4 (Humber HRA report): Second letter of response from NE on Phase 4 consultation, and outcomes of teleconference (24/04/13)	April 2013	Advice on HRA process to determine LSE for disturbance to SPA species, based on 1% population threshold.	The 1% 'rule of thumb' proposed by Natural England has been used in the LSE test in Section 3.2.20 *et seq*., and specifically paragraph 4.4.5, and has also been used to inform the appropriate assessment stage (Section 6.3).
			Provision of additional species figures.	Figures presented in Annex F and discussed in Section 6.3.
			Requests for further information on specific attributes of construction methods and programme.	Further information on cable installation and access to the intertidal has been provided in paragraph 2.3.2 *et seq*. Where information is not currently available, this will be provided in the cable specification and installation plan (i.e., post consent).
			Recommendation for inclusion of further projects for consideration in in-combination assessment.	Projects considered as part of the in-combination assessment have been presented in paragraph 4.4.16.
Natural England	Phase 4 (Humber HRA report): Third email response from Natural England on Phase 4 consultation, and outcomes of correspondence (24/04/13)	June 2013	Reiteration that the 1% population threshold is a rule of thumb and that further consideration may be required depending on the species in question.	The 1% 'rule of thumb' has been used as a guide as detailed in paragraph 4.4.5.
			It should be noted that the appropriate assessment must be able to conclude that there is no reasonable scientific doubt remaining regarding adverse effects on integrity.	Conclusions with respect to adverse effects on site integrity in Section 7 have been made with due consideration of reasonable scientific doubt in the assessment.
			If it is not possible to present noise levels as LA_{max} values, an indicative list of equipment and plant machinery anticipated should be presented.	Further information on the vehicles and equipment to be used for cable installation in the intertidal is presented in Volume 1, Chapter 3: Project Description.
			It is important to note that the LSE test must be undertaken on a species by species basis, regardless of how many species are present on the (HVDC converter/ HVAC substation) site.	Species have been considered individually in the LSE test (see Table 4.11 and Table 4.12) for effects at the landfall site and HVDC converter/HVAC substation.
			Natural England agrees that cable installation and construction of the converter station / sub-station is not likely to have a significant effect on foraging SPA birds, due to the absence of large flocks using the inland areas around the cable route and the availability of alternative habitat in the surrounding areas.	No action necessary.
JNCC/Natural England	Phase 3 Consultation (Offshore HRA Screening)	14 February 2013	The screening assessment should present a clear rationale for scoping out sites so the decision to screen out sites is presented in a transparent and robust manner.	The screening assessment addresses all qualifying features of identified Natura 2000 sites considered in the HRA in Sections 4.3 and 4.4. Further, following further discussions for birds this appears to relate to the non-inclusion of lesser black-backed gull and herring gull beyond the LSE stage. Both these species are now going to be considered in the second stage and therefore will be included.
			The document lacks assessment of in-combination impacts on habitats, marine mammals and fish interest features.	The screening assessment addresses in-combination impacts on qualifying features of identified Natura 2000 sites considered in the HRA in Sections 4.3 and 4.4.

Consultee	Form of response	Date	Comment	How/where addressed
			Consider all impacts that arise from construction activities (direct and indirect). Seabed preparation for gravity base foundations, for example, should be considered as these may affect sites outwith the construction site boundary, as could provision of new habitat that could be colonised by non-native species.	The screening assessment addresses all potential impacts on qualifying features of identified Natura 2000 sites considered in the HRA in Sections 4.3 and 4.4.
			If cables cannot be buried to the optimum cable burial depth and cable protection becomes necessary, the scope of the HRA may need to be widened because of potential impacts arising from interruption to sediment supply and erosion processes along the coast. Further sites may then have to be screened in to the assessment.	Full consideration on the effects of cable burial and associated protection has been made in Sections 4.3 and 4.4.
			This section focuses on SPA features and should include more detail on the interest features of the SACs being assessed. It is also important to note however that the assessment should, in addition to bird features, also include an assessment of the habitats that support the SPA population in question as appropriate.	The screening assessment addresses all potential impacts on all qualifying features of identified Natura 2000 sites considered in the HRA in Sections 4.3 and 4.4.
			Topics for inclusion in the marine mammal in-combination assessment should include: ▪ What is the potential for piling at other wind farms in the area to take place simultaneously? ▪ What is the potential for year on year sequential piling to expose the same area of sea to 'disturbing' levels of noise over a number of years which may increase the potential long term avoidance of the area by marine mammals? ▪ What is the potential for displacement of prey species from the area? ▪ What is the importance of this area for seal feeding and could subsequent impacts to prey species in this area affect seal condition? ▪ What is the potential for transboundary effects to occur within the in-combination assessment?	These topics have been considered in the marine mammal assessment in Sections 5.2 and 5.3.
			It appears that there is to be no in-combination assessment of bird displacement due to the fact that no other offshore wind farms are within Hornsea Project One's footprint of displacement. We do not consider this an appropriate way of screening in-combination displacement impacts. We suggest that the foraging area for each species from each SPA should be quantified and mapped against all other activities which are displacing or stopping birds feeding in this foraging area.	Following discussions on 28 March 2013 with JNCC and Natural England, an in-combination displacement assessment has been undertaken in Section 5.5, considering all project within foraging range (breeding season) and across the east coast (non-breeding season). It should be noted that since most other projects did not quantify mortality, this is largely qualitative.
JNCC/Natural England	Phase 4 Consultation (PVA; Offshore HRA Report)	13 March 2013	We note the recent publication of the "JNCC and Natural England interim advice note on HRA screening for seabirds in the non-breeding season" (February 2013), and request that the processes outlined in this advice note are followed. At present we are unable to confirm that the approach to determining LSE as set out in 'Annex A – SPA Screening Assessment (Offshore HRA)' is appropriate.	The JNCC and Natural England interim advice on HRA screening has been considered and followed where appropriate. This includes considering distant SPAs where connectivity may only exist during the non-breeding season, and attributing impacts in the breeding and non-breeding seasons to different SPAs. Determination of LSE is species-, season- and impact-specific, and in-combination effects have also been considered.

Consultee	Form of response	Date	Comment	How/where addressed
JNCC/Natural England	Phase 4 Consultation (Offshore HRA Report)	13 March 2013	Greater clarity should be provided on the screening method and as to how interest features / designated sites have been dropped from the assessment process between 'screening' and a final determination at the LSE stage.	Additional text on the screening method is provided in Sections 3 and 4. Lesser black-backed gull and herring gull are now included (see Section 4.3, paragraph 4.3.134 *et seq.*).
			The relationship and cross-over with the Humber/onshore HRA could be made clearer. If the offshore HRA includes all impacts up to mean low water springs (MLWS), impacts to fish and habitat features below this point should be subject to further consideration in this document.	The two HRAs for the onshore (Humber Estuary) and offshore have been combined into a single HRA for Project One (i.e., this document).
			Decommissioning should also be considered.	Decommissioning impacts have been included in Section 2.5 and Table 2.1.
			Only other projects which are not likely to have a LSE alone should be considered in the in-combination element of an LSE assessment, as should any residual effects remaining after mitigation for projects which have a LSE alone. Moreover, fully consented and operational projects would be part of the baseline but may also have residual effects which should be included in an assessment.	This approach has been taken and is presented in the in-combination screening assessment methodology is presented in Section 3.2 and paragraph 3.2.26 *et seq*.
			There should be a more detailed explanation of why construction and decommissioning impacts can be disregarded.	Additional text has been added that expands on potential impacts from construction and decommissioning, in Table 2.1.
			The proposed extension of the boundary and change in the interest features of Flamborough Head and Bempton Cliffs SPA should be the basis for assessment.	Revised numbers have been used in the assessment in Section 5.4.
			Some confusion between the concept of cumulative effect and the requirements of an HRA in-combination assessment. Built, operational, developments are not part of an HRA in-combination assessment, but they are part of an existing baseline of impacts, accumulated over time. The three 'Tier' approach being suggested is adequate to cover cumulative and combining impacts.	As all offshore wind farms have residual effects on birds during the operational period then based on this advice all operational wind farms have been included in the in-combination assessment in Section 3.2 and paragraph 3.2.26 *et seq*.
			Consideration should be given to impacts at or near to the SPAs themselves. For example, the Environment Agency Filey Bay Net Limitation Order intended to limit by-catch of auks from Flamborough Head and Bempton Cliffs SPA, and a recent proposal in local authority forward planning documents to create a marina at Bridlington Harbour.	These have been considered in paragraph 4.3.187 *et seq.* and 4.4.16 *et seq*.
			There should be an explanation of how the APEM migration model operates, with figures used to demonstrate how the percentage of the population predicted to pass through Hornsea has been generated and how this relates to impacts on specific SPAs.	The HRA report cross-references information on the APEM modelling undertaken for migratory birds in the Screening Assessment (Section 4.3 and Annex A). The detailed methodology of the model is presented in Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix D.

Consultee	Form of response	Date	Comment	How/where addressed
			Provide clarification on to what distance from the offshore wind farm displacement effects have been assessed.	SMart Wind consider that a 1 km buffer is sufficient for moderate sensitivity species such as auks, with the site alone being sufficient for low sensitivity species such as gulls. Further clarification is provided on this matter in the Environmental Statement Volume 2, Chapter 5: Ornithology and in the matrix tables based on 2 km displacement in Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix A, for reference.
			Information from Scroby Sands, Beatrice Demonstrator and Blyth Wind Farm not included.	Beatrice Demonstrator and Blyth Wind Farm have been included. Information from the Scroby Sands Environmental Statement is not available, although due to the age of the project, there would be very low confidence in the associated data.
			Considerable differences in the collision estimates used for in-combination collision risk assessment compared with the same assessment done for East Anglia One.	These discrepancies have now been updated, see Sections 4.3 and 5.5.
			While there will be no direct overlap in displacement effects from Hornsea Project One and other projects, there is potential for in-combination displacement impacts due to several projects being within foraging range of auks from Flamborough Head and Bempton Cliffs SPA.	The in-combination assessment now considers all projects within mean maximum or maximum foraging range from the Flamborough Head and Bempton Cliffs SPA during the breeding season. Outwith the breeding period auks can be from many other sites and impacts are apportioned across colonies according to the proportion of colony size. Birds from Flamborough Head and Bempton Cliffs may occur anywhere in the North Sea but it is not possible to identify which other wind farm sites they might occur near.
			No arguments have been provided on why the in-combination displacement assessment is restricted to projects within 100 km of Hornsea Project One.	The scope of in-combination displacement has now been based on projects within mean maximum or maximum foraging range during the breeding season and across the east coast during the non-breeding season. This is presented in Section 4.3.
			Common advice across the SNCBs is an avoidance rate of 98% for gannet collision risk assessment. Results making use of a 98% avoidance rate should be presented alongside results for a 99% avoidance rate for all in-combination assessments.	Results at a 98% avoidance rate are presented for species in the absence of sufficient information to suggest otherwise. Where information suggests that 99% is more appropriate (as in the case of gannet), only this associated mortality rate has been taken forward to the impact assessment stage, to reduce the risk of confusion if more than one value is presented.
			Define breeding seasons carefully with reference to a range of relevant literature. The breeding season should be considered as beginning before egg-laying. The close of the breeding season should also be chosen carefully with respect to fledging/colony departure, as it will have a significant bearing on the definition of the post-breeding season.	The kittiwake breeding season has been revised to March-July inclusive. The gannet breeding season is considered to be April-September inclusive, as recommended by Royal Society for the Protection of Birds (RSPB), (Phase 4 Consultation), in relation to information collected at the Flamborough Head and Bempton Cliffs SPA colony. For other species, less information is available, although as birds present will be from a variety of colonies, a more generic breeding season range, as presented in Kober *et al.* (2010) is more applicable, and indeed more precautionary.

Consultee	Form of response	Date	Comment	How/where addressed
			31 annual collisions of adult Gannets apportioned to Flamborough Head and Bempton Cliffs SPA constitutes an increase of more than 1% in baseline mortality. We look forward to continuing the discussion on suitable parameters for PBR analysis.	PBR analysis has been carried out and is reported in Section 5.4 and Annex J.
			The value for flights of kittiwakes at potential collision height (PCH) of 2.8% appears very low in comparison to the 15.7% (7.9 – 23.6) suggested by Cook *et al*. (2012) and is not within the 95% confidence interval of that value. Natural England recommends assessing potential collision risk based on both values.	The correct PCH value for kittiwakes used for Band (2012) Option 1 collision modelling is 3.7%. This is based on data from Subzone 1 only. Site-specific values are used for the CRM instead of Cook *et al*. (2012), and the suitability of the values for kittiwake has been discussed in Environmental Statement Volume 2, Chapter 5: Ornithology.
			Assessment should be made on the basis of a range of percentages from 0% to 100% for displacement of birds from the wind farm area plus buffer. Assessment should be made whilst considering a range of percentages from 0% to 100% for assumed mortality, in all seasons.	The Interim Advice Note on displacement issued by JNCC/Natural England in January 2013 has been considered in full and revisions to the displacement impact assessment have been carried out, see Sections 5.4 . An appropriate selection of displacement/mortality rate for each species has however still been made based on available evidence and expert judgement.
			It is of concern that the apparent methodology for determining which sites and features should go forward to appropriate assessment has used specific assumptions on mortality arising from displacement. This attributes mortality of 10%, 2% and 1% for the various seasons.	As there is no current advice from JNCC/Natural England as to the appropriate mortality rates to use, the final assessment followed this same approach.
			Further detail should be added to reflect the potential impact to features arising below MLWS but further inshore than the array itself i.e., cable installation, cable protection etc.	Additional text has been added covering cable laying activities (see Section 6.2).
JNCC/Natural England	Phase 4 follow up	June 2013	Meeting to provide SNCBs with an: ▪ update on the key points that have changed since the Phase 4 consultation (collision risk modelling, PVA & PBR and in-combination impact assessment); ▪ opportunity to discuss ways to refine displacement assessment; ▪ opportunity to raise any final points following receipt of SMart Wind's Phase 4 consultation responses; and ▪ post application engagement steps.	Updated information is set out with Sections 5.4 and 5.5.
RSPB	Phase 4 Consultation (Offshore HRA Report)	27 March 2013	Assuming that during the non-breeding season, birds are present in numbers in proportion to SPA breeding colony size assumes complete mixing of birds from these SPAs and equal likelihood of occurrence in Project One. The most precautionary approach would be to consider all predicted non-breeding collisions to relate to Flamborough. The likelihood is that the collision associated with Flamborough lies somewhere between the scenario presented and a scenario that assumes all collisions apply to Flamborough.	It is acknowledged that whilst there may not be complete intermixing of populations in the non-breeding season, equally this cannot be ruled out as most species considered disperse widely, if not being completely migratory. The assumption, which was agreed with JNCC and Natural England, used is considered to be reasonable, considering that there is a great likelihood that non-regional birds will also be present and as robust as any alternative method in the absence of formal industry guidance or empirical research data to suggest otherwise.

Consultee	Form of response	Date	Comment	How/where addressed
			Whilst birds may have greater mobility options during the non-breeding season, it does not necessarily follow that they can simply relocate their foraging areas. They require access to foraging habitat of comparable quality which may be limited or already occupied and increased densities of feeding birds may not be sustainable.	In certain cases this may be true, however for the species considered here, they are all wide ranging naturally in winter months in response to redistribution of mobile prey, and therefore any effects would be temporary.
			In-combination collision mortality is based on 332 x 3.6 MW turbines and 98% avoidance rate (AR). As discussed at our meeting on 31st January 2013, it would be helpful to include the collision risk modelling (CRM) for 8 MW turbines also.	The modelling results for the 8 MW turbine are available in the Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report), and the assessment has carried forward the relevant (worst case) outputs to the HRA report.
			We do not consider that adequate justification is presented for using 99% avoidance rate for breeding adult gannets.	Further evidence has been provided where possible (see Section 5.4).
			It would be useful to see the variance applicable to the proportion of observed gannets in Hornsea Project One to determine whether multiple values of estimated collision of adults should be assessed to represent the seasonal range of adult proportions.	The proportion of adult to immature gannets (and for other species where appropriate) is now split between breeding and non-breeding season. Where sufficient data are available for species, a monthly breakdown of adult/sub-adult composition is presented in the Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report.
			Assuming equivalent proportions of adults to immatures at other wind farms and proposal sites is one potential scenario, but may be wrong. Alternative scenario(s) should be assessed as well.	Recognising that there may be errors when making assumptions, the assessment is now only considering numbers presented in other applications. Regarding applications where there are no numbers presented; then no assumptions are being made.
			Consider a range of possible displacement and mortality values, as per statutory guidance.	A range has been presented in the updated displacement matrices (Sections 5.4 and 5.5 and Environmental Statement, Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix A), but the most appropriate value has been taken forward to assessment.
RSPB	Phase 4 Consultation (Humber HRA report)	April 2013	The request of more detailed information on the methods and programme of cable installation at Horseshoe Point.	Further information on cable installation and access to the intertidal has been provided in paragraph 2.3.5 *et seq*. Where information is not currently available, this will be provided in the cable specification and installation plan (i.e., post consent).
			Inclusion of recently produced SPA conservation objectives.	Conservation objectives for the Humber Estuary SAC and SPA are referred to in Annex E and presented in Annex I. These are fully considered in Sections 4.4, 5.2, 5.3 and 6.
			Production of figures to show spatial distribution of SPA species and provide further confidence for conclusions.	Further information on effects of cable installation on SPA species, including details of spatial distribution and effects related to noise and visual disturbance, has been provided in Section 6.3 and Annex F.
			Assessment of habitat away from area-based approach.	The assessment of effects on habitats has fully considered direct (e.g., habitat loss) and indirect effects (e.g., plume effects and release of sediment bound contaminants). These are presented in Section 6.2 and 6.3

Consultee	Form of response	Date	Comment	How/where addressed
			In-combination effects with recreational activities.	Projects and activities considered as part of the in-combination assessment have been presented in paragraphs 4.3.187 *et seq.* and paragraphs 4.4.16 *et seq*.
	Phase 4 (Humber HRA report): Letter response to Phase 4 comments, and teleconference (24/04/13)	April 2013	Provision of detailed programme and methods in relation to potential impacts on SPA features.	Further information on cable installation and access to the intertidal has been provided in Section 2.3. Where information is not currently available, this will be provided in the cable specification and installation plan (i.e., post consent).
			Provision of suitable figures to provide information on species' distribution and site usage.	Further information on effects of cable installation on SPA species, including details of spatial distribution and alternative habitats, has been provided in Section 6.3 and Annex F.
			Determination of likely recreational disturbance levels and access restrictions.	Projects and activities considered as part of the in-combination assessment have been presented in paragraphs 4.3.187 *et seq.* and paragraphs 4.4.16 *et seq*. Proposed access arrangements are fully discussed in paragraph 2.3.23 *et seq*.
RSPB	Phase 4 follow up	July 2013	Meeting to provide SNCBs with an: ▪ update on the key points that have changed since the Phase 4 consultation (collision risk modelling, PVA & PBR and in-combination impact assessment); ▪ opportunity to discuss ways to refine displacement assessment; ▪ opportunity to raise any final points following receipt of SMart Wind's Phase 4 consultation responses; and ▪ post application engagement steps.	Updated information is set out with Sections 5.4 and 5.5.
Environment Agency	Meeting	April 2011	The Environment Agency reported the need for a HRA to determine the impact of proposals on the site.	This HRA Report has been compiled for both the offshore project components and onshore infrastructure.
Rijkswaterstaat North Sea (Ministry of Infrastructure and Environment)	PEIR Consultation Response	September 2012	Suggests that information on the proposed Natura 2000 sites and other areas of ecological importance within study on cross border impact and cumulative impacts be included. This should include: Dutch Dogger Bank proposed Site of Community Importance (pSCI) and Klaverbank pSCI.	Marine mammal features of transboundary Natura 2000 sites have been assessed in Sections 4.3, 5.2 and 5.3.
	Section 42 Consultation	13 March 2013	Request information regarding the effects on harbour porpoise on the Dutch Exclusive Economic Zone (EEZ), whether the development is in compliance with the Dutch 'Harbour Porpoise Protection Plan'.	The Developer commits to the development of a Marine Mammal Mitigation Protocol (MMMP) through consultation with statutory advisors. The MMMP will inform the Code of Construction Practice (the provision for which is made within the draft Marine Licence for the Project) (see Section 5.6).
	Minutes of meeting	13 March 2013	Waddenzee (Wadden Sea) SCI which is designated for grey seal and harbour seal should be considered.	The Waddenzee (Wadden Sea) SCI has been considered in Section 4.3 but has been screened out as no connectivity to Project One has been demonstrated.
Bundesamt für Seeschifffahrt und Hydrographie	Minutes of meeting	18 December 2012	Discussion relating to transboundary issues.	Transboundary effects for Natura 2000 sites are considered for Project One alone and in-combination effects in Sections 5.2 and 5.3.

2 PROJECT OVERVIEW

2.1 Introduction

2.1.1 The Hornsea Zone is located in the southern North Sea, covering an area of approximately 5,000 square kilometres (km^2) (Figure 1.1). The East Riding of Yorkshire coast lies 31 km to the west of the Zone's boundary. The Zone's eastern boundary is 1 km from the median line between UK and the Netherlands waters.

2.1.2 Full details of the offshore and onshore components and activities associated with the construction, operation and maintenance and decommissioning of Project One are provided in the Environmental Statement Volume 1, Chapter 3: Project Description, though a brief summary of the Project One components relevant to the HRA report is provided below. Project One has been described with regard to both its offshore (Section 2.2) and onshore project components (Section 2.3). The offshore components comprise the offshore wind turbines, inter-array cables and export cable up to the boundary of the Humber Estuary SPA/SAC/Ramsar site. For the purposes of this HRA, the onshore components comprise the export cable from this boundary through the Humber Estuary and the inter-tidal and the onshore cable route to the substation at North Killingholme.

2.1.3 The design envelope scenarios assessed for the purposes of the HRA, assuming the maximum worst case scenarios, are summarised in Table 2.1, with further details of these provided in the relevant Environmental Statement chapters listed in paragraph 1.4.5.

Project One

2.1.4 Project One includes all offshore infrastructure (e.g., turbines, offshore substations, inter array and export cables) and onshore infrastructure required to connect with the onshore grid connection. The wind farm will be located in the southern North Sea, approximately 103 km to the east of the East Riding of Yorkshire coast. The onshore cables will connect to the National Grid substation at North Killingholme, with a cable route landfall at Horseshoe Point, North Coates, Lincolnshire.

2.1.5 Project One will have a total generating capacity of up to 1.2 GW. Therefore, there will be a maximum of 332 wind turbine generators (WTGs) (depending on turbine type) within Project One, with turbine capacities ranging from 3.6 MW up to 8 MW being considered.

Subzone 1

2.1.6 Subzone 1 is situated within the centre of the Hornsea Zone with a total area of 407 km^2 (Figure 1.1). Subzone 1 is described as the area within the Hornsea Zone containing the offshore array, comprising WTGs and foundations, inter-array cabling, offshore converter stations, offshore collector stations, offshore accommodation platforms, and all associated infrastructure.

2.1.7 The western boundary of Subzone 1 lies 103 km off the East Riding of Yorkshire coast and the eastern boundary of Subzone 1 is 43.6 km from the median line between UK and Dutch waters. The offshore cable route extends from the proposed landfall at Horseshoe Point in Lincolnshire, offshore in a north-easterly direction to the southern boundary of Subzone 1. The route is approximately 150 km in length.

2.1.8 SMart Wind has defined four indicative turbine layouts which are presented in the Environmental Statement Volume 1, Chapter 3: Project Description. These layout options are for assessment purposes only and have been developed based on determination of the worst case layout for each receptor. The final layout will be determined post-consent.

2.2 Offshore Project Components

Turbine Installation

2.2.1 Turbine components (nacelle, rotor, blades and towers) will be loaded on the installation vessel at a UK or European port, and shipped directly to Subzone 1. Up to ten turbines can be loaded at a time, depending on installation vessel size and capability.

2.2.2 Once the installation vessel is on location, the tower will be erected first, followed by the nacelle with hub already in place, thereafter the blades will be installed one at a time (single blade installation). Alternatively the nacelle will be installed without the hub and the blades will be connected to the hub and installed as a single rotor.

Wind Turbine Foundations

2.2.3 Three foundation types for turbines are being considered for Project One. The final selection of foundation type(s) for Project One will be dependent on the final turbine size, site ground and seabed conditions, water depth, environmental considerations and economic and supply chain considerations. The following foundation concepts are being considered:

- Monopiles including braced and guyed designs;
- Steel jackets/space frame structure supported by piles (including both driven and suction piles); and
- Gravity base foundation (including mono-suction caissons).

Monopiles

2.2.4 A monopile foundation comprises a large diameter steel or concrete tube (pile) driven vertically into the seabed. Typically a transition piece is installed on top of the pile to provide a level stable platform to support the weight of the tower and turbine. The dimensions of the pile depend on the size of the WTG, water depth, meteorological, oceanographic and the ground conditions at each location.

2.2.5 Depending on the local ground conditions, there may be a requirement for drilling to facilitate the installation of a monopile to target depth, with the subsequent drill arisings disposed of at sea adjacent to the foundation location.

2.2.6 Driving a single monopile could take less than one hour with good ground conditions or up to seven hours spread over 24 hours if the geology proves to be difficult. During installation of the foundations, piling may be carried out concurrently on two WTG monopile foundations in Project One, using two separate installation vessels. Piling may occur at any time of day (vessel operations are 24 hours) though piling will not be constant for 24 hours per day. Between piling of individual monopiles, vessel movements and pile handling operations will need to occur which are likely to take 12 hours.

2.2.7 It is expected that the piles will be driven by hammers with potential to produce up to 2,300 kJ of piling energy. It is normal in offshore piling to select a hammer that can drive piles to the required penetration without applying 100% of the hammer's available piling energy. A 'soft start' of 20 to 30 minutes, where the hammer energy applied would be around 10-20% energy, would be expected at all piling locations. Following the soft start, a gradually increasing hammer energy up to a maximum of full hammer energy may be needed to install piles to full design penetration at the site. The finalised pile driving requirements are sensitive to the final pile length, geometry, diameter, soil strength and soil composition at each location. Due to the potential adverse environmental impact, hammers greater than 2,300 kJ will not be used. The underwater noise assessment within this HRA therefore considers a 'realistic worst case' hammer energy of 2,300 kJ, (i.e., the largest hammer that is proposed for use at this development) (refer to the Environmental Statement Volume 2, Chapter 4: Marine Mammals, Table 4.13). However, the maximum energy required to complete pile installation may, in some cases, be less than 2,300 kJ. In the event of pile refusal before the design penetration depth is achieved when a hammer energy of 2,300 kJ is being used, then relief drilling will be undertaken to complete the piles in question.

Jacket structures

2.2.8 Steel jacket or space frame structure foundations have a steel lattice construction comprising tubular steel members and welded joints which is fixed to the seabed using piles at the corners of the base. Typically piles are hollow steel structures and are driven up to 75 m into the seabed substrata.

2.2.9 The jacket foundations will be fabricated onshore and transported to Subzone 1. Once on site the jackets will be lifted by crane onto the seabed and secured with either standard or suction piles. The piles may either be installed before the jacket is placed on the seabed (pre-piled), usually using a template, or after the jacket is placed on the seabed (post-piling).

2.2.10 In the case of pre-piling, the piles may be installed by a different installation vessel than the one that places the jackets. The jackets will be fitted to the piles in a pin and socket arrangement where either jacket legs are inserted into the piles (usually when pre-piling) or the piles are inserted into pile sleeves at the base of the jacket (usually when post-piling).

2.2.11 The pre-piling installation process, excluding weather down time, will take approximately 24 hours for the pre-piling of four piles, where each single piling event is expected to take around six hours. Post-piling jacket pile installation could take approximately the same amount of time as pre-piling operations. Therefore the durations of pile driving operations should remain the same.

2.2.12 It is anticipated that a 2,300 kJ hammer would be required for driving these piles. If piling alone fails to install piles to full depth, then a combination of piling and drilling will be used. In terms of assessing the impacts, the focus is on piling only as noise impacts from drilling are considerably less, with potential effects for the latter predicted to of similar magnitude to vessel noise (see Environmental Statement Volume 2, Chapter 4: Marine Mammals, Section 4.6).

2.2.13 In the case of suction piles, no hammering is required. Instead, the piles are placed on the seabed and, using a pump, a negative pressure is applied to the inside of the pile (the seabed end of the pile is open, the other end is closed). This negative pressure 'sucks' the pile into the seabed and holds it there.

Gravity base foundations

2.2.14 Gravity base foundations (GBF) work by using a wide area base, which is sufficiently heavy to resist horizontal forces of wind and currents acting on the turbine and tower. Downward forces are resisted by the base bearing onto the seabed.

2.2.15 The GBFs will be constructed onshore using reinforced concrete and/or steel. The installation process is expected to take between three and five days per foundation, not including seabed preparation. Noise levels associated with GBF installation are much lower when compared with the worst case monopiles (see Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.9 and Chapter 4: Marine Mammals, Table 4.13).

Accommodation Platforms

2.2.16 Due to the distance from shore of Subzone 1, it is possible that up to two offshore accommodation platforms may be required to accommodate the project operation and maintenance (O&M) personnel and to store maintenance spares, as well as potentially housing construction and commissioning staff during the construction phase. Further details on O&M strategy, including how accommodation platforms will be used can be found in Section 2.4.

2.2.17 The offshore accommodation platforms will be supported by either monopile, jacket or gravity base foundations similar to those already described in Section 2.2. Installation of the foundations will occur using the methods described in Section 2.2. The installation of the topsides of the accommodation platforms will be carried out by a heavy lift vessel. Installation of the accommodation platform is expected to take approximately 30 days, exclusive of weather downtime.

Offshore Transmission Infrastructure

2.2.18 In order to collect and transfer the electricity generated by the offshore turbines to the onshore National Grid transmission system, two main options are being considered: High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC) technology.

2.2.19 For the HVDC Export Option the offshore electrical components that will be required include:

- Alternating Current (AC) inter-array cables from the WTGs to offshore HVAC collector substation(s);
- Offshore HVAC collector substation(s);
- Offshore HVDC converter station(s);
- Cables from offshore HVAC collector substation(s) to HVDC converter station(s); and
- HVDC transmission cables from offshore HVDC converter station(s) to landfall.

2.2.20 For the HVAC Export Option the offshore electrical components that will be required include:

- AC inter-array cables from the WTGs to offshore HVAC collector substation(s);
- Offshore HVAC collector substation(s);
- An offshore HVAC reactive compensation substation; and
- HVAC transmission cables from offshore HVAC collector substation(s) to the landfall via the offshore HVAC reactive compensation substation.

2.2.21 Both of these systems can be used in a number of configurations, the options and components required are explained in more detail below. The worst case design elements for the HVDC and HVAC transmission options and components have been considered within the assessment.

Inter-array cables

2.2.22 Inter-array cables will connect the individual turbines in Subzone 1 to the offshore HVAC collector substation(s).

2.2.23 The inter-array subsea cables will be a three core configuration and will be buried in the seabed where possible. The extent and method by which the inter-array cables will be buried is dependent on the result of a detailed seabed survey of the final cable route and associated burial risk assessment process. Cable installation would likely involve one, a combination of, jetting and ploughing from an anchored barge or Dynamic Positioning (DP) vessel. Where cable burial is not possible, surface laying will be required.

2.2.24 Cable protection measures around the inter-array cables as they transition from the seabed to enter the turbines may be deployed. The exact amount of cable protection required at each cable end will depend on the burial depths achieved by the inter-array cable installation. Furthermore, the exact form of cable protection to be used will depend on local ground conditions, hydrodynamic processes and the selected cable protection contractor. Cable protection options are described within the Environmental Statement Volume 1, Chapter 3: Project Description, Section 3.2.

Offshore HVAC collector substation, offshore HVAC reactive compensation substation and offshore HVDC converter station

2.2.25 The purpose of the offshore HVAC collector substation is to provide a centralised collection point for the inter-array cables, and to transform the voltage of the electricity generated at the turbine to a higher voltage, suitable for the transporting bulk power flows. It is expected that a maximum of five offshore HVAC collector substations will be required for Project One.

2.2.26 In order to limit the electrical losses inherent in using HVAC transmission over long distances it is necessary to use shunt reactors to provide reactive compensation at some point close to the midway point along the export transmission cables. These electrical reactors will be housed in an offshore HVAC reactive compensation substation.

2.2.27 In addition there may be up to two offshore HVDC converter substations required for Project One. The power generated by the WTGs will be at medium voltage (30 to 70 kV) before being increased to high voltage at the offshore HVAC collector substations. The HVAC electricity is converted to HVDC by the offshore HVDC converter station(s) before being transported to shore via HVDC cables. It is anticipated that the HVDC converter substations will be located within the Subzone 1 turbine arrays. Co-location and/or consolidation with the offshore HVAC collector substations are also being considered.

2.2.28 The offshore substations will most likely be supported by a monopile, jacket or gravity base foundation. The characteristics of the foundations will be similar to those already described in Section 2.2 and, where necessary, will require similar seabed preparations. The installation of the topsides will be carried out by a heavy lift vessel. Installation is expected to take approximately 30 days, exclusive of weather downtime.

Export cables

2.2.29 For the HVDC transmission option the bulk power flows from the offshore HVDC converter station(s) to landfall, fed via up to two HVDC circuits; each comprising two single core subsea cables in separate trenches (i.e., up to four trenches in total), or bundled together with two cables to a single trench. If the cables are bundled, each bundled cable may be separated near the substation and at the near shore pull-in (at approximately 100 m and 50 m, respectively).

2.2.30 In the case of the HVAC export option, power is transmitted to shore via export cables and an offshore HVAC reactive compensation substation.

2.2.31 The extent and method by which the export cables will be buried is dependent on the results of a detailed seabed survey of the final cable route and associated burial risk assessment process. Cable installation would likely involve one, a combination of, or all of, ploughing, trenching, jetting, rock-cutting, dredging, surface laying with post lay burial or surface laying from an anchored barge or DP vessel. Where cable burial is not possible, cable protection measures for up to 25% of the export cable route will be required.

2.3 Onshore Project Components

2.3.1 Project One is likely to require up to four cable circuits, each comprising a single three core cable buried in its own trench (i.e., up to four trenches in total). For the purposes of the Humber assessment, Project One has been assessed on the basis of four cable trenches through the Humber Estuary and the intertidal area and all necessary onshore infrastructure required to achieve connection to the National Grid substation at North Killingholme (see Figure 1.1). In order to achieve this connection a variety of onshore electrical components are required, including:

- Landfall;
- Cable Route;
- Onshore HVDC converter or HVAC substation; and
- HVAC cables from HVDC converter/HVAC substation to National Grid substation.

Landfall

Subtidal cable installation within the Humber Estuary SAC

2.3.2 This section of the export cable route (i.e., within the Humber Estuary SAC) is approximately 3.2 km in length, encompassing some subtidal habitats of the SAC. The extent and method by which the cables will be buried is dependent on the result of a detailed seabed survey of the final cable route and associated burial risk assessment process. Full details will be presented in the cable specification and installation plan which will be submitted for agreement to the MMO prior to cable installation. Cable installation would likely involve one of, or a combination of, ploughing, trenching or jetting.

2.3.3 The number of trenches required to accommodate the HVDC or HVAC transmission cables will be up to four, ultimately determined by cable design and installation methodology. Cables in most subtidal areas will be buried to a maximum depth of 3 m and the maximum width of seabed affected per trench will be 10 m. Maximum burial depth of 3 m, subject to cable burial assessment, is anticipated for the majority of the intertidal area. Burial depths of 5 m may be required in a limited number of places in the intertidal and subtidal areas to allow for seasonal changes in seabed levels.

2.3.4 Where drainage channels exist in the intertidal, cables will be buried below the lowest likely depth of the channel, to ensure cables remain buried and do not interfere with the natural flow in the area. Where it is not possible to bury export cables to the target depth (i.e., to ensure cables remain buried throughout the operation phase) within the SAC, cable protection will be installed in the form of frond mattressing, which may be installed over a maximum of 10% of the export cable length within the SAC. This frond mattressing will ensure that that cables remain buried and, by reducing current flow in the immediate vicinity of the fronds, will prevent scour effects and allow for sediment accumulation (Seabed Scour Control Systems, 2013). Full recovery of sediments (i.e., burial of fronds) is predicted to occur within one year following installation of the frond system, ensuring no long term habitat loss in subtidal areas.

Intertidal cable burial

2.3.5 The export cable corridor will converge to a landfall at Horseshoe Point, Lincolnshire. In order to bring up to four HVAC or HVDC export cables ashore these must:

- Be brought through the intertidal zone within the specified corridor shown in Figure 2.1; and
- Cross the existing sea defences using horizontal directional drilling (HDD) to enter a transmission pit on the landward side of the sea defences.

2.3.6 Prior to cable installation in the intertidal, the ends of the HDD ducts are exposed in an 'exit pit' in the intertidal area using a tracked excavator. Following this a barge will arrive with a length of cable and anchor as close to the exit pit as possible (within the cable convergence corridor). The cable will be installed in one duct at a time and then elevated from the beach surface using rollers, which guide the cable and protect it from damage. The barge is then used to install the cable through the remainder of the intertidal area using jetting, trenching, or ploughing (see below), and out a certain distance to sea. The barge, whilst it is working in the intertidal area, will be aground at low tide. It will be flat-bottomed and up to 150 m long and 50 m wide.

2.3.7 It is not expected that any ground preparation work will be necessary before cable laying is carried out at the landfall. However, if large boulders or other obstructions are found, they will need to be removed.

2.3.8 HVAC or HVDC cables will be installed through the intertidal using the following methods:

- Trenching by use of a tracked excavator or similar;
- Ploughing; and/or
- Jetting.

Trenching

2.3.9 This method is one by which traditional or specialised digging equipment is used to excavate a trench, in which a cable or cables are inserted, and then excavated sediment is backfilled. Specialised trenching machines can either be land driven specialist vehicles which can operate in shallow waters or marine deployed Remotely Operated Vehicles (ROV). It is likely that an ROV solution will be used.

2.3.10 The digging equipment may be tracked, to keep the pressure on the ground to a minimum, and drive out into the intertidal area to dig the trench. Alternatively, the equipment may be located on barges that float at high tide and rest on the ground at low tide.

2.3.11 Trenching may temporarily affect a corridor of up to 40 m width of each of the four trenches through direct contact with the trenching equipment or other equipment, laydown of the cable prior to burial, or displaced spoil from each trench before it is backfilled. This does not include vehicle movements around the cable trenches, though all works (including vehicle movements) will be restricted to within the convergence corridor shown in Figure 2.1. Additionally, if a barge is used, the area could be greater when the barge is resting on the ground at low tide. Should this occur, the area affected would also be within the convergence corridor identified in Figure 2.1. Additional temporary works for anchor placement may be required which would result in limited sediment disturbance in the temporary working areas shown on Figure 2.1. It should be noted these areas are for both Project One and Project Two, and represent temporary working areas which may be required for future operation and maintenance or construction of Project One, were Project Two already installed. The extended area would allow placement of anchors over the Project Two cables.

Ploughing

2.3.12 This method is one by which a ploughing machine opens a trench, a cable or cables are inserted, and the trench is backfilled (this is done simultaneously in contrast to trenching where trenching, laying and burial will occur individually).

2.3.13 The plough could have tracks or skids which are used to steer the plough and can be lowered and raised to vary the burial depth. It would be deployed and pulled from the cable installation barge.

2.3.14 Ploughing may temporarily affect a corridor of up to 40 m width of each of the four trenches through direct contact with the plough or other equipment, laydown of the cable prior to burial, or displaced spoil from each trench before it is backfilled.

Jetting

2.3.15 This method is to place a cable on the seabed and a machine uses jets of water to liquefy the sediments allowing the cable to sink into the seabed.

2.3.16 The jetting machines work by placing a 'sword' (an arm with jetting nozzles on) beside and beneath the cable to liquefy the sediment so that the cable can drop down to its required burial depth. Jetting can only be carried out with suitable water levels to provide water for the pumps and consequently jetting work may be heavily interrupted if used in intertidal areas. These will be deployed from cable installation barges which will house the necessary pumps and power supplies for jetting.

Cable installation at sea defences: Horizontal directional drilling (HDD)

2.3.17 HDD will be used to cross the sea defences. The technique involves drilling in an arc between two points, passing beneath the sea defences. A small pilot drill is first used to determine the path for each cable duct and then a larger reamer is pulled back through the duct to increase the diameter for the high density polyethylene ducts to be pulled through. The cables are then pulled through the ducts to the transition joint bays.

2.3.18 The export cables will be installed under the sea defences in up to four ducts. These ducts could be up to 0.75 m in diameter and be between 100 and 700 m in length. These ducts will conduct the cables to the transition pit. The actual number and size of the ducts will depend on the rating and number of the subsea cables used.

2.3.19 Suitability of the technique requires confirmation using intrusive sampling techniques along the route to be followed by the planned HDD procedure. Preliminary survey results of the route have indicated the ground conditions to be suitable for HDD. The detailed design of HDD is determined by more detailed survey of the ground conditions.

2.3.20 The maximum depth to which cables will be installed under the sea defences will be 30 m. The depth of burial will be dependent upon the natural variation in beach levels predicted over the life of Project One (see paragraph 2.3.3).

2.3.21 At the HDD exit point for each duct, a pit measuring 900 m^2 (30 x 30 m) and 4 m depth will be excavated in the intertidal. The drilling system will use a closed circuit mud management system where the mud is constantly pumped out of the pit for processing and re-use and will minimise the risk of drilling mud escaping into the sea. At the end of the drilling operation, drilling fluids and any wastes will be cleared from the site. The HDD pit will be backfilled other than the part where the adjoining transition joint bay will be constructed. Excavation of HDD exit pits and associated works (e.g. spoil storage, vehicle movements) will be restricted to within the convergence corridor.

2.3.22 For HDD operations up to four transition joint bays will be constructed on the landward side of the coastal defences, each a maximum of 250 m^2 (25 x 10 m) in area, they will be located within a 200 x 150 m temporary working compound area (see Figure 2.1) required for a typical HDD rig compound. HDD ducts may be constructed on the landward side of the sea defence within the compound area and transported over the sea defences via the access route described below, or by pulling them over the sea defences using rollers temporarily installed on the sea defences (approximately 10 rollers, measuring 1 m tall and with a base of 2 x 2 m). Alternatively, these may be capped and transported on a barge from the sea. The ducts will then be pulled through the drilled hole and under the sea defence.

Proposed access to the intertidal

2.3.23 During construction, proposed access to the intertidal will be from the landward side of the sea defences over (i.e., perpendicular to) the sea wall (see Figure 2.1) along two access tracks. Each of these will comprise a temporary bridge and/or culvert over the drainage ditch and a track and ramp over the sea wall providing direct access onto the intertidal: one from the onshore HDD compound directly to the intertidal works area and one approximately to the southeast of this area (see Figure 2.1). After crossing the sea wall, the southern access track will then turn northwest (i.e., parallel to the sea wall) and continue to the works area in the intertidal (i.e., the HDD exit point). Proposed access to the intertidal will affect 5 m wide corridors from the landward side to the top of the sea wall then, 3 m wide corridors from the top of the sea wall to the intertidal and (for the southern access route) a 10 m wide corridor, parallel to the sea wall, between the sea wall crossing and the intertidal works area.

2.3.24 An indicative number of 15 return vehicle movements per day has been estimated during cable installation works at Horseshoe Point. Full details of the access arrangements to the intertidal, including confirmation of the number of daily vehicle movements, measures to reduce ground pressures in the vicinity of sand dune habitats and contingency plans for recovery of vehicles in the event of break downs, will be detailed in the cable specification and installation plan (to be produced post consent).

2.3.25 During the operational phase, there may be a need to undertake routine inspections of the export cables in the intertidal, with approximately two visits per year during the operational phase. During these inspections, the intertidal will be most likely accessed by small vehicles (e.g., 4x4 vehicles or low ground pressure tracked vehicles) along the top of the sea defence from Horseshoe point car park, suitable protection for vehicle access will be agreed with the Environment Agency. In the unlikely event that heavy vehicles are required, additional protection may be considered. Recent discussions with Natural England have also highlighted potential alternative access options at the landfall. These will be discussed further post-submission.

Indicative cable installation programme

2.3.26 Drilling of HDD holes and installation of ducts could take several months and will be done prior to cable installation. Installing and burying of cables in the intertidal could take several weeks per cable (or cable circuit if more than one cable in the same electrical circuit can be installed simultaneously with the same piece of trenching/jetting equipment). It is likely that there will be a gap of at least several weeks between the installation of each cable (or cable circuit) in order to install the remaining cable in offshore areas. A 24 hour operation window will be required during continuous HDD drilling operations with other work being undertaken during daylight working hours.

2.3.27 Cable installation in the intertidal will be completed over two phases with all works in the intertidal to be undertaken between the 1 April and the 30 September. The two phase cable installation will be as follows:

- Phase 1: HDD under the sea defences and installation of all ducts (which will be capped and buried using a tracked excavator until the following season); and
- Phase 2: Cable pulling under the sea defences; installation of all four export cable circuits through the intertidal area, and out to sea (approximately 20 km).

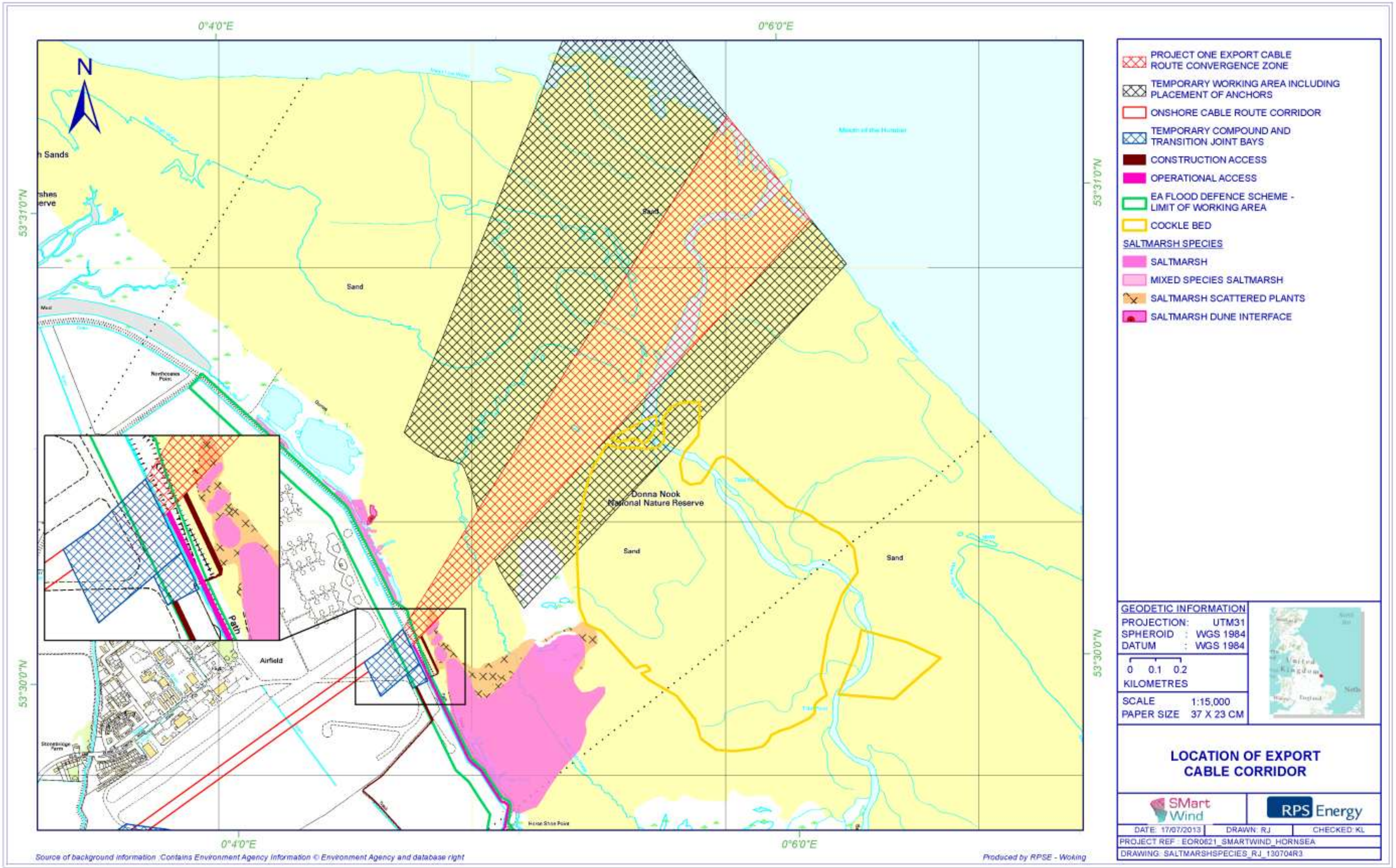


Figure 2.1 Indicative location of export cable landfall.

Cable Route

2.3.28 The onshore cable route runs from the landfall at Horseshoe Point to the grid connection point at North Killingholme. All cables from Project One to the onshore substation will be underground. The onshore cables will be buried in cable ducts within back-filled open cut trenches. HDD or other trenchless installation techniques may be used to pass larger structures such as sea walls, dikes, roads and railways.

Onshore HVDC Converter/HVAC Substation

2.3.29 If HVDC transmission is used, an onshore converter station will be required to convert HVDC electricity back into HVAC suitable for connection to the grid. The HVDC converter station will incorporate up to two approximately 500 MW or one up to 1,200 MW Voltage Source Converter to be constructed close to the North Killingholme grid interface points (see Environmental Statement Volume 1, Chapter 3: Project Description, Section 3.3). This will comprise a site with an area of 30,000 m^2, with a converter station building of 24 m height, 120 m length and 80 m width (maximum worst case dimensions).

2.3.30 If HVAC transmission is used, an HVAC substation will be required in the same location, with a maximum area of 30,000 m^2, comprising a building of 15 m height, 40 m width and 100 m length (maximum worst case dimensions).

HVAC Cables from Converter Station to National Grid Substation

2.3.31 The circuit, or circuits, delivering power from the onshore HVDC converter/HVAC substation to the National Grid substation will be underground until they reach the National Grid substation when they will come out of the ground and enter the building.

2.3.32 The interconnection will be made up of up to two HVAC cable circuits. Each circuit will consist of either a single three core cable or three single core cables buried in one trench, with an installation method similar to that adopted for the onshore cable route described in paragraph 2.3.28.

2.4 Operation and Maintenance

2.4.1 The overall operation and maintenance strategy has not been finalised for Project One. It is anticipated that this will be finalised once the operation and maintenance onshore base location and technical specification of Project One are known, including turbine type, electrical export option, and final project layout.

2.4.2 The general operation and maintenance strategy will rely primarily on crew vessels, offshore accommodation, supply vessels, and helicopters for the operation and maintenance services that will be performed at the wind farm. Maintenance activities will be undertaken using vessels or helicopters and are categorised into two levels: preventive and corrective maintenance. Preventive maintenance is according to scheduled services whereas corrective maintenance covers unexpected repairs, component replacements, retrofit campaigns and breakdowns.

2.4.3 Once commissioned Project One will operate automatically, with each wind turbine operating independently of the others. The offshore HVAC collector, offshore HVDC converter and/or offshore HVAC reactive compensation substation will be monitored and maintained.

2.4.4 Onshore cables will not require frequent or significant maintenance measures to be undertaken and any such activities will likely be limited in frequency and not out of keeping with typical levels of activity on agricultural land. Maintenance of cables within the Humber Estuary is not expected as the target burial depths should be adequate to ensure cables are not exposed during the operational phase (see Section 4.4 for more details). Routine inspections of the export cables in the intertidal will be required during the operational phase to confirm the status of the export cables and assess the risk of cables becoming unburied (though exposure of cables is not expected to occur). As detailed in paragraph 2.3.25, operational, maintenance and emergency access to the intertidal at Horseshoe Point will be gained along the top of the sea defences from Horseshoe Point car park when construction is complete. Suitable protection for vehicle access will be agreed with the EA. Recent discussions with Natural England have highlighted potential alternative access options. These will be discussed further post-submission.

2.5 Decommissioning

2.5.1 At the end of the operational lifetime of the wind farm (25 years) it is anticipated that all structures above the seabed will be completely removed. The Crown Estate Lease will run for 50 years and so it is possible that the wind farm will be re-powered at the end of its turbine design life. It is likely however that this would require a further environmental assessment.

2.5.2 The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment. A decommissioning plan will be prepared and updated during the project's lifespan to take account of changing best practice and new technologies for agreement by the Secretary of State.

2.5.3 Turbines will be removed by reversing the methods used to install them. Piled foundations would likely be cut approximately 2 m below the seabed, with due consideration made of likely changes in seabed level, and removed. Best endeavours will be made to ensure that the sections of pile that remain in the seabed are fully buried. GBFs would be removed by removing their ballast and either floating them (for self-floating designs) or lifting them from the seabed.

2.5.4 Currently there is no statutory requirement for decommissioned cables to be removed, though to ensure the maximum adverse scenario was assessed, it has been assumed that offshore cables will be removed (though at the export cable landfall, these will remain in place to minimise environmental disturbance; see paragraph 4.4.15). Therefore, it is expected that all inter-array and export cables will be left in situ. Further discussion will be sought with regulators to confirm this at the time of decommissioning.

2.6 Potential Impacts on Qualifying Features

2.6.1 The assessment of LSEs presented within Sections 4.3 and 4.4 of this HRA has been based upon the maximum worst case scenarios for Project One with regard to the offshore and onshore components of Project One during the construction, operation and maintenance and decommissioning phases. These assessment scenarios are listed in Table 2.1 and have been selected as those having the potential to result in the greatest effect on the European sites and their qualifying features assessed within this HRA. These scenarios have been selected from the details provided in the Environmental Statement Volume 1, Chapter 3: Project Description and summarised in Section 2 above. These impacts and the scenarios considered have been used to inform the screening stage of the HRA (i.e., test for LSEs), discussed further in Section 4 (i.e., Section 4.3 for the offshore screening and Section 4.4 for the Humber screening).

Table 2.1 Maximum worst case scenarios for Project One for the assessment of impacts on European sites and their qualifying features.

Potential impact	Maximum worst case scenario	Justification
Construction phase		
Temporary habitat loss/disturbance from construction operations including foundation installation and cable laying operations, affecting Annex I habitats, Annex II species and SPA bird species.	**Humber** Total subtidal temporary habitat loss = 128,000 m^2. Total intertidal temporary habitat loss = 1,574,620 m^2. **Offshore** Total subtidal temporary habitat loss = 28,522,163 m^2. See the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further details of the maximum worst case scenario for temporary habitat loss.	These represent the maximum worst case scenario for benthic subtidal and intertidal receptors as described in the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9.

Potential impact	Maximum worst case scenario	Justification
Direct habitat loss to SPA bird species due to construction and presence of infrastructure and changes to physical processes.	**Offshore** As above for offshore temporary habitat loss.	**Offshore** The worst case scenario is represented by the largest footprint from the foundation structures (and associated scour protection) under consideration and hence greatest influence on habitat and physical processes, created by greatest number of turbines etc.
Indirect effects of temporary habitat loss on Annex II species and SPA bird species in the Humber Estuary (e.g. loss of feeding habitat).	**Humber** As above for temporary habitat loss from cable laying operations in the intertidal. Construction of four transition pits on the landward side of the sea wall each measuring 250 m^2, though not protruding over ground level. Construction of an onshore HVDC converter/HVAC substation with maximum site footprint of 150 m by 200 m (30,000 m^2) and a maximum building height of 24 m height.	**Humber** As above for temporary habitat loss from cable laying operations in the intertidal. Maximum area of habitat affected for construction of transition pits and HVDC converter/HVAC substation.
Increased suspended sediment concentrations and sediment deposition as a result of foundation installation, cable installation and seabed preparation affecting Annex I habitats, Annex II species and SPA bird species.	**Humber** Temporary increase in suspended sediments and sediment deposition as a result of: ▪ 12.8 km of subtidal export cable installation via ploughing, trenching or jetting; and ▪ 8.8 km of intertidal export cable installation via trenching, ploughing or jetting (assuming all works are conducted within the convergence corridor). **Offshore** Seabed preparation works associated with installation of: ▪ Seabed preparation associated with gravity base foundation installation for up to 332 turbines; ▪ Installation of monopiles using drilling methods; ▪ Ploughing and jetting for inter-array, inter-connector and export cable installation; and ▪ Sandwave clearance along parts of export cable route via trailer suction hopper dredging or mass flow excavator. See the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further details of the maximum worst case scenario for increases in suspended sediments and sediment deposition.	The maximum predicted scenario for suspended sediment concentrations and sediment deposition during the construction phase is based on the maximum worst case scenario as assessed in the Environmental Statement Volume 2, Chapter 1: Marine Processes, Table 1.16.

Potential impact	Maximum worst case scenario	Justification
Seabed disturbance leading to release of sediment contaminants affecting Annex I habitats and Annex II fish species.	**Humber** As above for increased suspended sediment concentrations within the Humber Estuary. **Offshore** As above for increased suspended sediment concentrations in offshore areas.	**Humber** As above for increased suspended sediment concentrations within the Humber Estuary. **Offshore** As above for increased suspended sediment concentrations in offshore areas.
Seabed disturbances within the intertidal zone leading to the release of sediment nutrients affecting Annex I habitats.	**Humber** As above for increased suspended sediment concentrations within the Humber Estuary.	**Humber** As above for increased suspended sediment concentrations within the Humber Estuary.
Changes to physical processes may lead to changes in habitat available for prey species of SPA birds.	**Offshore** As above for increased suspended sediment concentrations in offshore areas.	**Offshore** As above for increased suspended sediment concentrations in offshore areas.
Disturbance and displacement to SPA bird species from underwater noise, vessel / helicopter activity.	**Offshore** Construction to occur 24 hours per day over a three year period. An additional 6,966 vessel round trips for construction related vessels over the five year construction period, plus potentially helicopter trips. Layout of largest number (332) of turbines plus associated Offshore HVAC collector substations (up to five), converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1. Piling activity using jacket foundations (see below and the Environmental Statement Volume 2, Chapter 4: Marine Mammals, Table 4.13 for more details). Installation of inter-array cables (up to 450 km), platform inter-connector cables (five up to 80 km in total), export cables (four up to 150 km in total).	**Offshore** Maximum vessel traffic movements and operations (particularly piling) will be associated with greatest turbine numbers (and associated infrastructure). Provides for the largest possible noise over the greatest spatial extent of the Project One site, over the largest temporal scale (piling over 36 months, within a total construction window of up to five years, over three phases), with maximum level of concurrent activity accounted for. Noise from concurrent piling installation could represent a larger area for disturbance/ displacement of birds. The worst case would be that two of the piles located up to 3 km from each other within the development area are installed at the same time, thus producing the largest area of noise impact and therefore displacement.

Potential impact	Maximum worst case scenario	Justification
Disturbance to Annex II species (e.g. collision with vessels) and SPA bird species due to cable installation operations in the Humber Estuary.	**Humber** Maximum of four trenches on the intertidal at any one time. Maximum of one cable laying vessel within Humber Estuary SAC. Scheme parameters as per temporary habitat loss above. Construction to be undertaken over two phases: ▪ Phase 1 – up to 4 x HDD ducts installed; and ▪ Phase 2 – up to 4 x export cable circuits installed.	**Humber** Maximum number of cable trenches during the construction phase. Maximum physical extent of disturbance to birds. Maximum temporal extent of disturbance to birds which would include peak population and site usage for many SPA species in autumn and winter, as well as at sensitive times during the day (e.g. high tide roosting).
Indirect impacts on SPA bird species from habitat loss, disturbance and displacement impacts for prey species due to construction of infrastructure, increased vessel activity and underwater noise.	**Humber** As above for disturbance to Annex II species and SPA bird species due to cable installation in the Humber Estuary. **Offshore** As above for disturbance and displacement to SPA bird species from offshore construction activities.	**Humber** As above for disturbance to Annex II species and SPA bird species due to cable installation in the Humber Estuary. **Offshore** As above for disturbance and displacement to SPA bird species from offshore construction activities.
Underwater noise as a result of foundation installation (i.e., piling) and other construction activities (e.g., cable installation) affecting Annex II species.	**Offshore** Piling activity using jacket foundations: ▪ Piling of 341 jacket foundations for up to 332 turbines, five offshore HVAC collector substations, two accommodation platforms and two offshore HVDC converter stations; ▪ Piling of 8 x 3 m diameter HVAC jacket piles at one location on the export cable corridor; ▪ A worst case hammer energy of 2,300 kJ; ▪ Maximum piling duration of up to seven hours per pile for monopiles and six hours per pile for jackets with up to two concurrent piling events occurring at once; ▪ Maximum worst case scenario assessed for spatial extent is for 3 km spacing between piling vessels during concurrent piling; ▪ Total duration is up to 178 days over an 18 month period (based on two installation vessels); and ▪ Temporal worst case of up to 355 days over a 36 months piling period based on a single piling vessel. Installation of up to 150 km x four export cables, 450 km of inter-array cables and 80 km of inter-connector cables will be buried using ploughing with cable installation over 42 months. See Volume 2, Chapter 4: Marine Mammals, Table 4.13 for further details of the maximum worst case scenario for underwater noise.	**Offshore** Maximum worst case scenario incorporates the use of the maximum hammer energy (2,300 kJ) for all activities requiring seabed foundations (pile size is not expected to have a significant effect on noise levels). HVAC piling is assessed separately, (i.e., not concurrently with piling at Subzone 1) as concurrent piling will only be undertaken with a maximum of 3 km spacing between piling. Duration of piling is based on installation of pin piles (rather than monopiles) as this would be longer (i.e., 1,420 pin piles in total, for all turbines and offshore stations) x 6 hours per pile. For cable installation, ploughing to bury the cable may result in the loudest noise along with the longest potential construction time.

Potential impact	Maximum worst case scenario	Justification
Increased construction vessel traffic may result in an increase in disturbance to Annex II marine mammal species.	**Offshore** Vessel activity throughout Project One: Disturbance from vessel movements from range of vessels including: jack-up barge, small and large cable laying vessels, heavy lift vessels, crew transport, anchor handling tugs; Noise from vessel engines and from thrusters used during dynamic positioning; and Maximum of 6,966 vessel movements in total over the construction phase (i.e., up to five years, over three phases).	**Offshore** The maximum number of annual vessel movements has been considered within this assessment to encompass the realistic worst case scenario for potential disturbance from vessels.
Increased construction vessel traffic may result in an increased risk of vessel strikes with Annex II marine mammal species.	**Humber** As above for disturbance to Annex II species and SPA bird species due to cable installation in the Humber Estuary. **Offshore** Vessel activity throughout Project One: ▪ Vessels using ducted propellers such as cable-laying vessels, heavy lift barge and jack-up barge; and ▪ Maximum of 6,966 vessel movements in total over the construction phase (i.e., up to five years, over three phases).	**Humber** As above for disturbance to Annex II species and SPA bird species due to cable installation in the Humber Estuary. **Offshore** The maximum number of annual vessel movements has been considered within this assessment to encompass the realistic worst case scenario for potential vessel strikes.
Accidental pollution events during the construction phase affecting Annex I habitats, Annex II species and SPA bird species.	**Offshore** Synthetic compound, heavy metal and hydrocarbon contamination resulting from offshore infrastructure installation and a maximum of 6,966 round trips to port by construction vessels over the construction period (i.e., up to five years, over three phases).	**Offshore** These parameters are considered to represent the likely worst case scenario with regards to vessel movements during construction.
Changes in the fish and shellfish community resulting from construction impacts may lead to a loss in prey resources for Annex II marine mammal species.	**Offshore** Changes in fish and shellfish community due to: ▪ Effect of piling noise from maximum worst case scenario (see above); ▪ Effect of habitat loss due to seabed preparation for gravity bases and trenching for cable installation; ▪ Increased sedimentation and sediment deposition arising from installation of gravity base foundations and cabling; and ▪ Potential for contamination arising from installation works and construction vessels.	**Offshore** These represent the maximum worst case scenarios for fish and shellfish receptors as described in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.9, and therefore the maximum worst case scenario for effects on marine mammal prey species.

Potential impact	Maximum worst case scenario	Justification
Operation and Maintenance phase		
Long term habitat loss for Annex I habitats, Annex II species and SPA bird species due to presence of turbine foundations and scour/cable protection.	**Offshore** Total long term habitat loss = 4,225,434 m^2. See the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further details of the maximum worst case scenario for long term habitat loss	**Offshore** These represent the maximum worst case scenario for benthic subtidal and intertidal receptors as described in the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9.
Direct habitat loss for SPA bird species due to presence of infrastructure and changes to physical processes.	**Offshore** As above for long term habitat loss.	**Offshore** As for long term habitat loss
Temporary habitat disturbance to Annex I habitats due to access to the intertidal (i.e., for routine inspections).	**Humber** Occasional disturbance to a limited area of sand dune and intertidal habitats through access to the intertidal. Note: access will be gained through a permitted access route.	**Humber** Access via southern access route (see paragraph 2.3.25).
Increased suspended sediment during cable maintenance may impair the foraging ability of Annex II marine mammal species.	**Offshore** Maintenance works to rebury subtidal inter-array, platform inter-connector and export cables.	**Offshore** The maximum extent and elevation in suspended sediment concentrations.
Underwater noise as a result of operational turbines and maintenance vessel traffic resulting in potential effects on Annex II fish and shellfish and marine mammal species.	**Offshore** Underwater noise during the operational phase from up to 332 turbines and maintenance vessel operations over the lifetime of the project (i.e., 25 years).	**Offshore** Since the area of ensonification is small for all turbine sizes the maximum worst case scenario represents the maximum number of operational turbines over lifetime of project.
Disturbance as a result of activities associated with maintenance of operational turbines, cables and other infrastructure may result in disturbance or displacement of SPA bird species.	**Offshore** Up to 2,630 vessel movements in total per annum over the lifetime of the project (i.e., 25 years). Up to 14,400 helicopter flights in total per annum over the lifetime of the project (i.e., 25 years).	**Offshore** Option provides for the largest possible source of direct and indirect (prey species) disturbance from noise, vessel movements and other maintenance related activity over the longest time period.
Increased vessel traffic may result in an increase in noise disturbance to Annex II marine mammal species.	**Offshore** Noise and disturbance from operation and maintenance from 2,630 vessel movements in total per annum over the lifetime of the project (i.e., 25 years).	**Offshore** Maximum number of operational turbines and related operation and maintenance visits by vessels during the lifetime of the project.

Potential impact	Maximum worst case scenario	Justification
Increased vessel traffic may result in an increased potential of vessel strikes to Annex II marine mammal species.	**Offshore** Collision risk from operation and maintenance vessels from 2,630 vessel movements in total per annum over project lifetime (i.e., 25 years). ▪ Vessels using ducted propellers (only a proportion of the total number i.e., 68 jack up vessels).	**Offshore** Maximum number of vessels and range of vessels likely to lead to disturbance and/or vessel strike.
Collisions of SPA bird species with rotating turbine blades may result in direct mortality of an individual.	**Offshore** A total of 332 3.6 MW x 120 m diameter turbines have been modelled as the maximum adverse model for collision mortality. This is the turbine layout with the largest rotor swept area and collision probability (maximum rotor speed, equal lowest tip height of 22 m above sea level) placed up to the edge of Subzone 1. Maximum rotor height is not relevant to this since all flights above 22 m have been considered to be at risk for the model.	**Offshore** Maximises collision risk and therefore mortality rates for all species as the surface area available for collision increases.
Displacement of SPA bird species from physical presence of wind turbines may result in effective habitat loss and reduction in survival or fitness rates.	**Offshore** Layout of largest number (332) of turbines plus associated offshore HVAC collector substations (up to five), offshore HDVC converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1, with spacing minimised.	**Offshore** Provides for the maximum amount (spatial extent) of habitat loss due to displacement effects (considered in this context up to 2 km from outermost turbines, depending on species). For sensitive species, the wind farm as a whole will be avoided, whereas for others only individual turbines will be avoided while within the wind farm.
Barrier effects on SPA bird species caused by the physical presence of turbines may prevent clear transit of birds between foraging and breeding sites, or on migration.	**Offshore** Layout of largest number of turbines with largest rotor diameter (up to 332 turbines, up to 178 m diameter) plus associated offshore HVAC collector substations (up to five), offshore HDVC converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1 and distributed in a manner that prevents a clear corridor of access.	**Offshore** Provides the maximum number of structures in the wind farm, to increase likelihood that birds will avoid individual turbines or the wind farm as a whole. Impact assessment assumes that the turbines are spread out spatially to the boundary edge of each turbine array.
Attraction of SPA bird species to lit structures during the operational and maintenance phase by migrating birds in particular may cause disorientation, reduction in fitness and possible mortality.	**Offshore** Layout of largest number (332) of turbines plus associated offshore HVAC collector substations (up to five), offshore HDVC converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1 and distributed in a manner that prevents a clear corridor of access. Lighting outward and not directional on all structures, maximised intensity and range to provide best visibility for aviation and shipping purposes. Red and white light has been shown to be more disorienting for migrating birds (Poot *et al.,* 2008).	**Offshore** Provides the maximum number of structures in the wind farm, with maximum intensity and extent of red and white light sources to increase likelihood that birds will be attracted to structures and become disoriented or more susceptible to collision risk.

Potential impact	Maximum worst case scenario	Justification
Changes to physical processes may lead to changes in habitat available for prey species of SPA birds.	**Offshore** Layout of largest number (332) of turbines plus associated offshore HVAC collector substations (up to five), offshore HDVC converter stations (up to two) and accommodation platforms (up to two). Installation of inter-array cables (up to 450 km), platform inter-connector cables (five up to 80 km in total), export cables (four up to 150 km in total).	**Offshore** Provides for the maximum amount (spatial extent) of physical habitat that may be altered and therefore potentially the largest number of prey items affected.
Introduction of turbine foundations and scour/cable protection (hard substrates and structural complexity) creating reef habitat, affecting Annex I habitats and Annex II fish species.	**Offshore** Introduced hard substrate: ▪ 2,862,136 m^2 provided by gravity base foundations, including scour protection, for 332 turbines, five offshore HVAC collector substations and two offshore HVDC converter stations and two accommodation platforms; and ▪ 1,998,000 m^2 from surface protection for up to 200 km of inter-array, platform inter-connector and export cables.	**Offshore** Maximum surface area created by turbine, substation and accommodation platform foundations, scour protection and surface protection for cables where secondary cable protection is required. This assumes that 10% of inter-array and platform inter-connector cables and 25% of export cables will require cable protection. For gravity base foundations, this area includes the surfaces of the foundation shaft, cone and base.
Effects of EMF emitted by inter-array and export cables on Annex II species during the operational phase.	**Humber** EMF resulting from: ▪ Presence of 12.8 km of subtidal export cable and 8.8 km of intertidal export cable within the Humber Estuary SAC. **Offshore** EMF resulting from: ▪ 450 km of single AC inter-array (maximum voltage 70 kV); ▪ 80 km of inter-connector cables (maximum voltage 400 kV); and ▪ Up to 600 km of HVDC export cables (4 cables x 150 km) of maximum voltage 400 kV. Cable burial to a minimum depth of 1 m for inter-array cables and to a maximum depth of 3 m below stable seabed, subject to a cable burial assessment, for export cables and the majority of inter-connector cables within Subzone 1. Some inshore parts of the export cable may require burial to a maximum of 5 m depth.	**Humber** Maximum length of cable within Humber SAC. **Offshore** The HVDC export cable scenario represents the maximum worst case scenario for magnetic field strengths, though for induced electrical fields it is unclear whether the HVAC or HVDC options represent the maximum worst case scenario. As such, both scenarios have been fully considered.

Potential impact	Maximum worst case scenario	Justification
Accidental pollution events during the operational phase affecting Annex I habitats, Annex II species and SPA bird species.	**Offshore** Synthetic compound, heavy metal and hydrocarbon contamination resulting from up to 332 turbines, five offshore HVAC collector substations and two offshore HVDC converter stations and two accommodation platforms. Accidental pollution may also result from offshore refuelling for crew vessels and helicopters and up to 2,630 round trips to port by operational and maintenance vessels (including supply/crew vessels and jack-up vessels) over the operational period. A typical 8 MW turbine is likely to contain approximately 200 L of grease, 1,100 L of hydraulic oil, 2,000 L of gear oil, 42,400 L of nitrogen and 3,000 kg of transformer silicon/ester oil. A typical offshore accommodation platform is likely to contain approximately 400 to 10,000 L of coolant, 400 to 10,000 L of hydraulic oil and 1,000 to 3,500 kg of lubricates. Two offshore fuel storage tanks: ▪ One for helicopter fuel with a capacity of 10,000 L; and ▪ One for crew transfer vessel fuel with a capacity of 245,000 L. Potential leachate from zinc or aluminium anodes used to provide cathodic protection to the turbines.	**Offshore** These parameters are considered to represent the likely worst case scenario with regards to maximum number of turbines and vessel movements and therefore the maximum volumes of potential contaminants carried during operation and maintenance activities.
Temporary habitat loss and disturbance from maintenance operations (i.e., jack up operations) affecting Annex II fish species.	**Offshore** Temporary habitat loss/disturbance of 716,100 m^2 from five jack-up barge operations per turbine/offshore structure (i.e., total of 341 structures, see habitat loss scenario) over the lifetime of the project (i.e., 25 years). Maintenance works to rebury subtidal inter-array, platform inter-connector and export cables. See the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further details of the maximum worst case scenario for temporary habitat loss during maintenance.	**Offshore** These parameters are considered to represent the likely worst case scenario for the requirement for jack-up barge operations per turbine for the lifetime of the project. See the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for full justification of the maximum worst case scenario for this impact.
Changes in the fish and shellfish community resulting from operational impacts may lead to a loss in prey resources for Annex II marine mammal species.	**Offshore** Changes in fish and shellfish community due to: ▪ Long-term loss of 4.224 km^2 of seabed habitat and introduction of new substrate (gravity base foundations); ▪ Underwater noise from operation of up to 332 turbines; ▪ Effects of EMF; ▪ Reduced fishing pressure within Subzone 1; and ▪ Contamination arising from operation and maintenance.	**Offshore** These represent the maximum worst case scenarios for fish and shellfish receptors as described in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.9 and therefore the maximum worst case scenario for effects on marine mammal prey species.

Potential impact	Maximum worst case scenario	Justification
Alteration of seabed habitats arising from scour effects and changes in the sediment transport and wave regimes (physical processes) affecting Annex I habitats.	**Offshore** Maximum change in flow associated with gravity bases for 332 turbines with a minimum spacing of 924 m, five offshore HVAC collector substations, two offshore HVDC convertor stations, two accommodation platforms and one offshore HVAC reactive compensation substation. Scour effects associated with monopile foundations, scour around the jacket legs of jacket foundations and global scour associated with the jacket structures. See the Environmental Statement Volume 2, Chapter 1: Marine Processes, Table 1.16 and Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further details of the maximum worst case scenario.	**Offshore** The modelling was carried out based on the layout with the greatest numbers of turbines combined with the largest foundation option to ensure a worst case is assessed. Scour is not acceptable for gravity base foundations; therefore scour protection would be used. Maximum scour footprint is therefore for monopile/jacket foundations. See the Environmental Statement Volume 2, Chapter 1: Marine Processes, Table 1.16 and Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further justification of maximum worst case scenario.
Potentially reduced fishing pressure within Subzone 1 offering some protection and possible local enhancement of Annex II fish and shellfish populations.	**Offshore** Precautionary area of fisheries exclusion during operation: ▪ Maximum of up to 332 turbines, inter-array cables, five offshore HVAC collector substations, two offshore HVDC converter stations and two accommodation platforms; ▪ Operational safety zones of 500 m around offshore platforms (up to five offshore HVAC collector substations, two offshore HVDC converter stations, two accommodation platforms), with 500 m roaming safety zone during major maintenance activities; ▪ No formal safety zones around turbines (however safe operating distances suggest an effective 50 m exclusion around turbines) or related to the offshore cable route during operation. However, it is assumed that as a result of logistical and safety reasons, trawling activity may be reduced within Subzone 1. Further details of the maximum worst case scenario for reduced fishing pressure within Subzone 1 are presented in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.9.	**Offshore** Assessment assumes that fishing activity may potentially be reduced within Subzone 1 due to the presence of Subzone 1 infrastructure and logistical and safety constraints.
Potentially reduced fishing (potential for fisheries exclusion zones) within Subzone 1 causing an increase in fishing pressure outside of the site, affecting Annex II fish species.	**Offshore** As above for potentially reduced fishing pressure within Subzone 1.	**Offshore** As above for potentially reduced fishing pressure within Subzone 1.

Potential impact	Maximum worst case scenario	Justification
Decommissioning phase		
Temporary Annex I habitat loss/disturbance due to decommissioning of turbine foundations and inter-array and export cables.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** Maximum adverse scenario as per construction phase above (excluding seabed preparation for gravity base foundation installation). Total subtidal temporary habitat loss = 11,722,163 m^2. See the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Table 2.9 for further details of the maximum worst case scenario for temporary habitat loss.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** Maximum worst case scenario as per construction phase (excluding seabed preparation for gravity base foundation installation).
Direct habitat loss for SPA bird species due to presence of infrastructure and changes to physical processes.	**Offshore** Worst case scenario as per temporary habitat loss above.	**Offshore** Worst case scenario as per temporary habitat loss above.
Temporary increases in suspended sediment concentrations and sediment deposition on Annex I habitats from removal of inter-array cables, export cables and turbine foundations.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** Increases of suspended sediment concentration and associated deposition associated with the removal of up to 341 foundations and 1,130 km of inter-array, platform inter-connector and export cables.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** Maximum worst case scenario as per construction phase.
Disturbance and displacement to SPA bird species and Annex II species from underwater noise, vessel / helicopter activity.	**Offshore** Removal of largest number (332) of turbines plus associated offshore HVAC collector substations (up to five), offshore HVDC converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1, using loudest noise sources. Removal of inter-array cables (up to 450 km) platform inter-connector cables (5 up to 80 km in total), export cables (four up to 150 km in total). Underwater noise associated with decommissioning of up to 341 foundations and 1,130 km of inter-array, platform inter-connector and export cables. Removal of all subsea cables and cable protection. Removal of piled foundations to removed just below seabed level. Scour protection a will be left *in situ*.	**Offshore** Provides for the largest possible noise over the greatest spatial extent of the Project One site, over the largest temporal scale. Maximum worst case scenario as per construction phase, however, there will be no piling required during the decommissioning phase and as such the noise impacts are anticipated to be of a lower magnitude than during the construction phase. The necessity to remove cables will be reviewed at the time, after consideration of the environmental impact of the removal operation and safety of the cables left *in situ* (see the Environmental Statement Volume 1, Chapter 3: Project Description, Section 3.5). Therefore, the maximum worst case scenario has assumed the removal of all cables, although this is likely to be over precautionary.

Potential impact	Maximum worst case scenario	Justification
Increased vessel traffic may result in an increase in disturbance to SPA bird species and Annex II marine mammal species or increase potential of vessel strikes to Annex II marine mammal species.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** Disturbance and increase in collision risk due to: ▪ 6,966 vessel movements in total during the decommissioning phase. Range of vessel types as described for construction phase. Decommissioning phase is expected to a maximum of four years.	**Humber** Export cables at the landfall will be left *in situ* and not removed during decommissioning. **Offshore** Maximum worst case scenario as per construction phase.
Indirect effects of disturbance to qualifying features of the Humber Natura 2000 sites via their prey.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning.
Indirect impacts on SPA bird species from habitat loss, disturbance and displacement impacts for prey species due to decommissioning activities, increased vessel activity and underwater noise.	**Offshore** Removal of largest number (332) of turbines plus associated offshore HVAC collector substations (up to five), offshore HVDC converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1, using loudest noise sources. Removal of inter-array cables (up to 450 km) platform, inter-connector cables (5 up to 80 km in total) and export cables (four up to 150 km in total).	**Offshore** Provides for the largest possible noise over the greatest spatial extent of the Project One site, over the largest temporal scale.
Seabed disturbance leading to release of sediment contaminants affecting Annex I habitats and Annex II fish species.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** Seabed disturbance arising from installation of foundations and cables as described above for temporary habitat loss/disturbance.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning. **Offshore** This scenario represents the maximum total seabed disturbance and therefore the maximum amount of contaminated sediment that may be released into the water column during decommissioning activities.
Accidental pollution events during the decommissioning phase affecting Annex I habitats, Annex II species and SPA bird species.	**Offshore** Synthetic compound, heavy metal and hydrocarbon contamination resulting from a maximum of 332 turbines and a maximum of 6,398 round trips to port by decommissioning vessels over the decommissioning period.	**Offshore** Maximum worst case scenario as per construction phase.

Potential impact	Maximum worst case scenario	Justification
Changes in the fish and shellfish community resulting from decommissioning impacts may lead to a loss in prey resources for Annex II marine mammal species.	**Offshore** Changes in the fish and shellfish community associated with all decommissioning activities including temporary habitat loss, underwater noise, suspended sediments, sediment deposition and contamination.	**Offshore** Maximum worst case scenario as per the construction phase (see the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.9).
Indirect effects of temporary habitat loss on Annex II species and SPA bird species in the Humber Estuary (e.g. loss of feeding habitat).	**Humber** Export cables at the landfall will be left *in situ* and not removed during decommissioning.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning.
Indirect effects of increased suspended sediments on Annex II species and SPA bird species (e.g., effects on fish migration and reduction of quality of bird prey species).	**Humber** Export cables at the landfall will be left *in situ* and not removed during decommissioning.	**Humber** Export cables at the landfall will be left in situ and not removed during decommissioning.
Changes to physical processes may lead to changes in habitat available for prey species of SPA birds.	**Offshore** Removal of largest number (332) of turbines plus associated offshore HVAC collector substations (up to five), offshore HVDC converter stations (up to two) and accommodation platforms (up to two) placed up to the edge of Subzone 1. Removal of inter-array cables (up to 450 km), platform inter-connector cables (five up to 80 km in total) and export cables (four up to 150 km in total).	**Offshore** Maximum footprint and hence greatest influence on physical processes, created by removal of greatest number of turbines. Impacts may be either positive or negative depending on habitat types created for prey species.

3 HRA ASSESSMENT APPROACH AND METHODOLOGY

3.1 Introduction

3.1.1 The approach to the HRA is presented within the following sections and provides a step wise description of the process in determining whether Project One, alone or in-combination with other plans or projects, will have a LSE on qualifying features of European sites considered within this assessment. Following this, if LSEs are predicted, information and assessment is presented in order to determine whether an adverse impact on the integrity of the relevant European sites could arise

3.2 Screening Assessment

3.2.1 The objective of the screening assessment was to identify the range of European sites and their qualifying features for which a likely significant effect could arise as a result of the potential impacts of the project. An LSE was concluded if the potential impact was likely to undermine the site's conservation objectives (EC, 2010).

3.2.2 The scope of the screening assessment was determined by the requirements of the Habitats and Birds Directives for assessments to include all qualifying species or habitats for which the site has been designated, and not to selectively consider individual components or qualifying species (EC, 2010). Consequently, if a site is identified as being at potential risk of a significant effect, all qualifying species or habitats of that site are required under the Directives to be assessed and not just those that are considered likely to be potentially impacted.

Baseline Data Collection and Analysis

3.2.3 The screening assessment was based on the results from desktop studies and site specific survey data (see Environmental Statement: Volume 5, Annex 5.4.1: Marine Mammal Technical Report; Annex 5.5.1: Ornithology Technical Report; Volume 6, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report; Volume 5, Annex 5.2.1: Benthic Ecology Technical Report; Volume 5, Annex 5.3.1: Fish and Shellfish Technical Report; Volume 6, Annex 6.3.8: Breeding Bird Survey) and the conservation objectives of the relevant European sites. For many sites the level of baseline information was sufficient to determine whether LSEs would arise from the Project One development without further baseline data collection.

3.2.4 Data sources for each category of qualifying feature are presented below. All of the desk study and survey results are summarised in the relevant Environmental Statement chapters (Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, Section 2.5, Chapter 3: Fish and Shellfish Ecology, Section 3.5, Chapter 4: Marine Mammals, Section 4.5, Chapter 5: Ornithology, Section 5.5; and Volume 3, Chapter 3: Ecology and Nature Conservation, Section 3.5).

3.2.5 Survey designs and methodologies for the Project One specific baseline characterisation surveys were agreed and approved with the relevant SNCBs (paragraph 1.5.5), as detailed in the relevant Environmental Statement chapters (paragraphs 3.2.4). Analysis of boat based survey birds and marine mammals data was also approved (paragraph 1.5.5).

<u>Annex I Habitat Features</u>

Humber

3.2.6 In order to inform the assessment of effects on Annex I habitat features of Natura 2000 sites in the onshore and intertidal study area, a Phase 1 intertidal and coastal habitat survey was undertaken at Horseshoe Point, within the Humber Estuary SAC, as part of the onshore ecology baseline characterisation (Volume 6, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report). This was followed by a Phase 2 intertidal survey and a detailed desktop study undertaken as part of the Benthic Subtidal and Intertidal Ecology baseline characterisation (see Volume 5, Annex 5.2.1: Benthic Ecology Technical Report, Section 3.2).

Offshore

3.2.7 In order to provide an up-to-date characterisation of the Annex I habitats occurring within the Project One benthic ecology study area it was agreed with the regulatory authorities that site-specific surveys would be undertaken within the Project One benthic ecology study area (as defined in Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology; see paragraph 1.5.4). An Annex I habitat assessment was undertaken at sampling locations where potential Annex I biogenic (i.e., *Sabellaria spinulosa*) or geogenic (i.e., cobble) reef habitats were identified from the drop down video footage, seabed stills or geophysical data (see Volume 5, Annex 5.2.1: Benthic Ecology Technical Report, Section 3.2).

<u>Annex II Species</u>

Humber

3.2.8 Data on the Annex II species features of Natura 2000 sites (i.e., Humber Estuary and River Derwent SACs) were sourced through a detailed fish and shellfish desktop study supplemented by site specific sampling (i.e., intertidal netting and subtidal trawl surveys) as part of the fish and shellfish baseline characterisation (Volume 5, Annex 5.3.1: Fish and Shellfish Technical Report, Section 3.2). Data on Annex II marine mammal features of Natural 2000 sites were collected as part of the marine mammal baseline characterisation (Volume 5, Annex 5.4.1: Marine Mammal Technical Report, Section 3.3). This included desktop information of the grey seal colony at Donna Nook, which is listed as a feature of the Humber Estuary SAC and Ramsar site.

Offshore

3.2.9 Benthic subtidal ecology and fish and shellfish ecology baseline characterisation in the offshore environment has been based on studies conducted within the Project One study area for each ecological discipline and across a wider regional study area across the southern North Sea (see paragraph 1.5.4).

3.2.10 The marine mammal characterisation has been based on two years of data collected from site-specific surveys for Project One and the wider Hornsea Zone and, where appropriate, relevant data from other offshore wind farms (Volume 5, Annex 5.4.1: Marine Mammal Technical Report). Other data sources that were used to augment site-specific data collection included shore based seal tagging data, predicted seal at sea populations (St. Andrew's Sea Mammal Research Unit (SMRU), (SMRU, 2011)) and broadscale SCANS data (Hammond, 2006; Hammond *et al.,* 2013).

3.2.11 The assessment for marine mammals is based on site specific data and results from noise modelling undertaken to determine the potential for likely significant effects (see Volume 2, Chapter 4: Marine Mammals, Section 4.6). Impacts likely to cause a significant effect from noise largely depend on the proximity of the marine mammal to the noise source. The closer the qualifying site, or the species from that site, is to the noise source, the greater the risk of a likely significant effect. It is also recognised that sensitivities to noise sources vary across species and these are taken into consideration in the noise modelling undertaken and presented in the Environmental Statement Volume 2, Chapter 4: Marine Mammals, Section 4.6.

SPA Features (Birds)

Humber

3.2.12 In order to be able to determine the numbers, distribution and temporal variation in bird species within the SPA, a variety of previous studies have been considered in this report. The main sources of data are the results from the annual WeBS programme carried out across Britain, which are summarised in Annexes E and F and Volume 3, Chapter 3: Ecology and Nature Conservation in relation to the Humber Estuary area, and the sectors within that which correspond with the area considered for the cable landfall. Additional studies specific to the Humber (e.g., Catley, 2000; Allen *et al.,* 2003; Humber Industry Nature Conservation Association, INCA) have also been summarised in this report, as well as information from the RSPB and Lincolnshire Bird Club.

3.2.13 As populations of some species found within the SPA are highly mobile and may be present in large numbers only briefly (e.g., autumn or spring staging), it is important that site-specific information is available for all periods of the year. This was highlighted during consultation with Natural England (Section 1.6), where it was considered important that the migratory period of July-August should be adequately covered, in order to give a complete picture of passage usage by waders, of which some species may be present in large numbers during late summer.

3.2.14 Specific surveys at Horseshoe Point conducted by RPS on behalf of SMart Wind commenced in September 2011 and continued for a full year, in order to cover the complete migratory period, including the highlighted July-August migratory period (Volume 6, Annex 6.3.9: Wintering and Migratory Birds Survey). In addition, site specific survey data were also collected along the onshore export cable route between April and June 2011 and at the proposed HVDC converter/HVAC substation at North Killingholme in February and March 2012 to assess the suitability of the habitat for either feeding or roosting waterfowl (Volume 6, Annex 6.3.8: Breeding Bird Survey).

Offshore

3.2.15 The offshore ornithology characterisation has been based on two years of data collected from site-specific boat-based surveys within Subzone 1 and the wider Hornsea Zone and, where appropriate, relevant data from other offshore wind farms and relevant studies (Volume 5, Annex 5.5.1: Ornithology Technical Report). The surveys were conducted to be able to accurately estimate the offshore bird assemblage which includes 'true' seabird species as well as divers, grebes and sea ducks, plus terrestrial species on migration (e.g., waders and passerines).

3.2.16 The screening assessment considered possible differences in bird distribution between the summer (breeding season) and winter (non-breeding season) from site-specific baseline surveys. It was recognised within the assessment, that breeding seabirds will remain within a certain distance of their colonies and that this distance varies between species and colonies (e.g., BirdLife International, 2012; Thaxter *et al*., 2012). Outside the breeding season, seabirds forage widely and will travel considerable distances from the breeding areas making the assessment of SPA effects more difficult to achieve. For example, for breeding auks, there is clearly a period following breeding where they disperse from colonies with chicks. Concentrations of Auks can occur offshore during this post-breeding period.

3.2.17 Figures presented in Annex C show the maximum and the mean maximum reported foraging ranges for qualifying seabird species from their respective SPAs. From these figures it was possible to identify whether there was a risk of breeding SPA seabirds occurring within the Project One offshore wind farm site. If the foraging ranges do not overlap with the wind farm, then it can be reasonably assumed there will not be a likely significant effect on these species during the breeding season.

3.2.18 In the non-breeding season, distributions of seabirds within the North Sea are more extensive since they are not constrained by returning to nesting site, and so it is likely that a wider range of birds from a wider range of SPAs may be present within Subzone 1 at this time (following Natural England and JNCC's *Interim advice note on HRA screening for seabirds in the non-breeding season* and consultation outlined in Table 1.1). All east coast SPAs from Hermaness in Shetland to Kent have been initially included, as well as appropriate non-UK coastal and offshore SPAs in continental northwest Europe. This seasonal breakdown of connectivity and inclusion of SPAs which is season and species-specific was agreed during consultation with JNCC and Natural England.

3.2.19 Where an SPA with a qualifying feature shows potential connectivity with Project One, and therefore may be susceptible to identified impacts, then it is taken forward to the next step, which is the test of LSE.

Test of Likely Significant Effect

3.2.20 The screening assessment identified the potential impacts that may arise on qualifying features from Project One. These have been identified through the EIA and reported within the Environmental Statement for Project One.

3.2.21 The screening of designated sites potentially affected by the onshore project components and cable laying in the Humber Estuary, focused on the Humber Estuary SAC, SPA and Ramsar (collectively known as the Humber Estuary European Marine Site, EMS) and Natura 2000 sites with potential connectivity to the Humber Estuary (i.e., sites with mobile features which are known to transit through the Humber Estuary). The screening for the designated sites potentially affected by the offshore elements of Project One (wind turbines, inter-array cables and export cable route up to the Humber Estuary EMS boundary), focused on the broad envelope of sites that were identified as having the potential to be affected by activities associated with the offshore aspects. The results of the screening exercise are discussed in Section 4 (i.e., Section 4.3 for the offshore screening and Section 4.4 for the Humber screening) and presented in Annexes A, B for SPA sites screening. Annex D summarises the initial screening assessment carried out for the Humber (onshore) assessment.

3.2.22 The test for LSE considers the information presented in the baseline environmental conditions for the features/sites considered in the assessment and those potential impacts (see Table 2.1) that could be reasonably predicted to have an adverse effect on the conservation objectives of a European site. A decision on whether a LSE may arise is also dependent on the environmental conditions of the site, (i.e., is the species/habitat for which a site is designated in favourable conservation status (FCS)) (EC, 2010). For each site, the FCS of each qualifying feature was considered.

3.2.23 The LSE test filters out effects that are clearly trivial or inconsequential. To conclude likely significant effect, there must be a link between the proposal's effects and the qualifying interest(s) and it must be reasonable to suggest that the effect is likely. Having established this, only where the effects are obviously trivial or inconsequential and this judgement can be clearly and easily justified, is no LSE concluded. Detailed analysis of complex interactions would not normally be part of the process to determine LSE. A judgement of likely significant effect in no way pre-supposes a judgement of adverse effect on site integrity (English Nature, 1999).

3.2.24 The following categories have been used to conclude potential for likely significant effect:

- No LSE: Based on available information about project activities and their potential effects it is considered that there would be no likely significant effect with respect to the identified qualifying feature of the European site. This determination is based on a number of factors, including distance between the Project One boundary and the designated sites and the absence of direct or indirect impact pathways that could affect designated features of those sites. Receptor specific criteria is set out within Sections 4.3 and 4.4;
- Potential for a LSE: The possibility of a likely significant effect cannot be ruled out at this stage; and
- LSE: Based on available information it is apparent that project activities would have an effect upon designated features and could potentially lead to significant negative temporary or long term change.

3.2.25 Where it has been determined, based on the available evidence, that any potential effects are not likely to undermine the conservation objectives of the site, no further assessment has been undertaken. Where it has been determined that potential impacts are non-trivial and may undermine the conservation objectives of the site then a potential LSE has been concluded and further assessment has been undertaken (the appropriate assessment stage of the HRA).

In-combination Screening Assessment

3.2.26 In-combination effects refer to effects, which may or may not interact with each other, but which could affect the same receptor or interest feature (i.e., a habitat or species for which a European Site is designated). The in-combination assessment includes developments that are:

- Built and operational (with the exception of those as described below in paragraph 3.2.27);
- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined;
- Projects on the PINS Programme of Projects;

- Projects identified in the relevant Development Plan (and emerging Development Plans); and
- Sites identified in other policy documents, as development reasonably likely to come forward.

3.2.27 For the purposes of the HRA, 'built and operational' projects have not been included within the in-combination assessment where the influence of operational projects upon a receptor, which is also predicted to be affected by Project One, is considered to be captured within the baseline (i.e., from data collected during surveys for Project One). This is important as it avoids other schemes/projects being double-counted (i.e., as part of the baseline and then again as a component of the in-combination assessment). However, for the purposes of the HRA in-combination assessment, all developments, including 'built and operational' projects may need to be considered, if these projects have any residual effect on Natura 2000 sites since its designation. This is because for HRA process, it is important to consider the integrity of the Natura 2000 sites as designated.

3.2.28 For many features of Natura 2000 sites, the effects of 'built and operational' projects are accounted for when considering the baseline (e.g., bird populations at SPAs and Annex I habitat extents within SACs) against which potential LSEs are assessed. For example, as agreed with JNCC and Natural England, effects on ornithological features of SPAs are assessed against the most recent reference population estimates, rather than the population estimates at the time of designation. This means that baseline survey data is directly comparable with these population estimates (see the Environmental Statement Volume 2, Chapter 5: Ornithology for more details). Similarly, for Annex I habitat extents or Annex II species populations within SACs, where more recent data is available on these SAC features, these are also reported and appropriately accounted for. This ensures that 'built and operational' projects are adequately accounted for in the baseline and therefore in the LSE test.

3.2.29 The in-combination impacts that have been included in the screening assessment are those arising from existing and reasonably foreseeable activities including:

- Other offshore wind farms;
- Oil and gas installations;
- Aggregate extraction and dredging;
- Navigation and shipping;
- Established fishing activities;
- Existing, and planned construction of, subsea cables and pipelines;
- Flood defence schemes;
- Ports;
- Other onshore development (wind farms, other energy plants); and
- Recreational and non-construction activities.

Humber

3.2.30 For the Humber assessment, projects and plans were screened on the basis of the maximum area of extent, based on the maximum buffers used for the onshore CIA (i.e., 5 km buffer around the cable route corridor and 15 km around the HVDC converter station/HVAC substation). The use of these buffers was considered to be adequately precautionary for consideration of projects in the middle to lower Humber Estuary with the potential to affect the same SPA and SAC features in-combination with Project One. Where sufficient project information was not available for particular projects, these projects were deemed to have a low data confidence and were therefore not included in the in-combination assessment, as it was not possible to carry out a meaningful assessment.

3.2.31 The in-combination assessment was also informed by consultation with Natural England who highlighted a number of projects to be considered in the in-combination assessment (see Section 1.6). The onshore in-combination assessment considers major projects which fall into the categories set out in PINS Advice Note Nine: Using the Rochdale Envelope (PINS, 2011). These have been identified through consultation with the local planning authorities and other relevant authorities.

3.2.32 The onshore in-combination assessment also assesses Project One and Project Two together using one of four possible scenarios:

- Project One and Project Two commence construction simultaneously;
- Project One and Project Two commence construction in a staggered manner;
- Project One complete and operational at the time that construction of Project Two commences (or *vice versa*); and
- No change (Project Two does not get constructed).

3.2.33 The HRA (both Humber and Offshore) for Project One does not consider Project Three or Four, as cable routes and other details for these projects will differ to the Project One route and are not yet known.

Offshore

3.2.34 The projects and plans selected as relevant to this assessment are based upon the results of a screening exercise undertaken on the 'long list' of projects (see Appendix B of the Environmental Statement Volume 5, Annex 4.5.1: Cumulative, Transboundary and Inter-related Effects Document). Each project on the 'long list' has been considered on a case by case basis for screening in or out of the HRA based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved. The specific projects/plans scoped in as relevant to the HRA are presented in Sections 4.3 (offshore) and 4.4 (Humber). Further detail of the approach to screening and in-combination assessment is provided in Annex 4.5.1: Cumulative, Transboundary and Inter-related Effects Document.

3.2.35 In assessing the in-combination impacts for Project One it is important to bear in mind that other projects/plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to an in-combination impact with Project One. For example, relevant projects/plans that are already under construction are likely to contribute to in-combination impact with Project One (providing effect or spatial pathways exist), whereas projects/plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason all relevant projects/plans considered cumulatively alongside Project One have been allocated into 'tiers', reflecting their current stage within the planning and development process. This allows the in-combination assessment to present several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to each scenario (tier) in the decision making process when considering the potential in-combination impact associated with Project One (e.g., it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tiers 2 and 3). An explanation of each tier is included below:

- **Tier 1**: Project One with projects under construction and built and operational projects in the limited circumstances explained in paragraph 3.2.27. Projects falling into this tier in the HRA had a high data confidence and therefore could be included within the in-combination assessment;
- **Tier 2**: All projects included in Tier 1 plus other projects/plans consented but not yet implemented or submitted applications not yet determined. This includes the first project within the East Anglia Zone (East Anglia One) which was submitted in November 2012 and Dogger Bank (Creyke Beck A & B) which will be submitted at a similar time to Project One. The majority of projects/plans falling into this tier in the HRA had a medium data confidence and therefore could be included within the in-combination assessment. Where data confidence was assessed as low for projects falling within this tier (i.e., where the Environmental Statements were not available, or there was not sufficient other information in the public domain, to inform this assessment), these were excluded from further assessment as a meaningful assessment was not considered possible; and
- **Tier 3**: The projects included in Tier 1 and Tier 2 plus projects/plans on relevant plans and programmes that are likely to come forward (the PINS Programme of Projects being the source most relevant for this assessment). This includes Hornsea Project Two, Dogger (Teesside A & B, and C & D) and East Anglia (Three and Four). Data confidence for most of the projects falling within this tier for HRA was low. After consideration of the available information it was considered that the data confidence (i.e., information available in the public domain) for the projects having low data confidence was insufficient to allow a meaningful in-combination assessment. However, for Hornsea Project Two, the Project One EIA team is able to access more robust data for Project Two, and data confidence for this project is therefore assessed as medium.

3.2.36 The project parameters for the in-combination assessment (Table 2.1) have been selected from the details provided in the project description (Environmental Statement Volume 1, Chapter 3: Project Description). Impacts of LSE are unlikely to arise should any other development scenario based on details within the Project Description (e.g., different foundation types) to that assessed here, be taken forward in the final design scheme.

3.2.37 Where interactions between the screened in projects and European site features have been identified (i.e., through effect-receptor pathways), the likelihood and nature of any increase (or possible decrease) in the level of impact identified for the feature has been determined. Once assessment of any interaction of effects that may occur across screened in projects has been undertaken, using the information reported on for other projects, re-assessment of the relevant impacts is then made for each.

3.2.38 The following paragraphs 3.2.39 to 3.2.58 provide brief descriptions for the types of other existing or reasonably foreseeable activities identified in paragraph 3.2.29 that could have the potential for in-combination effects with Project One, and therefore have been considered in the in-combination screening assessment in Sections 4.3 and 4.4. The assessment of how each type of activity or project/plan has been screened in or out is discussed within Sections 4.3 and 4.4 with regard to qualifying features, (i.e., habitats, fish, marine mammals and birds), of Natura 2000 sites. In the event of a potential LSE identified, the assessment to determine whether there is an adverse effect on the feature and the Natura 2000 site for which it is designated is presented within Sections 5 and 6.

In-combination with other offshore wind farms

3.2.39 Other offshore wind farms have the potential to cause a range of in-combination impacts similar to those arising from Project One alone. There are currently a number of offshore wind farms that may be constructed at the same time as Project One and these have been assessed in the in-combination assessment. In addition, offshore wind farms that have been consented but not yet implemented, or applications for consent have been submitted but not yet determined were also considered in the assessment. The Hornsea Zone Project Two offshore wind farm has also been included due to the intent to submit an application in the future and reasonable data confidence for this project (see paragraph 3.2.35).

In-combination with oil and gas installations

3.2.40 Oil and gas activities occur widely across the North Sea and are long established. Consequently, any historical impacts on qualifying features are incorporated into the baseline data obtained for Project One. The main potential impacts from oil and gas activities include:

- Noise disturbance from exploration, production and decommissioning of fields;
- Disturbance and displacement around platforms;
- Accidental pollution events;
- Atmospheric emissions; and
- Seabed disturbance.

3.2.41 Although there are oil and gas developments in the region and future licence blocks may be licenced there is currently no information on future oil and gas exploration activities, (e.g., seismic surveys that may occur during the exploration phases). Seismic surveys, should they occur, will have an impact for the duration of the survey, which typically lasts for less than two weeks.

3.2.42 There is potential for a localised displacement affect around the immediate vicinity of any new platform that may be installed in the future. Any impact will be localised to approximately a few hundred metres around each platform and therefore have a very small impact on displaced birds. The majority of new field developments in the southern North Sea comprise subsea tie-backs and therefore do not have any displacement effects. It is not known if, where or when any surface structures might be located and therefore it is not possible to undertake an in-combination assessment. However, should they occur the effect will be very localised and in-combination effects are not anticipated.

3.2.43 All the fields in the southern North Sea are either gas or gas condensate fields. There are no oil fields and therefore the risk of a significant oil spill is negligible. Accidental spills from bunkering operations can and do occur but the impacts from the volume spilled is relatively small, (i.e., <1 tonne) and of diesel that rapidly evaporates and disperses. Therefore the impacts from such spills are localised. Being accidental events it is not known where or when they might occur. However, should they do so the effects are likely to be very localised and the risk of occurring in-combination with an accidental spill from Project One is extremely low; therefore in-combination effects are not anticipated.

3.2.44 Atmospheric emissions from the oil and gas industry come primarily from power generation and flare gas. Atmospheric emissions are not predicted to have any direct impact on any qualifying species or habitat and in-combination effects are not anticipated.

3.2.45 Seabed disturbance arising from oil and gas activities arises primarily during the construction period, particularly relating to subsea infrastructure, (e.g., pipelines and subsea manifolds). Impacts from subsea construction activities typically impact an area of seabed within 10 m of the works being undertaken. Consequently the impacts are very localised and in-combination effects are not anticipated

In-combination with aggregate extraction and dredging

3.2.46 There are no aggregate extraction areas within Project One. Aggregate production Areas 490 and 506 is located just to the south of the Hornsea Zone.

3.2.47 The main potential impacts from aggregate and dredging activities include:

- Physical impacts and seabed disturbance; and
- Displacement and disturbance by vessels.

3.2.48 Physical impacts and seabed disturbance from aggregate and dredging activities will have a localised impact based on projects within a tidal ellipse, extending from 500 to 1,500 m from the area of impact (Newell *et al.* 2002). Vessel activity arising from aggregate and dredging activities may disturb or displace seabirds. The effects arising from any vessel activity will be localised (within a few hundred metres of the vessel) and temporary as the vessel passes.

3.2.49 Aggregate and dredging activities are on-going and considered part of the baseline environment (see paragraph 3.2.27). Any effects will be localised, temporary and outside of the zone of effect from Project One, therefore in-combination effects are not anticipated.

In-combination with navigation and shipping

3.2.50 Shipping activity can cause disturbance and displacement of seabirds. Impacts arising from on-going shipping activities will be part of the baseline environment. On-going shipping activity will have the same level of impact as historical levels. Future increases in shipping activity relating to other offshore developments will have localised impacts but the impacts will be temporary and affect an area in the immediate vicinity of the vessel. It is not known when or where future increases in shipping may occur and therefore no detailed assessment can be undertaken, however as any impacts are predicted to localised and temporary, in-combination effects are not anticipated.

In-combination with established fishing activities

3.2.51 Effects from existing fishing activities are part of the baseline environment. However, Project One and other offshore wind farms could cause a change in the distribution of fishing vessels that could impact on qualifying species or habitats. Changes in fishing vessel location could change seabird distribution, particularly those that scavenge behind fishing vessels. However, studies have shown that seabird distribution is not significantly affected by fishing vessels (e.g., Camphuysen and Garthe, 1997) and that the attraction of seabirds to fishing vessels is limited to about 10 km (Skov and Durinck, 2001). Consequently, impacts on seabird distribution are very localised and in-combination effects are not anticipated.

3.2.52 No restrictions to fishing vessels once Project One is operational are planned, apart from operational safety zones of 500 m around offshore platforms, with 500 m roaming safety zones during major maintenance activities (see the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.9 for more details). There may be localised displacement of vessels; however in-combination impacts effects are not anticipated.

In-combination with existing, and planned construction of, subsea cables and pipelines

3.2.53 Impacts arising from existing telecommunication cables and pipelines on the seabed will be part of the baseline environment. The majority of pipelines in the southern North Sea are buried and evidence from existing pipelines indicates that the seabed recovers within two years. Impacts from buried pipelines have been reported as being insignificant (OSPAR, 2009). There is no information available as to if, when or where future pipelines or subsea cables will be installed, however based on the construction of existing pipelines, the area of activity will be very localised and in-combination impacts effects are not anticipated.

3.2.54 Other potential in-combination effects on marine mammals could occur due to increased vessel activity and the increased potential for collisions with marine mammals with vessels, and/or construction activities associated with cable/pipeline works potentially causing displacement of prey (fish) species due to increased suspended sediment concentrations in the water column and seabed deposition or underwater noise.

In-combination with flood defence schemes

3.2.55 Impacts arising from flood defence schemes have the potential to affect coastal and intertidal habitats. These may include habitat loss and disturbance to saltmarsh, sand dune and intertidal sand/mudflat communities and increased potential for coastal squeeze (Doody, 2004) as a result of the interaction of sea level rise, landward habitat migration and the presence of sea defences. In addition, construction operations associated with flood defence schemes have the potential to result in effects on mobile species, including disturbance to bird species listed as qualifying features of Natura 2000 sites.

In-combination with ports

3.2.56 Physical impacts associated with port developments may include loss of coastal, intertidal and subtidal habitats, increases in suspended sediments and sediment deposition, release of pollutants and disturbance to mobile species. These impacts may have direct effects on designated habitats of Natura 2000 and indirect effects on the species relying on these habitats (e.g. feeding or roosting habitats for bird species). Disturbance during construction or operation of ports may also involve noise (airborne and subsea) and visual disturbance to mobile species including fish, mammals and birds designated for Natura 2000 sites.

In-combination with other onshore development (wind farms, other energy plants)

3.2.57 Impacts related to onshore construction operations and developments are likely to be similar to those discussed above for port developments. These may lead to loss of designated habitats of Natura 2000 sites and consequent indirect impacts on mobile species dependant on those habitats. These may also result in loss of habitats which do not form part of a Natura 2000 site, though provide important habitats for mobile species for which an adjacent Natura 2000 site has been designated (e.g., roosting, feeding or overwintering habitats for bird species). Impacts relating to visual and noise disturbance (during construction or operation) to species designated as features of Natura 2000 sites may also occur, particularly if the development is close to the boundary of such a site.

In-combination with recreational and non-construction activities

3.2.58 Recreational and non-construction activities, particularly in coastal areas, close to important habitats for mobile species (e.g., birds and marine mammals) designated as features of Natura 2000 sites, have the potential to result in disturbance to these species. This may include activities such as wildfowling and cockle gathering, dog walkers, vehicle movements, shellfishing, aircraft (both pleasure aircraft and military aircraft) and bait digging (all activities which occur at the Horseshoe Point landfall site; Cruickshanks *et al.*, 2010) all of which have the potential to affect birds and mammals during key life stages (e.g., breeding and overwintering).

3.3 Appropriate Assessment

3.3.1 An appropriate assessment is required where the screening assessment identified that a likely significant effect on a European site could arise either alone or in-combination with other plans or projects (EC, 2010; PINS, 2013). The information to inform an appropriate assessment is included within this HRA Report (Sections 5 and

6) and is based on information presented in the relevant Environmental Statement chapters. In order to avoid duplication of the information already presented in the Environmental Statement, a summary of the relevant information is provided within the HRA and reference is made to the appropriate sections of the Environmental Statement (i.e., Volume, Chapter, Section, and paragraph where required).

3.3.2 The decision as to whether an appropriate assessment is required will ultimately be undertaken by the competent authority, taking into account advice received from SNCBs (e.g., JNCC and Natural England). The assessment will demonstrate whether or not there will be an adverse effect on the integrity of a European site, in light of its conservation objectives. The information contained within this document aims to inform the process.

Approach to Consideration of Mitigation Measures

3.3.3 As part of the Project One assessment process (i.e., EIA and HRA) a number of measures have been built into the project design at this early stage to reduce the magnitude of impacts on sensitive receptors. These measures are discussed in Sections 5.6 and 6.4 have been taken into consideration when determining whether or not an adverse effect on the integrity of a European site would be likely to occur.

4 SCREENING ASSESSMENT (STAGE 1 OF THE HRA)

4.1 Introduction

4.1.1 Consultation at the Scoping stage for Project One was carried out with JNCC and Natural England (paragraph 1.6.2 and Table 1.1). Further consultation in September 2011 with both SNCBs was carried out in September 2011 where the draft approach to the HRA and initial screening assessment for the Humber (onshore) and offshore assessments were presented for discussion. The screening assessment identified the European sites to be included, qualifying features likely to be screened in/out of the assessment based on the preliminary information available and potential impacts and mitigation measures. Since that time a number of other sites have been included in the Screening Assessment presented within this HRA Report, based on outcomes of consultation regarding transboundary issues and greater availability of information and understanding of potential impacts to species/habitats that are qualifying features of sites. Annexes A and D (for the offshore assessment) and Annex E (for the Humber assessment) therefore provide information on these additional sites identified post Scoping Opinion.

4.1.2 The screening assessment presented in this section sets out the steps taken to determine the possible designated sites (SPAs, SACs, SCIs and Ramsar sites) that could be affected by Project One, either alone or in-combination with other plans or projects. The selection of projects and plans for the consideration in the in-combination assessment with Project One has made reference to the Environmental Statement Volume 1, Chapter 5: Environmental Impact Assessment Methodology for potential LSEs from onshore activities, and Volume 5, Annex 4.5.1: Cumulative, Transboundary and Inter-related Effects Document for potential LSEs from offshore activities.

4.1.3 In line with the approach described for the HRA assessment, (see Section 3.1), the screening assessment has been divided to address the differences between the offshore (Section 4.3) and onshore (Section 4.4) components of Project One.

4.2 Initial Identification of European Sites

4.2.1 An initial screening exercise was undertaken to identify and select those European sites with designated qualifying features that may be potentially affected by the impacts of Project One identified in Table 2.1. These potential impacts have been identified through the EIA and reported within the Environmental Statement.

4.2.2 The offshore and onshore components of Project One considered within the Screening Assessment are those activities related to construction, operation and maintenance and decommissioning. These include the offshore wind farm within

Subzone 1, the export cable route, the landfall for the export cable route and onshore infrastructure required to connect with the onshore grid connection (Section 2).

4.2.3 As a part of the identification of sites, it was necessary to identify potential impact pathways linked to the identified effects of the construction, operation and maintenance and decommissioning phases of Project One (see Table 2.1). The criteria for inclusion of sites included:

- Designated site directly overlapped the Project One boundary;
- Designated site supported mobile designated populations (e.g., migratory birds, marine mammals, fish) that may interact with the potential effects of Project One;
- Mean maximum foraging or migratory range for a qualifying species (where relevant) of a designated site overlapped with Project One;
- Sites and associated features located within the potential zone of influence for impacts associated with Project One (e.g., habitat loss/disturbance, increase in suspended sediments and sediment deposition, noise and risk of collision); and
- Habitats and/or species of a designated site were recorded as present during the site-specific surveys and listed in the citation as either a primary reason for site selection or listed as a qualifying feature.

4.2.4 Identification of sites was informed by consultation with PINS, JNCC, Natural England and transboundary EU representatives and refined following the Scoping Opinion (IPC, 2010; JNCC, 2011; PINS, 2012) and throughout the iterative pre-application consultation process as detailed in Table 1.1. Identification of transboundary sites was also consulted with EU environmental ministries and additional sites were included through this consultation process (paragraphs 1.6.4 and 1.6.5).

4.2.5 Following the identification of European sites, it was possible to screen out those sites and qualifying features where there was either no potential impact pathway likely to occur and/or where the potential effects associated with an impact were considered to be insignificant.

4.2.6 For those sites and qualifying features that were identified as having the potential to be affected by Project One, these sites and features were carried forward into test for LSE (Sections 4.3 and 4.4).

The following sites and qualifying features were identified as having the potential to be affected by Project One.

<u>Special Protection Areas (SPA)</u>

4.2.7 SPAs were selected using the criteria described in paragraph 4.2.3. All SPA bird populations were considered where there is the potential for an ecological link between birds using/overflying the Project One and those SPA bird populations.

4.2.8 Seven SPAs were originally identified within the Project One Scoping Report as being of relevance to the project based on the qualifying species and the relative proximity to Project One (SMart Wind, 2010):

- Flamborough Head and Bempton Cliffs SPA;
- North Norfolk Coast SPA;
- The Wash SPA;
- Gibraltar Point SPA;
- Great Yarmouth and North Denes SPA;
- Hornsea Mere SPA; and
- Humber Estuary SPA (supersedes the Humber Flats, Marshes and Coast SPA).

4.2.9 The Scoping Opinion provided by the IPC identified an additional eight SPAs to be included (IPC, 2010):

- Broadland SPA;
- Coquet Island SPA;
- Northumbria Coast SPA;
- Teesmouth and Cleveland Coast SPA;
- Lindisfarne SPA;
- Firth of Forth SPA;
- Forth Islands SPA; and
- St Abb’s Head to Fast Castle SPA.

4.2.10 It was recognised within the Scoping Opinion that the number of European sites that required assessment may increase based on the results of site-specific surveys. Specifically, that SPAs hosting far ranging or migratory species and international sites may need to be considered. Furthermore, the JNCC response to the Hornsea Year 1 Ornithological Report advised that under the Birds Directive, SPA populations are afforded protection throughout the year (irrespective of the season the SPA is designated for), which means that if connectivity is possible, birds originating from distant SPAs may interact with the development site and require consideration under the HRA process. This may be relevant for several seabird species on passage that are qualifying species for example of SPAs in Orkney and Shetland (e.g., kittiwakes, skuas and terns) (JNCC, 2011).

4.2.11 Based on the above advice from the JNCC, the following 65 SPA sites have been included in Screening Assessment for Project One:

- Alde-Ore Estuary SPA;
- Abberton Reservoir SPA;

- Auskerry SPA;
- Benfleet and Southend Marshes SPA;
- Blackwater estuary SPA;
- Breydon Water SPA;
- Broadland SPA;
- Buchan Ness to Collieston Coast SPA;
- Calf of Eday SPA;
- Colne Estuary SPA;
- Copinsay SPA;
- Cromarty Firth SPA;
- Coquet Island SPA;
- Dengie Marshes SPA;
- Dornoch Firth and Loch Fleet SPA;
- East Caithness Cliffs SPA;
- East Sanday Coast SPA;
- Fair Isle SPA;
- Farne Islands SPA;
- Fetlar SPA;
- Firth of Forth SPA;
- Firth of Tay & Eden Estuary SPA;
- Flamborough Head and Bempton Cliffs SPA;
- Forth Islands SPA;
- Foula SPA;
- Foulness SPA;
- Fowlsheugh SPA;
- Gibraltar Point SPA;
- Great Yarmouth and North Denes SPA;
- Hamford Water SPA;
- Hermaness, Saxa Vord and Valla Field SPA;
- Hornsea Mere SPA;
- Hoy SPA;
- Humber Estuary SPA;
- Imperial Dock Lock, Leith SPA;
- Inner Moray Firth SPA;
- Lindisfarne SPA;
- Loch of Strathbeg SPA;
- Marwick Head SPA;
- Medway Estuary & Marshes SPA;
- Minsmere - Walberswick SPA;
- Montrose Basin SPA;
- Moray and Nairn Coast SPA;
- Mousa SPA;
- North Caithness Cliffs SPA;
- North Norfolk Coast SPA;
- Northumbria Coast SPA;
- Noss SPA;
- Orkney Mainland Moors SPA;
- Outer Thames Estuary SPA;
- Papa Stour SPA;
- Papa Westray (North Hill and Holm) SPA;
- Pentland Firth Islands SPA;
- Ronas Hill - North Roe and Tingon SPA;
- Rousay SPA;
- St Abb's Head to Fast Castle SPA;
- Stour and Orwell Estuaries SPA;
- Sumburgh Head SPA;
- Teesmouth and Cleveland Coast SPA;
- Thames Estuary and Marshes SPA;
- Thanet Coast and Sandwich Bay SPA;
- The Swale SPA;
- The Wash SPA;
- Troup, Pennan and Lion`s Heads SPA;
- West Westray SPA; and
- Ythan Estuary, Sands of Forvie and Meikle Loch SPA.

4.2.12 In addition to the above UK sites, 11 designated non-UK SPAs (Figure 4.1) were identified in the Strategic Environmental Assessment (SEA) Round 3 Appropriate Assessment (TCE, 2009) as being at potential risk of LSE:

- Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete SPA;
- Östliche Deutsche Bucht SPA;
- Sylter Auβenriff SPA;

- Seevogelschutzgebiet Helgoland SPA;
- Borkum-Riffgrund SPA;
- Littoral Seino-Marin SPA;
- Baie de Seine Occidentale SPA;
- Falaise du Bessin Occidental SPA;
- Frisian Front SPA;
- Waddenzee (Wadden Sea) SPA; and
- Voordelta SPA.

4.2.13 In total, 77 SPAs have been identified as having qualifying bird species that have the potential to be impacted by Project One. The screening assessment for each of these sites, including their distance from Project One is presented in Annex A. The test for LSE has been made for each qualifying species against each site's conservation objectives, where available.

4.2.14 Those effects that are considered to merit being subject to the LSE test are determined in Section 4.3. Not all possible effects are included (i.e., those determined to be trivial, such as temporary disturbance of prey) but only those where it is felt that a non-trivial effect could occur (e.g., collision mortality).

<u>Ramsar Sites</u>

4.2.15 Under the Ramsar Convention sites regularly supporting 20,000 waterbirds and/or supporting 1% of the individuals in the population of one species or subspecies of waterbird, can be designated as Ramsar sites. Under UK guidance, sites are, as a matter of policy, afforded the same protection as European designations such as SPAs and SACs.

4.2.16 Ramsar sites were selected using the criteria described in paragraph 4.2.1 and 4.2.7. All bird populations associated with Ramsar sites were considered where there is the potential for an ecological link between birds using/overflying the Project One and those Ramsar bird populations. The following Ramsar sites are considered in this assessment:

- Abberton Reservoir Ramsar;
- Alde Ore Estuary Ramsar;
- Benfleet and Southend Marshes Ramsar;
- Blackwater Estuary Ramsar;
- Breydon Water Ramsar;
- Broadland Ramsar;
- Colne Estuary Ramsar;
- Crouch and Roach Estuaries Ramsar;
- Deben Estuary Ramsar;
- Dengie Ramsar;
- Foulness Ramsar;
- Gibraltar Point Ramsar;
- Hamford Water Ramsar;
- Humber Estuary Ramsar;
- Lindisfarne Ramsar;
- Medway Estuary and Marshes Ramsar;
- Minsmere Walberswick Ramsar;
- North Norfolk Coast Ramsar;
- Northumbria Coast Ramsar;
- Stour and Orwell Estuaries Ramsar;
- Teesmouth and Cleveland Coast Ramsar;
- Thames Estuary and Marshes Ramsar;
- Thanet Coast and Sandwich Bay Ramsar; and
- The Wash Ramsar.

<u>Special Areas of Conversation (SAC) and Sites of Community Importance (SCIs)</u>

4.2.17 Natura 2000 SACs and SCIs were selected using the criteria described in paragraph 4.2.3. A total of 11 UK SACs (Figure 4.1 and Table 4.1) have been identified for inclusion in the HRA for Project One based on their relative proximity and evidence of potential connectivity to Project One.

4.2.18 In addition to the above UK SACs, a total of 37 transboundary sites (Figure 4.1 and Table 4.2) have been considered as having qualifying features at risk of potential adverse effects from Project One (Table 4.1). These were based on the findings of the Round 3 Appropriate Assessment (TCE, 2009), information derived from the desktop studies and site-specific field surveys undertaken for the Environmental Statement, consultation with SNCBs and transboundary country representatives (see Table 1.1), as well as expert judgement.

Table 4.1 UK and transboundary sites identified as being at potential risk of an effect from Project One.

Natura 2000 Site Name	Feature	Distance (km) from Project One (and Subzone 1)
UK		
Moray Firth SAC	Annex I Habitats Annex II Species (bottlenose dolphin)	491 (521)
Firth of Tay and Eden SAC	Annex I Habitats Annex II Species (harbour seal)	340 (390)
Berwickshire and North Northumberland Coast SAC	Annex I Habitats Annex II Species (grey seal)	208 (258)
Humber Estuary SAC	Annex I Habitats Annex II Species (river and sea lamprey, grey seal)	0 (102)
Flamborough Head SAC	Annex I Habitats	47 (111)
Dogger Bank cSAC	Annex I Habitats	35
The Wash and North Norfolk Coast SAC	Annex I Habitats Annex II Species (harbour seal, otter)	40 (94)
River Derwent SAC	Annex I Habitats Annex II Species (river and sea lamprey, bullhead, otter)	45 (160)
Haisborough, Hammond and Winterton cSAC/SCI	Annex I Habitats	80 (88)
North Norfolk Sandbanks and Saturn Reef cSAC/SCI	Annex I Habitats	1.8 (10)
Inner Dowsing, Race Bank and North Ridges cSAC/SCI	Annex I Habitats	12 (71)
Belgium		
SBZ 1 / ZPS 2 SCI	Annex I Habitats Annex I Migratory Birds Annex II Species (twait shad, sea lamprey, grey seal, harbour seal, harbour porpoise)	276
SBZ 2 / ZPS 2 SCI		276
SBZ 3 / ZPS 3 SCI		276
Vlakte van de Raan pSCI		271
Germany		
NTP S-H Wattenmeer und angrenzende Küstengebiete SCI	Annex I Habitats Annex II Species (river and sea lamprey, grey seal, harbour seal, harbour porpoise)	386
Doggerbank SCI	Annex I Habitats Annex I Migratory Birds Annex II Species (grey seal, harbour seal, harbour porpoise)	209

Natura 2000 Site Name	Feature	Distance (km) from Project One (and Subzone 1)
Östliche Deutsche SCI	Annex I Habitats Annex I Migratory Birds Annex II Species (river lamprey, grey seal, harbour seal, harbour porpoise)	347
Sylter Auβenriff SCI		293
Steingrund SCI	Annex I Habitats Annex I Migratory Birds Annex II Species (grey seal, harbour seal, harbour porpoise)	378
Borkum-Riffgrund SAC	Annex I Habitats Annex I Migratory Birds Annex II Species (twait shad, grey seal, harbour seal, harbour porpoise)	254
Hamburgisches Wattenmeer SCI	Annex I Habitats Annex II Species (twait shad, river and sea lamprey, harbour seal, harbour porpoise)	393
Unterelbe SCI	Annex I Habitats Annex II Species (twait shad, river and sea lamprey, Atlantic salmon, harbour seal, harbour porpoise)	424
Helgoland mit Helgoländer Felssockel SCI	Annex I Habitats Annex II Species (grey seal, harbour seal, harbour porpoise)	367
Nationalpark Niedersächsisches Wattenmeer SCI		287
Denmark		
Venø, Venø Sund SAC	Annex I Habitats Annex I Migratory Birds Annex II Species (harbour seal)	501
Dråby Vig SAC	Annex I Habitats Annex I Migratory Birds Annex II Species (twait shad, harbour seal, otter)	534
Løgstør Bredning, Vejlerne og Bulbjerg SAC	Annex I Habitats Annex II Species (sea lamprey, harbour seal, otter)	539
Gule Rev SAC	Annex I Habitats Annex II Species (harbour porpoise)	517
Sydlige Nordsø SAC	Annex I Habitats Annex II Species (grey seal, harbour seal, harbour porpoise)	347

Natura 2000 Site Name	Feature	Distance (km) from Project One (and Subzone 1)
France		
Estuaires et Littoral Picards (baies de Somme et d'Authie) pSCI	Annex I Habitats Annex II Species (river lamprey, harbour seal)	384 (353)
Estuaire de la Seine pSCI	Annex I Habitats Annex II Species (river lamprey, Atlantic salmon, harbour seal)	490 (442)
Rècifs et marais arrière-littoraux du Cap Lèvi à la Pointe de Saire pSCI	Annex I Habitats Annex II Species (harbour seal)	495 (428)
Rècifs et landes de la Hague pSCI	Annex I Habitats Annex II Species (bottlenose dolphin)	513 (440)
Banc et rècifs de Surtainville pSCI		541 (469)
Anse de Vauville pSCI		524 (452)
Baie de Seine occidentale SCI	Annex I Habitats Annex II Species (harbour seal, bottlenose dolphin)	509 (443)
Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI	Annex I Habitats Annex II Species (grey seal, harbour seal, harbour porpoise)	325 (299)
Bancs des Flandres pSCI		279 (263)
Recifs Gris-nez Blanc-nez pSCI		315 (288)
Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI		320 (288)
Baie de canche et couloir des trois estuaires pSCI		361 (331)
Netherlands		
Doggersbank ('Dutch Dogger Bank') pSCI	Annex I Habitats Annex II Species (grey seal, harbour seal, harbour porpoise)	64
Klaverbank pSCI	Annex I Habitats Annex II Species (grey seal, harbour seal, harbour porpoise)	44
Vlakte van de Raan SAC	Annex I Habitats Annex II Species (twait shad, river and sea lamprey, grey seal, harbour seal, harbour porpoise)	259
Noordzeekustzone SAC	Annex I Habitats Annex I Migratory Birds Annex II Species (twait shad, river and sea lamprey, grey seal, harbour seal, harbour porpoise)	179
Noordzeekustzone II pSCI	Annex I Habitats Annex II Species (twait and allis shad, river and sea lamprey, grey seal, harbour seal, harbour porpoise)	180
Waddenze SCI	Annex I Habitats Annex II Species (twait shad, river and sea lamprey, grey seal, harbour seal)	189

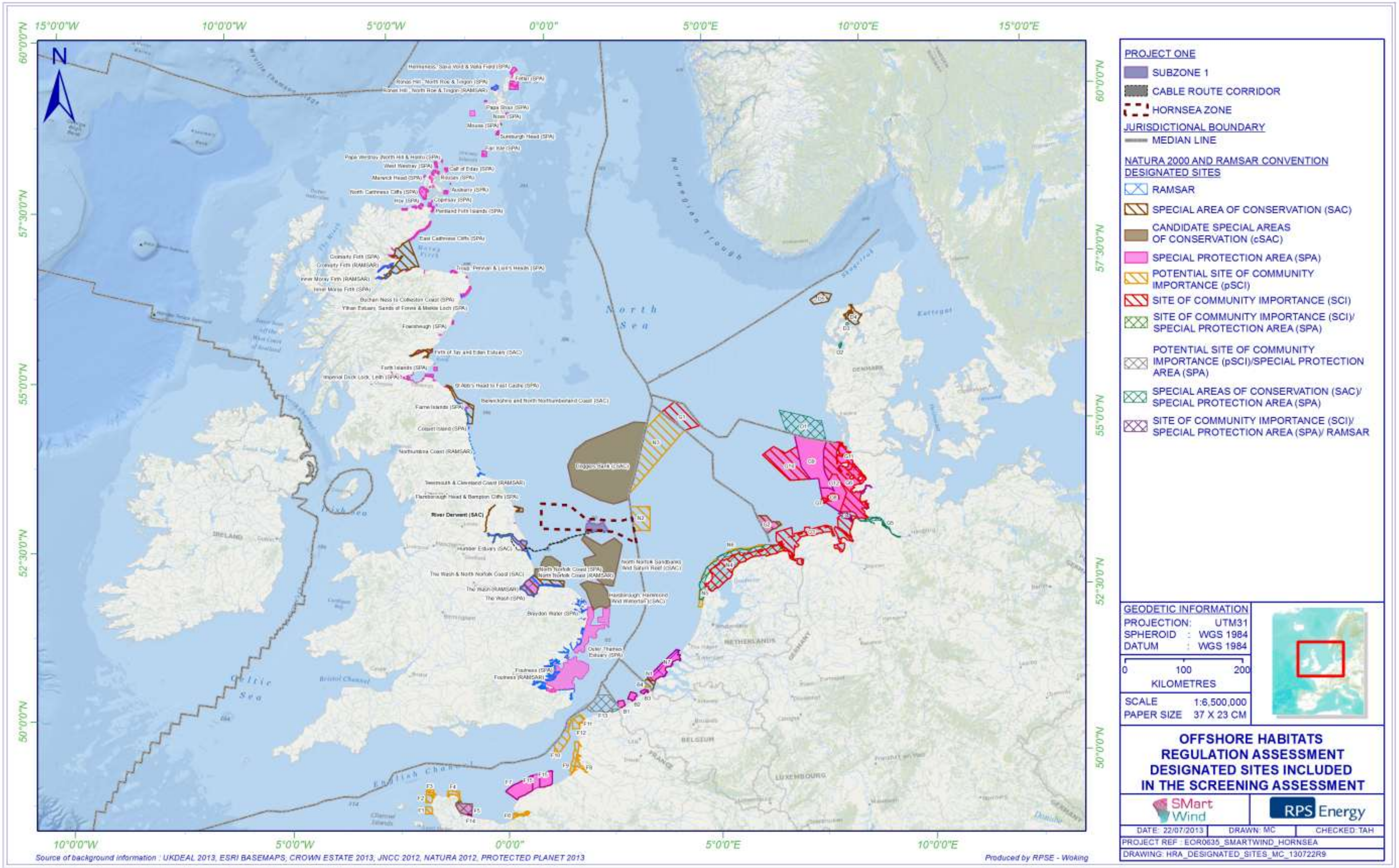


Figure 4.1 Natura 2000 sites considered in the HRA.

Table 4.2 Site Reference List for Non-UK Transboundary Sites in Figure 4.1.

ID	Country	Site	Designation
B1	Belgium	SBZ 1 / ZPS 1	SCI/SPA
B2	Belgium	SBZ 2 / ZPS 2	SIC/SPA
B3	Belgium	SBZ 3 / ZPS 3	SCI/SPA
B4	Belgium	Vlakte van de Raan	pSCI
G1	Germany	Doggerbank	SCI
G2	Germany	Borkum-Riffgrund	SAC/SPA
G3	Germany	Nationalpark Niedersächsisches Wattenmeer	SCI
G4	Germany	Hamburgisches Wattenmeer	SCI/SPA/RAMSAR
G5	Germany	Unterelbe	SAC/SPA
G6	Germany	NTP S-H Wattenmeer und angrenzende Küstengebiete	SCI/SPA
G7	Germany	Seevogelschutzgebiet Helgoland	SCI/SPA
G8	Germany	Steingrund	SCI
G9	Germany	Östliche Deutsche Bucht	SCI/SPA
G10	Germany	Sylter Außenriff	SCI/SPA
G11	Germany	Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete	SPA
G12	Germany	Seevogelschutzgebiet Helgoland	SPA
D1	Denmark	Sydlige Nordsø	SAC/SPA
D2	Denmark	Venø, Venø Sund	SAC/SPA
D3	Denmark	Dråby Vig	SCI/SPA
D4	Denmark	Løgstør Bredning, Vejlerne og Bulbjerg	SAC
D5	Denmark	Gule Rev	SAC
F1	France	Banc et récifs de Surtainville	pSCI
F2	France	Anse de Vauville	pSCI
F3	France	Récifs et landes de la Hague	pSCI
F4	France	Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire	pSCI
F5	France	Baie de Seine occidentale	SCI/SPA
F6	France	Estuaire de la Seine	pSCI
F7	France	Littoral Seino-Marin	SCI/SPA
F8	France	Estuaires et Littoral Picards	pSCI
F9	France	Baie de Canche et Couloir des Trois Estuaires	pSCI
F10	France	Ridens et Dunes Hydrauliques du Detroit du Pas-de-Calais	pSCI
F11	France	Falaises du Cran Aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant	pSCI
F12	France	Recifs Gris-nez Blanc-Nez	pSCI
F13	France	Bancs des Flandres	pSCI/SPA
F14	France	Littoral Seino-Marin	SPA
F15	France	Falaise du Bessin Occidental	SPA
N1	Netherlands	Vlakte van de Raan	SAC
N2	Netherlands	Klaverbank	pSCI
N3	Netherlands	Doggersbank	pSCI
N4	Netherlands	Waddenzee	SCI/SPA
N5	Netherlands	Noordzeekustzone	SAC/SPA
N6	Netherlands	Noordzeekustzone II	pSCI
N7	Netherlands	Voordelta	SCI/SPA/RAMSAR

4.3 Test of Likely Significant Effect – Offshore Assessment

4.3.1 In order to determine whether a LSE may occur on the qualifying features of the European sites identified in Section 4.2 as a result of impacts related to the construction, operation and decommissioning of the offshore components of Project One (Table 2.1), the information presented in the Environmental Statement was reviewed with particular attention to the effects on those qualifying features. Where there is potential interaction between a project effect and a designated qualifying feature (as identified in the Environmental Statement), this feature is taken through to the next stage and the test for LSE.

4.3.2 The following sections provide a summary of these effects on Annex I habitat features and Annex II fish and marine mammal features of the identified SACs and ornithological features of the SPAs identified. These were used to inform the conclusions made with respect to LSE, using the LSE categories detailed in paragraph 3.2.24 *et seq*.

Annex I Habitats

4.3.3 The screening assessment identified the following potential impacts on habitats as a result of the offshore components of Project One, which are summarised under the headings below. These impacts are discussed in detail in the Environmental Statement Volume 2, Chapter 2: Benthic Intertidal and Subtidal Ecology, Section 2.6 and are discussed below.

Construction and Decommissioning

Temporary habitat loss/disturbance from cable and foundation installation/removal and seabed preparation

4.3.4 There will be direct temporary loss/disturbance to subtidal habitat within Project One as a result of jack-up barge operations to install/remove foundations, the burial/removal of inter-array, inter-connector and export cables, anchor placements associated with these operations, seabed preparation works prior to the installation of gravity base foundations and maintenance activities.

4.3.5 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Qualifying habitats of all European sites considered in the pre-screening exercise have, therefore, been screened out as they are considered to be located outside of the Project One offshore footprint.

4.3.6 There is no potential interaction (impact pathway) and no predicted loss identified for Annex I habitats as a result of temporary habitat loss/disturbance from offshore construction and decommissioning activities. As such, no LSE is predicted on any European site as a result of Project One alone or in-combination with other projects, and no further assessment is required.

4.3.7 Construction activities, including seabed preparation works ahead of gravity base foundation installation, the installation of monopiles using drilling methods, the installation of inter-array, inter-connector and export cables via jetting, or trenching and sandwave clearance activities, where required, along the export cable route corridor all have the potential to impact benthic communities by temporarily increasing suspended sediment concentrations and associated sediment deposition from plumes.

4.3.8 In the offshore area, only the North Norfolk Sandbanks and Saturn Reef cSAC, which is located 1.8 km from Project One and 10 km from Subzone 1, is within the zone of potential influence from increased suspended sediment concentrations and sediment deposition resulting from export cable installation activities.

4.3.9 The majority of sediment disturbed by activities associated with Project One comprises mainly coarse material which will be deposited on the seabed in close proximity to the point of release. Numerical plume dispersion modelling for the fate of fine sediments (see the Environmental Statement Volume 2, Chapter 1: Marine Processes, Section 1.6) has shown that increases in suspended sediment concentrations above background may coincide with the North Norfolk Sandbanks and Saturn Reef cSAC. However, the predicted increases in suspended sediment concentrations above background are considered to be of low magnitude, typically 2 to 5 mg/l, and limited spatial extent, spreading up to 20 km to the north and south of the cable route as a result of cable installation. Furthermore, most of the time the instantaneous predicted plume will cover a much smaller area. Sediment deposition is not predicted to impact the North Norfolk Sandbanks and Saturn Reef cSAC as the spatial extent of deposition is limited to within 60 m of the release point.

4.3.10 The predicted increases in suspended sediment concentrations will be within background levels for this part of the North Sea and, as such, benthic communities are expected to be habituated to such levels of suspended sediments and sediment deposition.

4.3.11 Therefore, there is a potential interaction (impact pathway) with Annex I habitats in the North Norfolk Sandbanks and Saturn Reef cSAC. However, the duration, spatial extent and magnitude of the increases in suspended sediment and associated deposition due to seabed preparation and installation/removal of foundation and cables for offshore construction and decommissioning are such that they are not predicted to significantly affect Annex I habitats associated with European sites. The anticipated effects associated with an increase in suspended sediment concentrations and deposition, as a result of Project One alone or in-combination with other projects, will not result in a likely significant effect on any European site screened into the assessment.

Seabed disturbances leading to the release of sediment contaminants

4.3.12 Construction activities, including seabed preparation works, drilling for monopiles, the installation of inter-array, inter-connector and export cables and sandwave clearance activities, have the potential to impact benthic communities as a result of release of contaminants in the sediments.

4.3.13 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. The majority of adverse effects associated with contaminant release are expected only in the immediate vicinity of sediment disturbance (i.e., within Subzone 1 and the export cable route corridor) and once the contaminants are released, they are predicted to undergo rapid dilution and dispersion on the tide. As such, it is considered unlikely that Annex I habitats associated with European sites will be adversely affected. Furthermore, the assessment of subtidal sediment contamination within Project One concluded that contaminants, including heavy metals, hydrocarbons, organotins and organochlorine pesticides, were generally at levels that would not be of concern to the marine environment (see the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.5.16 and 2.6.81 *et seq.*).

4.3.14 Therefore, although there is a potential interaction (impact pathway) with Annex I habitats, the anticipated rapid dilution and dispersion of contaminants on the tide together with the typically low levels of contaminants in offshore sediments, means that this cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with the release of contaminants, as a result of Project One alone or in-combination with other projects, will not result in a likely significant effect on any European site.

Accidental release of pollutants may affect benthic ecology

4.3.15 There is a risk that pollution may be accidentally released from construction, installation and decommissioning vessels and machinery and from the construction/decommissioning process itself (e.g., water-based drilling muds in offshore areas). Pollution may include diesel oil, sewage discharge, vessel antifouling biocides, leachates from cements and/or grouts used in construction. The release of such contaminants may lead to impacts on the benthic communities through toxic effects resulting in a reduction in benthic diversity, abundance and biomass.

4.3.16 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Although the dispersal of pollutants accidentally released may potentially coincide with Annex I habitats associated with European sites in the wider area, the volumes of potential contaminants released would be small and rapidly dispersed/diluted to concentrations below which deleterious effects would be expected and as such it is considered unlikely that Annex I habitats associated with European sites will be adversely affected. Furthermore, provided published guidelines, best working practices and the implementation of a Code of Construction Practice (CoCP) are adhered to, the likelihood of an accidental spill is extremely low (see Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.6.107).

4.3.17 Therefore, although there is a potential interaction (impact pathway) with Annex I habitats, the anticipated rapid dilution and dispersion of potential pollutants together with the low likelihood of occurrence means that this cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with the accidental release of pollutants, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site.

Removal of foundations and cable protection leading to loss of species/habitats colonising these structures

4.3.18 The removal of foundations and cable protection from Subzone 1 and the export cable route corridor during decommissioning, would also remove any colonising species and the habitats they create.

4.3.19 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Qualifying habitats of all European sites considered in this assessment have been screened out as they are located outside of the Project One offshore footprint.

4.3.20 There is no potential interaction (impact pathway) and no predicted loss identified for Annex I habitats as a result of removal of offshore foundations/cable protection leading to a loss of species/habitats colonising these structures. As such, no likely significant effect is predicted on any European site as a result of Project One alone or in-combination with other projects, and no further assessment is required.

Operation and Maintenance

Temporary habitat loss/disturbance from offshore maintenance operations

4.3.21 There will be direct temporary loss/disturbance to subtidal habitat within Project One as a result of maintenance activities including spud-can leg impacts from maintenance jack-up operations and from subtidal cable maintenance activities.

4.3.22 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Qualifying habitats of all European sites considered have been screened out as they are located outside of the Project One offshore footprint.

4.3.23 There is no potential interaction (impact pathway) and no predicted loss identified for Annex I habitats as a result of temporary habitat loss/disturbance from offshore maintenance operations. As such, no LSE is predicted on any European site as a result of Project One alone or in-combination with other projects, and no further assessment is required.

Long term loss of seabed habitat through presence of foundations, scour protection and inter-array, inter-connector and export cables/cable protection

4.3.24 Long term habitat loss will occur directly under all foundation structures and associated scour protection, and also under all inter-array, inter-connector and export cables where secondary protection is required. In the offshore are there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Qualifying habitats of all European sites considered have been screened out as they are located outside of the Project One offshore footprint.

4.3.25 There is no potential interaction (impact pathway) and no predicted loss identified for Annex I habitats as a result of the presence of infrastructure associated with the offshore Project One footprint. As such, no LSE is predicted on any European site as a result of Project One alone or in-combination with other projects, and no further assessment is required.

Colonisation of turbines/cable protection/scour protection altering benthic ecology

4.3.26 Man-made structures placed on the seabed attract many marine organisms and it is likely that marine renewable energy infrastructure has the potential to act as artificial reefs (Inger *et al*., 2009) resulting in localised increases in biodiversity. The introduction of hard substrate may, however, also facilitate the colonisation and spread of non-indigenous species, which could have negative effects on the existing benthic communities. This may be further enhanced by the potential introduction of non-indigenous species to the area from construction and operational vessels.

4.3.27 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. As such, the predicted localised increases in diversity and biomass associated with the introduced hard substrate (see Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.6.138 *et seq.*) are considered unlikely to affect Annex I habitats within European sites. However, there is potential, as a result of the facilitation of the spread of non-indigenous species, for Annex I habitats to be affected.

4.3.28 As outlined in the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, little evidence has been found of invasive or non-indigenous species during post construction monitoring at other wind farms and where they have been recorded, no negative impacts on the benthic communities have been observed. Furthermore, non-indigenous species (e.g., the slipper limpet *Crepidula fornicata*) currently co-exist with native species in the region.

4.3.29 Therefore, although there is a potential interaction (impact pathway) with Annex I habitats, the anticipated effects associated with the introduction on non-indigenous species, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site.

Alteration of seabed habitats arising from scour effects and changes in the sediment transport and wave regimes (physical processes)

4.3.30 The presence of foundation structures, associated scour protection and cable protection material may introduce changes to the local hydrodynamic and wave regime, resulting in changes to the sediment transport pathways and associated effects on benthic ecology.

4.3.31 Changes in sediment transport and wave regime have been assessed in the Environmental Statement (Volume 2, Chapter 1: Marine Processes, Section 1.6) and the associated impacts on benthic communities has been assessed in Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology. This potential effect on benthic habitats is associated with the presence of the foundations and not with the export or inter-array cabling.

4.3.32 As outlined in the Environmental Statement (Volume 2, Chapter 1: Marine Processes, paragraph 1.6.170 *et seq.*), numerical modelling of the impacts of foundations on tidal currents has demonstrated that the presence of these structures would result in small scale, localised current effects (i.e., primarily within the wind farm footprint). Scour effects are similarly expected to be spatially confined to the area within Subzone 1. There are no SACs or SCIs directly within the footprint of Subzone 1.

4.3.33 With respect to the wave regime, it is under severe storm conditions that the behaviour and stability of offshore sandbanks are most affected and wave modelling undertaken for the Environmental Statement (Volume 2, Chapter 1: Marine Processes) results indicate that the wave climate, under storm conditions, remains largely unaffected by structure-induced wave scattering. Although a small reduction in wave climate is predicted to occur under high frequency low intensity wave events, which may result in a slow growth of bank crest level for some of the shallow banks within the Norfolk offshore sandbank system, these changes will be masked by the effects of storm events (Environmental Statement Volume 2, Chapter 1: Marine Processes).

4.3.34 In the offshore area, only the North Norfolk Sandbanks and Saturn Reef cSAC, which is located 10 km from Subzone 1, is within the potential zone of influence of changes to the wave regime. However, as the dominant force controlling the stability and behaviour of the sandbanks within this site (i.e., wave climate under storm conditions) is predicted to remain largely unaffected the operational presence of Project One cannot be reasonably predicted to affect the conservation objectives of any site as a result of changes to the wave regime.

4.3.35 Therefore, although there is a potential interaction (impact pathway) with Annex I habitats, the anticipated effects associated with the changes to marine processes, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site.

EMF from installed inter-array and export cables may effect benthic ecology

4.3.36 The transport of electricity through export, inter-array and inter-connector power cables has the potential to emit a localised EMF which could potentially affect the sensory mechanisms of some benthic species. The electric and magnetic fields generated increase proportionally to the amount of electricity transmitted. These fields are known to be in the range of detection of electromagnetic sensitive species (CMACS, 2003). There is limited research to suggest that some benthic invertebrates demonstrate predominantly behavioural responses to magnetic fields in particular.

4.3.37 The impact is predicted to be highly localised with previous modelling studies indicating that the range of the field is in the order of 10 m each side of the cable (assuming 1 m burial) (Normandeau *et al*., 2011). In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Therefore the magnitude and extent of impacts from EMF cannot be reasonably predicted to affect the conservation objectives of any site.

4.3.38 There is no potential interaction (impact pathway) and no predicted loss/change is identified for Annex I habitats as a result of EMF effects associated with the offshore subsea cabling for Project One. As such, no LSE is predicted on any European site as a result of Project One alone or in-combination with other projects, and no further assessment is required.

Accidental release of pollutants may affect benthic ecology

4.3.39 As described above (paragraph 4.3.15) there is a risk that pollution may be accidentally released from vessels, machinery, and offshore fuel storage tanks during the operation and maintenance phase as well as from the turbines and offshore substations themselves.

4.3.40 In the offshore area, there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. Although the dispersal of pollutants accidentally released may potentially coincide with Annex I habitats associated with European sites in the wider area, the pollutants potentially released would be rapidly and widely dispersed/diluted to concentrations below which deleterious effects would be expected and as such it is considered unlikely that Annex I habitats associated with European sites will be adversely affected. The historical frequency of pollution events in the southern North Sea is low considering the density of existing marine traffic in the area. Provided published guidelines, best working practices and the implementation of a Project Environmental Management and Monitoring Plan are adhered to, it is considered that the likelihood of accidental release is extremely low (see Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.6.184). Furthermore, the likelihood of an accident between vessels resulting in an accidental spill during the operation and maintenance period will be further reduced by the implementation of a project specific Active Safety Management System which will ensure the safety of navigation within proximity to the wind farm (see Volume 2, Chapter 8: Shipping and Navigation).

4.3.41 Therefore, although there is a potential interaction (impact pathway) with Annex I habitats, the anticipated rapid dilution and dispersion of potential pollutants together with the low likelihood of occurrence means that this cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with the accidental release of pollutants, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site.

Potentially reduced fishing pressure within Subzone 1 offering some protection and possible enhancement of benthic communities

4.3.42 Fishing activity may be reduced within Subzone 1 as a result of 500 m operational safety zones around offshore substations and as a result of the physical presence of the Subzone 1 infrastructure and as a result of associated logistical and safety reasons.

4.3.43 This may result in some possible enhancement of benthic communities within Subzone 1. However, in the offshore area there are no SACs or SCIs directly within the footprint of Subzone 1 or the export cable route. There is no potential interaction (impact pathway) and no predicted loss/change identified for Annex I habitats as a result of a potential reduction in fishing pressure within Subzone 1. As such, no LSE is predicted on any European site as a result of Project One alone or in-combination with other projects, and no further assessment is required.

<u>Likely Significant Effects on Annex I Habitat SAC/SCI Features</u>

4.3.44 As detailed in the sections above, no LSEs were predicted as a result of impacts related to construction, operation or decommissioning of Project One alone or in-combination with other plans or projects. On this basis, it was possible to rule out LSEs on Annex I habitats at a receptor level rather than species level for all European sites as no habitats designated for SACs/SCIs sites were predicted to be significantly affected by the offshore components of Project One. As a result, it can be concluded that LSEs will not occur on Annex I habitats designated as features of the following sites:

- River Derwent SAC;
- Moray Firth SAC;
- Firth of Tay and Eden Estuary SAC;
- Berwickshire and North Northumberland Coast SAC;
- Flamborough Head SAC;
- Dogger Bank cSAC;
- The Wash and North Norfolk Coast SAC;
- Haisborough, Hammond and Winterton cSAC;
- North Norfolk Sandbanks and Saturn Reef cSAC;
- Inner Dowsing, Race Bank and North Ridge cSAC;
- SBZ 1 / ZPS 1 SCI;
- SBZ 2 / ZPS 2 SCI;
- SBZ 3 / ZPS 3 SCI;
- Vlakte van de Raan pSCI;
- NTP S-H Wattenmeer und angrenzende Küstengebiete SCI;
- German Dogger Bank SCI;
- Östliche Deutsche Bucht SCI ;
- Sylter Außenriff SCI;
- Steingrund SCI;
- Helgoland mit Helgoländer Felssockel SCI;
- Hamburgisches Wattenmeer SCI;
- Unterelbe SCI;

- Borkum-Riffgrund SAC;
- Nationalpark Niedersächsisches Wattenmeer SCI;
- Venø, Venø Sund SAC;
- Dråby Vig SAC;
- Løgstør Bredning, Vejlerne og Bulbjerg SAC;
- Gule Rev SAC;
- Sydlige Nordsø SAC;
- Estuaires Et Littoral Picards (baies de Somme et d'Authie) pSCI;
- Estuaire de la Seine pSCI;
- Rècifs et landes de la Hague pSCI;
- Rècifs et marais arrière-littoraux du Cap Lèvi à la Pointe de Saire pSCI;
- Banc et rècifs de Surtainville pSCI;
- Anse de Vauville pSCI;
- Baie de Seine occidentale SCI;
- Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI;
- Bancs des Flandres pSCI;
- Recifs Gris-nez Blanc-nez pSCI;
- Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI;
- Baie de canche et couloir des trois estuaires pSCI;
- Dutch Dogger Bank pSCI;
- Klaverbank pSCI;
- Vlakte van de Raan SAC;
- Noordzeekustzone SAC;
- Noordzeekustzone II pSCI; and
- Waddenzee (Wadden Sea) SCI.

4.3.45 Where potential interactions were identified with these features for Project One construction activities and infrastructure within the Humber Estuary, these are addressed in Section 4.4.

Migratory Fish

4.3.46 Designated Annex II populations of migratory fish species considered in the screening assessment include sea lamprey, twaite shad, allis shad and Atlantic salmon. Subtidal fish ecology surveys were undertaken throughout the Project One study area, including the export cable corridor. A single salmon was recorded at the mouth of the Humber Estuary during the spring survey, a single twaite shad was recorded in the north east of Subzone 1 during the autumn trawl survey, and no lamprey were recorded, though these surveys were not specifically designed to target migratory fish species. Therefore, although these species may occur within Project One, the migratory distribution of these species, which is discussed in the Environmental Statement (Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.5.23 and Section 3.6) appears to preclude a significant presence within Project One area.

4.3.47 River lamprey is also a qualifying feature of some southern North Sea designated sites, however this species has been screened out, (with the exception of the Humber Estuary SAC, see Section 4.4), as this species is confined to freshwater and estuarine habitats (Maitland, 2003).

4.3.48 The screening assessment identified the following potential impacts on migratory fish as a result of the offshore components of Project One, which are summarised under the headings below. These impacts are discussed in detail in the Environmental Statement (Volume 2, Chapter 3: Fish and Shellfish Ecology, Section 3.6) and are discussed below.

<u>Construction and Decommissioning</u>

Temporary habitat loss/disturbance from cable and foundation installation/removal and seabed preparation

4.3.49 Temporary habitat loss will occur during construction/decommissioning phases and is likely to include sediment compaction and disturbance during foundation installation/removal (i.e., jack up operations) and sediment disturbance during cable laying/removal operations. Annex II populations of migratory fish species have the potential to be affected by this impact, through loss of feeding habitats.

4.3.50 The total disturbance of 3.47% of benthic habitat within the Project One boundary is not expected to diminish regional ecosystem functions (i.e., fish habitat or biodiversity functions) as the benthic habitats present within Project One are widespread within the southern North Sea. Furthermore, twaite and allis shad and Atlantic salmon are pelagic species and water column species, and sea lamprey is parasitic, feeding on larger species of fish. Benthic habitat loss for these species is not therefore considered to be of critical importance with regard to the feeding ecology of these species.

4.3.51 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species, these species are considered unlikely to occur in the offshore parts of Project One in any significant numbers. The relative importance of the offshore parts of Project One together with the widespread availability of comparable habitats in the wider area means that this impact cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with temporary habitat loss/disturbance, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Temporary increased suspended sediment concentrations and associated sediment deposition as a result of seabed preparation and installation/removal of foundation and cables

4.3.52 Construction activities may increase levels of suspended sediments and reduce light levels within the water column. Reduction in light levels within the water column can create a number of adverse effects particularly upon species reliant on their visual acuity to detect and locate prey (BERR, 2008).

4.3.53 The southern North Sea has a naturally moderate to high turbidity, especially during the winter. Values of suspended sediment in the summer are generally low in offshore areas, typically 0 to 10 mg/l, although background turbidity levels during winter in the southern North Sea can reach over 30 mg/l. Although elevated suspended sediment concentrations would be expected in the immediate vicinity of seabed preparation works (albeit in the short term), levels outside Subzone 1 are predicted to comparable to background concentrations for this part of the North Sea (see the Environmental Statement Volume 2, Chapter 1: Marine Processes, paragraph 1.6.16 *et seq.*).

4.3.54 The occurrence of Annex II migratory fish species in offshore parts of Project One is likely to be low and, as such, the likelihood of impacts to a small number of individuals is considered unlikely to have adverse effects on populations of migratory fish species as a whole. Furthermore, individuals that are present in the coastal waters would likely have some tolerance to high levels of suspended sediments as these are experienced naturally. Therefore, the temporary plumes generated during cable laying and seabed preparation works are considered to be of a low magnitude and short duration and of a sufficient distance from the coast that that they will not create a barrier to the migration of these species.

4.3.55 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of increased suspended sediments and associated deposition, any effect is likely to be insignificant given the likely low abundances of these species in the offshore areas of Project One, the temporary and short term nature of the effect and the distance of the impact from SACs listing these species as features. As such, the anticipated effects due to seabed preparation and installation/removal of offshore foundations and cables, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Underwater noise as a result of foundation installation (i.e., piling) and removal, cable laying/removal and other construction/decommissioning activities

4.3.56 Construction activities, in particular the pile-driving of foundations, will result in high levels of underwater noise that will be audible over several kilometres around Project One. At the highest noise levels, sub-lethal and lethal effects may occur, resulting in injury and in extreme cases cause the death of exposed fish species.

4.3.57 Underwater noise modelling has shown that mortality would therefore only be likely to occur in extreme proximity to the pile (<150 m) (based on the 2,300 kJ hammer energy). For pelagic migratory species, behavioural impacts (i.e., temporary avoidance) would be likely to occur over a larger area during piling operations (up to 11.9 to 27.9 km from each piling location, based on 2,300 kJ hammer).

4.3.58 As discussed previously, the Project One site specific surveys and historical data indicate that the offshore parts of Project One are unlikely to be of significant importance to Annex II migratory fish species and that the occurrence of these species in this area is likely to be low. Furthermore, the majority of the piling and therefore the noise effects will be restricted to Subzone 1. Therefore, for any individuals which are present, although noise impacts may result in temporary and short-term exclusion from the area (i.e., up to 27.9 km), the distance of the impact from the likely migratory routes of these species to estuaries/rivers means that a barrier to migration is not predicted (see the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.1.110 *et seq.*). Piling will, however, also take place on the export cable route for the offshore HVAC reactive compensation substation. Although the offshore HVAC reactive compensation substation is in closer proximity to the Humber Estuary and therefore potential migratory routes of Annex II species, piling will only involve the installation of up to 8 pin piles with piling for each pile taking up to six hours. Therefore, the impact will be of highly limited duration and, as such, is not anticipated to cause a barrier to coastal migration.

4.3.59 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of underwater noise from foundation installation, any effect is likely to be insignificant on Annex II migratory species given the likely low occurrence of these species in Project One, the temporary nature of the effect and the distance of the impact from the likely migratory routes. As such, the anticipated effects due to underwater noise, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Seabed disturbance (construction/decommissioning) leading to release of sediment contaminants

4.3.60 Construction activities, including seabed preparation works, drilling for monopiles, the installation of inter-array, inter-connector and export cables and sandwave clearance activities, have the potential to impact migratory fish species by leading to the resuspension of sediment bound contaminants.

4.3.61 The majority of adverse effects associated with contaminant release are expected only in the immediate vicinity of sediment disturbance (i.e., within Subzone 1 and the export cable route corridor) and once the contaminants are released, they are predicted to undergo rapid dilution and dispersion on the tide. As such, it is considered unlikely that Annex II migratory species will be adversely affected. Furthermore, the assessment of subtidal sediment contamination within Project One (see the Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.6.82 *et seq.*) concluded that contaminants, including heavy metals, hydrocarbons, organotins and organochlorine pesticides, were generally at levels that would not be of concern to the marine environment.

4.3.62 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species, the anticipated rapid dilution and dispersion of contaminants on the tide together with the typically low levels of contaminants in offshore sediments, means that this cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with the release of contaminants, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site.

Accidental pollution events may affect migratory fish

4.3.63 There is a risk that pollution may be accidentally released from construction, installation and decommissioning vessels and machinery, from the construction/decommissioning process itself (e.g., water-based drilling muds in the subtidal) and from offshore fuel storage tanks. Pollution may include diesel oil, sewage discharge, vessel antifouling biocides, leachates from cements and/or grouts used in construction. Accidental spillage of chemicals and substances may result in behavioural effects such as avoidance of affected areas. Chemical spills may also have sub-lethal to lethal effects dependent on the exposure and the level of toxicity (see the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.6.130 *et seq.*).

4.3.64 The historical frequency of pollution events in the southern North Sea is low considering the density of existing marine traffic in the area. Provided the proposed mitigation measures are adhered to, including a CoCP, employee training and the availability on each vessel of spill containment equipment, it is considered that the likelihood of accidental release is extremely low. Any spill or leak, should it occur, within the offshore regions of Project One would be immediately diluted and rapidly dispersed, generally to concentrations below which deleterious effects would be expected. Furthermore, given the low occurrence of Annex II migratory species in Project One, together with the increased mobility of these migratory pelagic fish, it is considered unlikely that these species will be adversely affected by marine pollution.

4.3.65 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species, the anticipated rapid dilution and dispersion of potential pollutants together with the low likelihood of occurrence means that this cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with the accidental release of pollutants, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Operation and Maintenance

Temporary habitat loss/disturbance from maintenance operations

4.3.66 There will be direct temporary loss/disturbance to subtidal habitat within Project One as a result of maintenance activities including spud-can leg impacts from maintenance jack-up operations and from subtidal cable maintenance activities.

4.3.67 The total disturbance of benthic habitat within the Project One boundary during the operation and maintenance phase is small (0.1%) and is not expected to diminish regional ecosystem functions (i.e., fish habitat or biodiversity functions) as the benthic habitats present within Project One are widespread within the southern North Sea. Furthermore, as discussed in paragraph 4.3.50, twaite and allis shad and Atlantic salmon are pelagic species and water column species, and sea lamprey is parasitic, feeding on larger species of fish. Benthic habitat loss for these species is not, therefore, considered to be of critical importance with regard to the feeding ecology of these species.

4.3.68 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species, these species are considered unlikely to occur in the offshore parts of Project One in any significant numbers. The likelihood of limited impacts to a small number of individuals is considered unlikely to have adverse effects on populations of migratory fish species as a whole. Furthermore, the relative importance of the offshore parts of Project One together with the widespread availability of comparable habitats in the surrounding area means that this impact cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with temporary habitat loss/disturbance, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Long term habitat loss due to presence of turbine foundations and scour/cable protection

4.3.69 The presence of turbine and substation foundations and associated scour protection and cable protection for offshore cables has the potential to impact on fish and shellfish by the removal of essential habitats for survival (i.e., feeding habitats).

4.3.70 The permanent habitat loss due to the installation of foundations, scour protection and cable protection is estimated to be up to 4.225 km^2, which represents 0.59% of the Project One development area and 0.01% of the area of the southern North Sea Marine Natural Area. Comparable habitats are present and widespread within the southern North Sea fish and shellfish study area and throughout the wider southern North Sea. Benthic habitat loss for migratory fish including twaite and allis shad, Atlantic salmon and sea lamprey is not considered to be of critical importance with regard to the feeding ecology of these species as they are either pelagic or parasitic species. Furthermore, neither the site-specific surveys nor the historical data indicate that the offshore Project One area is of particular importance for these Annex II species and, as such, are not anticipated to be present in any significant numbers.

4.3.71 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species, these species are unlikely to be present in large numbers in Project One and comparable feeding habitat is widespread in the southern North Sea. The anticipated effects associated with long term habitat loss, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Underwater noise as a result of operational turbines and maintenance vessel traffic

4.3.72 Underwater noise levels during the operational phase are predicted to be considerably lower than those of the construction phase, being limited to noise from operational turbines and maintenance vessel traffic.

4.3.73 The levels of noise associated with turbine operation are anticipated to be low and any risk of significant behavioural disturbance for fish would be limited to the area immediately surrounding the turbine, which represents a very small proportion of the area of Project One. With respect to noise associated with service vessels, physiological damage to migratory fish is unlikely, although the levels could be sufficient to cause local disturbance of sensitive marine fauna. However, ambient noise levels within the site would be expected to be lower than those present in the vicinity of nearby shipping lanes. It is also considered to be unlikely that these migratory fish species will be present in large numbers in Project One and, as such, the likelihood of impacts to a small number of individuals is considered unlikely to have adverse effects on populations of migratory fish species as a whole.

4.3.74 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of underwater noise from operational turbines and service vessels, any effect is likely to be insignificant on Annex II migratory species given the likely low occurrence of these species in Project One, the localised nature of the effect and the fact that the impact will not create a barrier to coastal migration. As such, the anticipated effects due to operational underwater noise, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Introduction of turbine foundations and scour protection

4.3.75 Foundation and scour protection components of Project One may act as artificial reefs and attract many marine organisms including hard substrate benthic species, which may have indirect effects on fish populations through their potential to act as artificial reefs and to bring about changes to food resources (Inger *et al.*, 2009). Additionally, man-made structures may also have direct effects on fish through their potential to act as fish aggregation devices. However, there is uncertainty associated with the likely effects of introduction of hard substrates into the marine environment on fish and shellfish receptors; and fish populations are unlikely to show noticeable benefits as a result of this impact (CEFAS, 2009b; BOWind, 2008).

4.3.76 As discussed previously, the Project One site specific surveys and historical data indicate that the offshore parts of Project One are unlikely to be of significant importance to Annex II migratory fish species. As the occurrence of these species in this area is likely to be low it is considered unlikely that Annex II migratory fish will be affected at a population level by the introduction of hard substrate.

4.3.77 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of the introduction of turbine foundations and scour protection, any effect is likely to be insignificant on Annex II migratory species given the likely low occurrence of these species in Project One and the highly localised nature of the effect. As such, the anticipated effects due to operational underwater noise, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

EMF emitted by inter-array and export cables during the operational phase

4.3.78 The transport of electricity through export, inter-connector and inter-array power cables has the potential to emit a localised EMF which could potentially affect the sensory mechanisms of Annex II migratory fish species (CMACS, 2003). Modelling studies have indicated that the range of the field is in the order of 10 m each side of the cable (assuming 1 m burial) (Normandeau *et al.*, 2011) and as such, the impact is considered to be highly localised and the effects confined to Subzone 1 and the export cable route corridor.

4.3.79 There is evidence of a response to electric and magnetic fields from sea lamprey and Atlantic salmon (Gill *et al.*, 2005). Migratory fish species could therefore be affected by the creation of artificial barriers (i.e., EMF) which may result in the physical and/or behavioural disturbance of this species, particularly in shallow waters (less than

20 m). However, as the offshore parts of Project One are unlikely to be of significant importance to Annex II migratory fish species and as the occurrence of these species in this area is likely to be low, it is considered unlikely that Annex II migratory fish will be affected at a population level by EMF. Given the highly localised nature of the impact, it is predicted that, for majority of Annex II species, EMF will not result in a barrier to the coastal migration of Annex II species. The exception to this is sea lamprey; this species possess specialised ampullary electroreceptors that are sensitive to weak, low frequency electric fields (Bodznick and Northcutt, 1981; Bodznick and Preston, 1983). Empirical evidence presented in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.6.176 *et seq.*, has demonstrated that the migration behaviour of this species may be affected when stimulated with electrical fields. However, it should be noted that the experimental levels found to have an effect on lamprey were considerably higher than modelled induced electrical fields expected from direct current (DC) or alternating current (AC) subsea cables, with levels similar to those of subsea cables showing no effect on migratory behaviour. This is further discussed with regard to lamprey migration within the Humber Estuary SAC in paragraph 6.2.42 *et seq*.

4.3.80 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of the EMF emitted from inter-array, inter-connector and export cables during the operational phase, any effect is likely to be insignificant on Annex II migratory species given the likely low occurrence of these species in the offshore parts of Project One and the highly localised nature of the effect. As such, the anticipated effects due to EMF, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Accidental pollution events may affect migratory fish

4.3.81 As described in paragraph 4.3.63, there is a risk that pollution may be accidentally released from vessels, machinery and offshore fuel storage tanks during the operation and maintenance phase as well as from the turbines and offshore substations themselves. Accidental spillage of chemicals and substances may result in behavioural effects such as avoidance of affected areas. Chemical spills may also have sub-lethal to lethal effects dependent on the exposure and the level of toxicity (see the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.6.133 *et seq.*).

4.3.82 The historical frequency of pollution events in the southern North Sea is low considering the density of existing marine traffic in the area. Provided the proposed mitigation measures are adhered to, including a Project Environmental Management and Monitoring Plan, employee training and the availability on each vessel of spill containment equipment, it is considered that the likelihood of accidental release is extremely low. Any spill or leak, should it occur, within the offshore regions of the Project One site would be immediately diluted and rapidly dispersed, generally to concentrations below which deleterious effects would be expected. Furthermore, given the low occurrence of Annex II migratory species in Project One together with the increased mobility of these migratory pelagic fish, it is considered unlikely that these species will be adversely affected by marine pollution.

4.3.83 Therefore, although there is a potential interaction (impact pathway) with Annex Ii migratory fish species, the anticipated rapid dilution and dispersion of potential pollutants together with the low likelihood of occurrence means that this cannot be reasonably predicted to affect the conservation objectives of any site. As such, the anticipated effects associated with the accidental release of pollutants, as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Potentially reduced fishing pressure within Subzone 1 offering some protection and possible local enhancement of fish and shellfish populations

4.3.84 Fishing activity may be reduced within Subzone 1 as a result of the physical presence of the Subzone 1 infrastructure and for associated logistical and safety reasons. This may result in some possible enhancement of fish communities within Subzone 1 by providing refuge from fishing activities.

4.3.85 However, as the offshore parts of Project One are unlikely to be of significant importance to Annex II migratory fish species and as the occurrence of these species in this area is likely to be low, it is considered unlikely that Annex II migratory fish will be affected at a population level. In addition, benthic habitats in the area are not considered to be of critical importance with regard to the feeding ecology of these species, and benefits to benthic habitats from reductions in fishing practices such as trawling are unlikely to indirectly benefit Annex II migratory fish species.

4.3.86 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of reduced fishing pressure, any effect is likely to be insignificant on Annex II migratory species given the likely low occurrence of these species in the offshore parts of Project One and the highly localised nature of the effect. As such, the anticipated effects as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Reduced fishing (potential for fisheries exclusion zones) within Subzone 1 causing an increase in fishing pressure outside of the site

4.3.87 As discussed in paragraph 4.3.84, during the operational phase of Project One, the intensity of fishing activities may be reduced from part of Subzone 1. This may have the potential to result in increased fishing pressure outside the Subzone 1 boundary, with receptors most likely to be affected being demersal fish species targeted by commercial fisheries occurring within Subzone 1.

4.3.88 As outlined in paragraph 4.3.50, the majority of Annex II migratory species are pelagic, water column species and, as such, are unlikely to be affected. This is further supported by the lack of evidence for significant populations of these species in the offshore parts of Project One.

4.3.89 Therefore, although there is a potential interaction (impact pathway) with Annex II migratory fish species as a result of a reduction in fishing pressure within Subzone 1 leading to an increase in fishing pressure outside Project One, any effect is likely to be insignificant on Annex II migratory species given the likely low occurrence of these species in the offshore parts of Project One and the pelagic nature of most species. As such, the anticipated effects as a result of Project One alone or in-combination with other projects, will not result in a LSE on any European site and no further assessment is required.

Likely Significant Effects on Annex II Migratory Fish SAC/SCI Features

4.3.90 As detailed above, no LSEs on Annex II migratory fish species were predicted as a result of impacts related to construction, operation or decommissioning of Project One alone or in-combination with other plans or projects. On this basis, it was possible to rule out LSEs on Annex II fish species for all European sites as no migratory fish species designated for SACs / SCIs were predicted to be significantly affected by the offshore components of Project One. As a result, it can be concluded that LSEs will not occur on Annex II migratory fish species designated as features of the following sites:

- SBZ 1 / ZPS 1 SCI;
- SBZ 2 / ZPS 2 SCI;
- SBZ 3 / ZPS 3 SCI;
- Vlakte van de Raan pSCI;
- NTP S-H Wattenmeer und angrenzende Küstengebiete SCI;
- Östliche Deutsche Bucht SCI ;
- Sylter Außenriff SCI;
- Hamburgisches Wattenmeer SCI;
- Unterelbe SCI;
- Borkum-Riffgrund SAC;
- Dråby Vig SAC;
- Løgstør Bredning, Vejlerne og Bulbjerg SAC;
- Estuaires Et Littoral Picards (baies de Somme et d'Authie) pSCI;
- Estuaire de la Seine pSCI;
- Vlakte van de Raan SAC;
- Noordzeekustzone SAC;
- Noordzeekustzone II pSCI; and
- Waddenzee (Wadden Sea) SCI.

4.3.91 Where potential interactions were identified with these features for Project One construction activities and infrastructure within the Humber Estuary, these are addressed in Section 4.4.

Marine mammals

4.3.92 The screening assessment identified the following potential impacts on marine mammals as a result of the offshore components of Project One, which are summarised under the headings below. These impacts are discussed in detail in the Environmental Statement Volume 2, Chapter 4: Marine Mammals and are discussed below.

Construction and Decommissioning

Underwater noise as a result of foundation installation (i.e., piling) and removal, cable laying/removal and other construction/decommissioning activities

4.3.93 Marine mammals detect sub-acoustic noise above ambient levels at distances from the source which depend on the hearing sensitivity of the species. At close ranges, intense underwater noise can cause injury or even death, whilst at large ranges marine mammals may be affected through changes in behaviour or avoidance of the impacted area. The primary noise impact during construction is that arising from pile driving activities during foundation installation, including piling of foundations for the offshore reactive compensation substation. Other construction activities, such as cable installation, also have the potential to generate noise levels that could affect marine mammals, although to a much lesser extent than piling noise. It was agreed with JNCC that the modelling of piling noise was required for Project One but for other activities (e.g., cable installation) this was not necessary.

4.3.94 Two worst case scenarios were considered in the impact assessment, the worst case spatially considered the maximum area of ensonification, whereby two installation vessels, separated by a distance of 3 km, would pile-drive concurrently using hammer energies up to a maximum of 2,300 kJ hammer. The worst case temporally considered the maximum duration of piling whereby only one installation vessel would be used throughout construction. This would lengthen the time required to install all the turbine foundations from 18 months (concurrent) to 36 months and therefore extend the period of possible disturbance of animals from the impacted area.

4.3.95 Modelling of underwater noise for the two worst case scenarios determined that with a soft/slow start procedure (up to 600 kJ for 30 minutes) and implementation of a Marine Mammal Monitoring Programme with a 600 m mitigation zone, the risk of auditory injury within 600 m is negligible for all Annex II marine mammals associated with SACs/SCIs considered in the Screening Assessment. However, modelling results showed that piling would result in a short to medium-term negative effect of disturbance of harbour porpoise (*Phocoena phocoena*), grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*) for up to 18 to 36 months (depending on whether one installation vessel or two vessels are used).

4.3.96 There is the potential for a LSE to arise with respect to designated populations of harbour porpoise, grey seal and harbour seal as a result of disturbance and displacement associated with offshore construction piling for Project One, either alone or in-combination. Further assessment is therefore required in order to determine whether an adverse effect on the integrity of European sites designated for these interests and screened into the assessment process could occur.

Increased vessel traffic may result in an increase in disturbance to marine mammals

4.3.97 During the construction phase there is the potential for an increase in construction vessel traffic to cause negative effects on marine mammal receptors. During the construction period it is anticipated that up to 1,835 offshore vessel movements will be made per annum over the offshore construction phase (i.e., up to five years, over up to three phases). However, increased vessel activity will, for the most part, be localised to within the Project One area, and existing shipping routes to and from ports.

4.3.98 Marine mammals react to the noise generated from the engine of vessels. Reactions can be at distance and are often linked to changes in the engine and propeller speed (Richardson *et al.*, 1995). Malme *et al.* (1989) and Richardson *et al.* (1995) report that noise levels for large surface vessels indicate that physiological damage to marine fauna is unlikely, although the levels may be sufficient to cause local disturbance of marine mammals in the immediate vicinity of the vessel, depending on their sensitivity, and the ambient noise levels.

4.3.99 Disturbance from vessel noise is predicted to occur primarily as a series of short term events (e.g., during the crew transfer times) over the construction period (i.e., up to five years, over three phases). This would most likely result in avoidance behaviour for the more sensitive species, such as harbour porpoise and seals. The distance over which effects will occur will vary according to the species and the ambient noise levels but masking may potentially occur several kilometres from the noise source.

4.3.100 Although there will be a short to medium-term negative effect (i.e., up to five years, over up to three phases) of minor magnitude on harbour porpoise and seals, these species are of low sensitivity to vessel noise in comparison to noise from construction piling proposed to occur over the same duration. Against a background of high vessel activity from commercial shipping and fishing, and including many smaller vessels operating at fast speeds, it is considered unlikely that this increase in vessel activity will affect marine mammals in the Project One marine mammal study area due to their apparent habituation to vessel noise (see Environmental Statement Volume 2, Chapter 8: Shipping and Navigation).

4.3.101 There is the potential for a LSE to arise with respect to designated populations of harbour porpoise, grey seal and harbour seal as a result of disturbance and displacement associated with offshore vessel noise from Project One, either alone or in-combination. Further assessment is therefore required in order to determine whether an adverse effect on the integrity of European sites designated for these interests and screened into the assessment process could occur.

Increased vessel traffic may result in an increased risk of vessel strikes

4.3.102 During the construction phase an increase of 1,835 offshore vessel transits per year may increase the risk of injury to marine mammals through vessel strikes. In particular, the use of ducted propellers has been linked to corkscrew injury in seals, causing mortality.

4.3.103 Existing levels of vessel traffic within the Project One marine mammal study area from oil industry support, shipping, fisheries and recreation, contribute to approximately 10,950 shipping movements per year, (Environmental Statement Volume 2, Chapter 8: Shipping and Navigation). As such marine mammals are likely to have habituated to the current levels of activity such that the additional 1,835 offshore vessel transits per year presents a relatively small increase compared to the already high level of vessel activity in the area. In addition, it is likely that the noise generated by the construction vessels will deter marine mammals from the immediate vicinity and therefore collision with construction vessels in the proximity of turbine locations is unlikely.

4.3.104 The risk of injury to seals from boat collisions is also a concern, particularly close to pupping or haul-out sites. A recent review has highlighted concerns that harbour and grey seals may be vulnerable to “corkscrew” injuries from ducted propellers, such as a Kort nozzle or some types of Azimuth thruster (Thompson *et al*., 2010). Investigations are on-going to determine the cause of such injuries, as at present the links between corkscrew injuries and ducted propellers remains unproven.

4.3.105 Therefore, using a precautionary approach there is the potential for a LSE to arise with respect to designated populations of grey seal and harbour seal as a result of physical injury associated from the risk of vessel collision during offshore construction and decommissioning for Project One, either alone or in-combination. Further assessment is therefore required in order to determine whether an adverse effect on the integrity of European sites designated for these interests and screened into the assessment process could occur.

Increased suspended sediments activities may impair the foraging ability of marine mammals

4.3.106 Construction activities may increase levels of suspended sediments and reduce light levels within the water column. This may impair the foraging ability of marine mammals within Project One.

4.3.107 Numerical plume dispersion modelling for the fate of fine sediments from seabed preparation has shown that the dispersion of fine material associated with increases in suspended sediment concentrations will be relatively rapid (lasting for less than 24 hours) and widespread. The peaks in suspended sediment concentrations in the immediate vicinity of the release locations are predicted to return to background levels almost immediately after the operation is complete (see Environmental Statement Volume 2, Chapter 1: Marine Processes).

4.3.108 Potential impacts from increased suspended sediment would be short term and intermittent (i.e., up to five years, over three phases). Marine mammals regularly occur in turbid environments and therefore are adapted to finding prey in such conditions. The use of echolocation by harbour porpoise enables this species to locate prey under conditions of poor visibility. Prey capture may be more difficult for non-echolocating species in turbid environments. Seals possess sensitive muzzles with vibrissae or sensory whiskers that they use to detect prey items either through direct contact or due to receiving vibrations in the water column (Denhart *et al*., 2001).

4.3.109 The duration, magnitude and extent of impacts from increased suspended sediments is therefore considered unlikely to significantly affect the foraging ability of marine mammal qualifying species and unlikely to compromise the conservation objectives of any designated site. Consequently, no LSE with respect to designated marine mammal populations is concluded for Project One, either alone or in-combination, and no further assessment is required.

Accidental pollution events may affect marine mammals

4.3.110 Accidental release of pollutants from installation vessels during construction may have a negative effect on marine mammals. Pollutants include diesel oil, sewage discharge, vessel antifouling biocides and leachates from cement and/or grouts used in construction.

4.3.111 The more toxic components of fuel spills are volatile and relatively short-lived. Heavier hydrocarbons, while less toxic, may persist for longer in the marine environment. However, any spill or leak within the offshore regions of Project One would be immediately diluted and rapidly dispersed. In addition, the historical frequency of pollution events in the southern North Sea is low given the density of existing marine traffic in the area. As part of the project design, a CoCP will be developed which will include measures to follow published guidelines and best working practice for the prevention of pollution events. Therefore accidental release of contaminants will be strictly controlled, and an emergency plan will also be put in place in the unlikely event of an incident.

4.3.112 Provided that the CoCP is followed there are unlikely to be any pollution events and those that do occur would be very small scale and short lived, due to rapid dispersal and dilution. It is therefore considered, that the duration, magnitude and extent of impacts from accidental pollution events during construction/decommissioning would be unlikely to significantly affect designated marine mammal species associated with European sites screened into the assessment.

Changes in the fish and shellfish community may lead to a loss in prey resources for marine mammals.

4.3.113 Offshore construction activities may result in indirect impacts on marine mammals. The key prey species for marine mammals include a number of clupeids (e.g., herring), gadoids (e.g., cod, whiting), flatfish and sandeels. These species have been identified as important components of the fish community within the study area and subsequently negative effects on the fish assemblages identified in the Project One impact assessment may have indirect negative effects on the marine mammal receptors.

4.3.114 Fish and shellfish receptors are vulnerable to a number of impacts during construction including temporary habitat loss during installation works, increased sediment concentrations and sediment deposition, underwater noise as a result of installation of foundations and subtidal cables, and accidental pollution. The potential effects of these impacts on fish receptors are described in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology.

4.3.115 Marine mammals generally exploit a suite of different prey items and can travel great distances to forage. The communities found within the Project One fish and shellfish study area were characteristic of the fish and shellfish assemblages in the wider region and therefore, due to the highly mobile nature of marine mammals, it is likely that they will be able to exploit similar resources elsewhere. However, there could be an energetic cost to this if animals have to travel further to a preferred foraging ground. For example, telemetry data from individual grey and harbour seals collected by SMRU since 1988 showed that seals regularly transit between their haul-out locations on the Norfolk and Lincolnshire coasts to the southern boundary of the Hornsea Zone (see the Environmental Statement, Volume 5, Annex 5.4.1: Marine Mammal Technical Report). The noise impact range maps for fish (Environmental Statement Volume2, Chapter 3: Fish and Shellfish Ecology) show that there is potential for avoidance of fish species along this southern boundary. Potential effects of changes in prey resources on marine mammals would be of only short term during construction and occur over the 18 to 36 month piling phase. Further, of the potential effects on seals, an increase in underwater noise levels during construction piling is considered to possess the greatest potential for impact at the population level.

4.3.116 Long-term habitat loss would affect only a small proportion (0.01%) of the habitat within the southern North Sea and similar habitats are widespread throughout the region. Sandeel and herring were considered to be of medium sensitivity to habitat loss but due to the very small magnitude of the impact, the effect was considered to be of minor significance. However, there may also be some beneficial effects due to the introduction of new substrate and the possibility for a reef effect. Although this may benefit a different suite of species than those for which negative effects of habitat loss are felt, the varied diet of marine mammals means that they too may benefit from exploiting an additional prey resource.

4.3.117 There is the potential for a LSE to arise with respect to designated populations of harbour porpoise, grey seal and harbour seal as a result of changes in fish/shellfish communities leading to a reduction in prey resources during offshore construction and decommissioning for Project One, either alone or in-combination. Further assessment is therefore required in order to determine whether an adverse effect on the integrity of European sites designated for these interests and screened into the assessment process could occur.

Operation and Maintenance

Operating noise of turbines may result in potential effects on marine mammals

4.3.118 Turbine operation will produce a low frequency, low level noise originating from the internal mechanics of the turbine such as the gearbox and generator. The radiated levels are likely to be low and the spatial extent limited, such that physical or auditory injury to marine mammals is unlikely (Tougaard and Henriksen, 2009). Marine mammals may perceive the radiated tonal components where they exist above ambient noise levels and this could lead to a reduced detection of other sounds (masking) or a behavioural response. Given the low level and limited spatial extent of the noise, the risk of behavioural disturbance would be limited to within the immediate vicinity of the turbine, affecting only a very small proportion of the available habitat for marine mammals within Project One.

4.3.119 The duration, magnitude and extent of impacts from the operational noise of turbines on marine mammal qualifying species is assessed as being unlikely to compromise the conservation objectives of any designated site. Consequently, no LSE with respect to marine mammal populations is concluded for Project One, either alone or in-combination, and no further assessment is required.

EMF emitted by inter-array and export cables

4.3.120 EMF will result from the installation of 600 km of 400 kV HVAC or HVDC export cables and 530 km of 70 kV AC inter-array and platform inter-connector cables. It is not thought that marine mammals are electro-sensitive, however, they may be sensitive to magnetic fields, produced by the current flow on the cable.

4.3.121 Studies indicate that even for DC cables, which are more likely to affect marine mammals than AC cables (Normandeau *et al.*, 2010), there is no evidence to suggest an effect may occur on magneto-sensitive species, other than perhaps very localised behavioural effects. In summary, based on the values of magnetic fields likely to occur, there is likely to be localised effects for animals within the vicinity of the inter-array, platform inter-connector and export cables, with potential responses such as temporary changes in swimming direction or slight deviation from a transit route.

4.3.122 The duration, magnitude and extent of impacts from EMF from operation of the inter-array, platform inter-connector and export cables on marine mammal qualifying species is assessed as being unlikely to compromise the conservation objectives of any designated site. Consequently, no LSE with respect to marine mammal populations is concluded for Project One, either alone or in-combination, and no further assessment is required.

Accidental pollution events may affect marine mammals

4.3.123 Accidental release of pollutants from operation and maintenance vessels may have a negative effect on marine mammals. As described in paragraph 4.3.110 *et seq.* the risk of an accidental pollution event and likelihood of occurrence will be managed and minimised through the use of good practice measures and the implementation of a CoCP.

4.3.124 The duration, magnitude and extent of impacts from accidental pollution events during offshore operation and maintenance on marine mammal qualifying species is assessed as being unlikely to compromise the conservation objectives of any designated site. Consequently, no LSE is concluded for Project One, either alone or in-combination, and no further assessment is required.

Likely Significant Effects on Annex II Marine Mammals SAC/SCI Features

4.3.125 A total of 48 European SAC and SCI sites (UK and transboundary) were identified in Section 4.2 for consideration in the test for LSE. This section presents the summary of the assessment to determine whether the selected European sites and qualifying marine mammal species have the potential for a LSE due to the offshore activities associated with Project One.

4.3.126 From the list of European sites identified during the pre-screening exercise (see Table 4.1), and the screening described in the preceding paragraphs, it was possible to make a determination as to whether a LSE would occur as a result of Project One. An impact for which there was a potential for interaction with a site's qualifying feature was taken forward to the test for LSE.

4.3.127 The potential impacts from Project One screened in for marine mammals due to potential for LSEs are as follow:

- Direct physical injury/behavioural disturbance to marine mammals as a result of underwater noise due to pile driving of foundations during construction;
- Direct behavioural disturbance to marine mammals as a result of underwater noise from vessels and other construction/decommissioning activities;
- Direct physical injury to marine mammals as a result of collisions with construction, operation and maintenance and decommissioning vessels; and
- Indirect physical injury to marine mammals as a result of changes to prey species (fish) distribution and/or abundance due to increased suspended sediment concentrations in the water column and sediment deposition on the seabed and underwater noise from the installation of foundations, cables and associated construction, operation and maintenance and decommissioning activities.

4.3.128 Designated sites have been screened in for consideration in the marine mammal assessment based on demonstrated connectivity between Natura 2000 sites and the effects of Project One and/or known foraging distances if appropriate information is available. For grey seal and harbour seal, this has been informed by published information regarding foraging distances (see paragraphs 4.5.55 and 4.5.65, respectively). A precautionary approach has been applied for harbour porpoise at the screening stage, due to the limited information available on the connectivity between Natura 2000 sites and the effects of Project One, and limited information on foraging ranges. Harbour porpoise that occur within the Hornsea Zone are therefore considered as part of the overall mobile southern North Sea population, which effectively encompasses the populations of marine and coastal SACs and SCIs designated for this species. Disturbance effects during construction could potentially displace animals from feeding grounds. It is therefore possible, given the mobility of animals within the southern North Sea, that animals forming part of the designated populations of SAC/SCIs could be adversely affected. On this basis it is not possible at this stage to determine that a LSE would not arise and all sites screened into the assessment process are taken through to the appropriate assessment stage.

4.3.129 There is no evidence from surveys (see Environmental Statement Volume 2, Chapter 4: Marine Mammals), to indicate that bottlenose dolphin occur in significant numbers or with any regularity within the Project One marine mammal study area. For this reason, it is not anticipated that effects on this species would arise that would give rise to a LSE with respect to any European sites designated for supporting populations of this species. Sites where this species is a qualifying feature have therefore been screened out (Table 4.1)).

4.3.130 Evidence from tracking studies indicates that grey seals may regularly travel long distances from one haul-out site to another, often hundreds of kilometres apart and they also make shorter, more local foraging trips to offshore areas. Grey seals generally travel between 75 and 100 km from haul-outs (McConnell *et al*., 1992), however individuals have been known to forage up to 145 km from haul-out sites (Thompson *et al*., 2003). European designated sites where grey seal is a qualifying feature have been screened out where they are located at distances greater than the extent of the majority of foraging trips (i.e., 145 km), where site-specific tagging data is not available.

4.3.131 Individual harbour seals show a very high degree of site fidelity, with seals travelling relatively locally to forage and returning to their haul-out sites. Tagging of harbour seal in the UK suggests that harbour seal tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). Harbour seal hauled out in The Greater Wash region (which encompassed the North Norfolk and Lincolnshire coastlines), however, were found to travel between 75 and 120 km offshore to assumed foraging locations (SMRU, 2011). European designated sites where harbour seal is a qualifying feature have been screened out where they are located at distances greater than that recorded for the majority of foraging trips (i.e., up to 120 km), again in the absence of site-specific tagging data.

4.3.132 As discussed in Table 1.1, the Waddenzee (Wadden Sea) SCI, Project One is located outside the predicted foraging range for grey seal and harbour seal (as described above in paragraphs 4.3.130 and 4.3.131, respectively), However, based on advice received by the Dutch Rijkswaterstaat during Phase 4 Consultation, the potential for connectivity between this SCI and Project One was further explored. Counts of grey seal, in particular, are undergoing exponential rates of increase in Dutch colonies, including those in the Waddenzee SCI. Tracking studies have revealed that this is, in part, attributable to immigration from, and movement between, UK colonies, particularly those on the east coast of Scotland (Brasseur *et al*., 2010). Telemetry data collected between 2005 and 2008 showed that of 11 seals tagged in Dutch waters, three crossed the North Sea to UK waters and haul-out sites in the Moray Firth, Farne Islands and Orkney (Brasseur *et al*., 2010). None of these tracks, however, showed movements to the southern North Sea area and subsequently none passed through Project One. As such it is not considered likely that the areas in the vicinity of Project One are important for individuals originating from these colonies. Similar tracking studies of harbour seal in the Wadden Sea in 2002/2003 showed that, although some individuals make foraging trips to UK waters, on the whole the at-sea distribution of this species is concentrated on the waters of Wadden Sea. The Waddenzee SCI has therefore not been taken forward into the impact assessment as no connectivity of seals moving between this site and Project One has been demonstrated.

4.3.133 The screening assessment undertaken to identify LSEs on SACs and SCIs identified 26 Natura 2000 sites with qualifying species with the potential to be affected by Project One. Of these 26 sites, three are UK designated European sites, namely the Humber Estuary SAC, the Berwickshire and North Northumberland Coast SAC and The Wash and North Norfolk Coast SAC. As a result, it can be concluded that LSEs will not occur on Annex II marine mammal species designated as features of the following sites:

- Moray Firth SAC;
- Firth of Tay and Eden SAC;
- Flamborough Head SAC;
- Dogger Bank cSAC;
- River Derwent SAC;
- Haisborough, Hammond and Winterton cSAC/SCI;
- North Norfolk Sandbanks and Saturn Reef cSAC/SCI;
- Inner Dowsing, Race Bank and North Ridges cSAC/SCI;
- Venø, Venø Sund SAC;
- Dråby Vig SAC;
- Løgstør Bredning, Vejlerne og Bulbjerg SAC;
- Estuaires et Littoral Picards (baies de Somme et d'Authie) pSCI;
- Estuaire de la Seine pSCI;
- Rècifs et marais arrière-littoraux du Cap Lèvi à la Pointe de Saire pSCI;
- Rècifs et landes de la Hague pSCI;
- Banc et rècifs de Surtainville pSCI;
- Anse de Vauville pSCI;
- Baie de Seine occidentale SCI; and
- Waddenze SCI.

Birds (offshore)

4.3.134 The screening assessment identified the following potential impacts on birds as a result of the offshore components of Project One, which are summarised under the headings below. These impacts are discussed in detail in the Environmental Statement Volume 2, Chapter 5: Ornithology and are discussed below.

<u>Construction, Operation and Maintenance and Decommissioning</u>

Disturbance and displacement from piling (noise), vessel / helicopter activity

4.3.135 During the construction and decommissioning phases, an additional 6,966 vessel round trips over a period of five years may take place. During the operational and maintenance phase, up to 20 crew vessel movements per day, one supply vessel movement per day and all structures get five jack-up visits over 25 years (68 return trips per year). In addition, up to 3,496 helicopter flights per year may occur between Subzone 1 and the shore.

4.3.136 Birds may be disturbed and/or displaced away from the areas of activity by vessel or helicopter movements. None of the species regularly recorded during site specific surveys are recognised to be highly sensitive to vessel disturbance (Furness and Wade, 2012) and any impacts from vessel or helicopter activity will be relatively localised to within a few hundred metres of the vessel for the more sensitive species, (e.g., auks, Furness and Wade, 2012). The localised area of impact means that relatively very few birds will be displaced by any one vessel and although there will be multiple vessel movements, the area of affect will be very localised and birds that are displaced will be able to relocate elsewhere beyond the area affected, (e.g., beyond a few hundred metres away). The impact is transitory and once the vessel leaves or helicopter passes, birds will return to the area from which they were displaced.

4.3.137 During the breeding period the only designated SPA populations that could be affected are those attributed to the Flamborough Head and Bempton Cliffs SPA that lies 117 km away. Of the qualifying species recorded within Project One only the auks (guillemot, razorbill and puffin) are predicted to be disturbed or displaced by vessel activities. The other qualifying species are less frequently recorded on the sea surface and their predominantly aerial behaviours means that they will be unlikely to be displaced as they fly around the vessels. Gulls (herring gull and kittiwake), fulmars and to a lesser extent gannets are known to be attracted to vessels in search for food and therefore unlikely to be displaced (Skov and Durink 2001; Camphuysen *et al.,* 1995). Studies undertaken on Auk species, including guillemot, indicate localised displacement with one study reporting 83.6% of guillemots showing no behavioural response to boats. Behavioural responses for the three species of Auk that were studied recorded no behavioural responses beyond 100 m from a boat (Heintz, 2006). Furness and Wade (2012) reported displacement effects within a few hundred metres of vessel disturbance.

4.3.138 The potential displacement of a proportion of the auks present within a few hundred metres of a vessel will impact on a very small proportion of the SPA's populations either during the breeding, post-breeding and non-breeding periods. The impacts will be for a short duration as the vessel passes or completes its works and relocates elsewhere.

4.3.139 The duration, magnitude and extent of impacts resulting from offshore piling, vessel/helicopter activity on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Consequently, no LSE with respect to designated SPA interests is concluded and no further assessment is required.

Direct habitat loss due to construction and presence of infrastructure and changes to physical processes leading to a reduction in suitable habitat for seabird foraging

4.3.140 Direct habitat loss leading to a reduction in suitable habitat for seabird foraging may occur due to construction, operation and maintenance and decommissioning activities. An estimated 28.6 km^2 of seabed will be disturbed during construction for Project One, of which 16 km^2 will be disturbed during seabed preparation for turbines. This habitat loss will be temporary for the duration of the construction phase only. Any effects of habitat loss/disturbance within the construction phase will be temporary and will cease following completion of construction activities. The proportion of sandeel spawning habitat affected is small (0.044% of the available sandeel spawning habitat in the southern North Sea and the area affected is known to be low intensity spawning habitat. The main autumn herring spawning habitat in the southern North Sea is located off Flamborough Head, outside the area affected by temporary habitat loss, although the inshore area of the export cable corridor is likely to be at the northern edge of the herring spawning habitat which occurs within The Wash (a spring spawning habitat). This loss of habitat is extremely small compared to the total area in which seabirds may forage, particularly during the non-breeding period when birds may be able to forage widely across the North Sea or further.

4.3.141 During the operational and maintenance phase, the physical presence of Project One will also cause a more permanent but smaller area of habitat loss, equating to an area of 4.225 km^2, which represents 0.59% of the Project One development area and 0.01% of the area of the southern North Sea MNA. Comparable habitats are present and widespread within the southern North Sea fish and shellfish study area and throughout the wider southern North Sea (see Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology). The main herring spawning ground in the southern North Sea is located to the west of Subzone 1, off Flamborough Head and therefore will not be affected by long term habitat loss and long term habitat loss is predicted to affect up to 0.01% of the sandeel spawning habitat within the southern North Sea MNA.

4.3.142 Breeding seabirds may also have extensive foraging ranges. Breeding seabirds occurring within Subzone 1 are foraging 117 km from the nearest SPA, which suggests that they have a potential foraging area of approximately 20,000 km^2. Although not all the potential foraging area may be equally suitable, site specific surveys and other sources (e.g., Stone *et al*., 1995; Forewind, 2013) indicate that seabirds from the nearest SPA occur widely across their potential foraging area. Any localised loss of habitat will be trivial and cannot be reasonably predicted to affect the conservation objectives of any site. Therefore there is no potential for a LSE, either alone or in-combination, from direct offshore habitat loss and no further assessment is required.

Indirect impacts from increased suspended sediment concentrations in the water column impairing the foraging ability of birds.

4.3.143 There is potential for a sediment plume to occur that could affect the ability of birds to forage in the water column. The extent of the plume of suspended sediments between 2 and 10 mg/l above background levels is predicted to extend approximately 10 km from the Subzone 1 boundary typically along the main tidal axis (i.e., to the north and south; see the Environmental Statement Volume 2, Chapter 1: Marine Processes). The increase in sediment in the water column is relatively low and may not impact on the ability of seabirds to forage. However, should it do so then there may be a localised and temporary displacement behaviour particularly on seabirds that feed in the water column, e.g. auks and gannets.

4.3.144 Results from site-specific surveys found no areas to be of relatively more importance to birds than others, with all qualifying species occurring across a wide geographical area. Therefore, the duration, magnitude and extent of impacts resulting from increased suspended sediment concentrations in the water column on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Consequently, no LSE with respect to designated SPA interests, either alone or in-combination, is concluded and no further assessment is required.

Indirect impacts due to from disturbance and displacement impacts on prey species due to construction/decommissioning of infrastructure, increased vessel activity and underwater noise.

4.3.145 Indirect impacts may occur if prey species for seabirds become unavailable due to disturbance and or displacement impacts or there is a loss of suitable habitat for the prey species.

4.3.146 During the construction and decommissioning phases, noise arising from installation/removal of turbine foundations, cables and seabed preparation has the potential to cause injury, displacement or behavioural impacts on prey (fish) species. Localised impacts to within 150 m of the piling event are predicted to cause fish fatalities. The presence of the vessels may displace some birds away from vessels within this range. Displacement and behavioural impacts from piling activities will affect a wider area. Noise modelling indicates that an impact out to 27.9 km may occur for the most sensitive fish species (See Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology). The change in fish distribution or behaviour may cause a temporary displacement impact on birds.

4.3.147 Changes in physical process may also lead to changes in habitat available for prey species and indirect effects from the presence of foundations include potential changes to the wave climate, creation of hard substrate around turbine foundations and inter-array/export cables, increases in sedimentation in the water column and noise and vibration from operational turbines. However, any changes in habitat or prey distribution during construction, operation or decommissioning activities due to changes in physical processes from Project One will be very localised (see Environmental Statement Chapter 2: Benthic Subtidal and Intertidal Ecology and Chapter 3: Fish and Shellfish Ecology).

4.3.148 The main prey species for seabirds during the breeding period is sandeels (e.g., Wanless *et al.,* 1998; Webb *et al.,* 1985; Wright and Begg, 1997). Studies on the impact of noise on sandeels indicate a very localised area of impact with no change in their abundance and only a moderate effect on their behaviour from seismic noise (Hassel *et al.,* 2004). There is the potential for a localised displacement impact during the construction period.

4.3.149 During the breeding period birds from the Flamborough Head and Bempton Cliffs SPA may occur in the area of potential impact and there may be localised displacement of these birds. However, Subzone 1 is beyond the mean maximum or maximum foraging ranges for many of the birds potentially affected and those that are present are likely to be near the limit of their foraging ranges during the breeding season. The distribution of seabirds across the wider area indicate that those that are displaced due to indirect impacts will be able to relocate to other suitable foraging areas in response to any changes in local prey distribution.

4.3.150 During the breeding season there may be indirect impacts that cause displacement effects that may not be trivial or inconsequential on birds from the Flamborough Head and Bempton Cliffs SPA and could cause a LSE. The scale of potential displacement impacts will vary depending on the sensitivity of the receptor fish species to noise and the relative importance of the species as a component of the bird species diet. For the purpose of this assessment it is assumed on a precautionary basis that the displacement effects will extend across Subzone 1 and 1 km beyond but not all birds will be displaced as fish will still be available across parts of the Subzone 1 that are not affected by piling noise. The assessment is based on the same magnitude of effect as potential displacement from the physical presence of the wind farm.

4.3.151 During the non-breeding period the potential foraging area for displaced seabirds is even greater and displaced birds that feed on widely occurring fish species will be able to relocate to other suitable foraging areas within their normal range of distribution at this time. The indirect impacts during the non-breeding period will be trivial and cannot reasonably be predicted to affect the conservation objectives of any site.

4.3.152 The duration, magnitude and extent of impacts resulting from displacement due to indirect effects on prey species on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Consequently, no LSE either alone or in-combination, with respect to designated SPA interests is concluded and no further assessment is required.

Collisions with rotating turbine blades may result in direct mortality of an individual.

4.3.153 The risk of collision with wind turbine generators depends on a number of variables, in particular species-specific near and far field avoidance rates, flight heights, speed of flight, frequency of movements in or near to the turbines as well as the size and location of the turbines themselves. Additional factors such as weather and species' behaviour can also affect the risk of collision.

4.3.154 Collision impacts occur during the operational phase of the development, once the turbines are operating, until the time of decommissioning. There is potential for a wide range of species to be impacted over the duration of the operating period and there is the potential for a LSE on some species, which will be considered in the site-specific test for LSE in Annex A, with supporting quantification of impacts in Annex B.

Displacement from physical presence of wind turbines during the operational and maintenance phase may result in effective habitat loss and reduction in survival or fitness rates.

4.3.155 Evidence from existing offshore wind farms have identified that some species of seabird may avoid entering wind farms and therefore be displaced from areas that they would otherwise utilise (e.g., Zucco *et al.* 2006). The level of displacement is very species specific and the duration of displacement may vary across species, with some species avoiding offshore wind farms immediately post-construction and returning to the area after a period of time and other species showing little or no evidence of returning to the wind farm area post-construction. Displacement from an area may reduce the number of suitable locations available for foraging, increasing inter- and intra-specific competition and consequently lowering survival rates.

4.3.156 Displacement impacts caused by the physical presence of the wind turbines occurs during the operational period and some species, (e.g., red-throated divers are known to avoid wind farms by 2 km or more). However, for the regularly recorded qualifying species which are of relatively lower sensitivity (Langston, 2010), displacement impacts are predicted to occur, albeit out to shorter distances (see Section 5.4 for further details). There is therefore the potential for a LSE from displacement from operating wind turbines for some species, which will be considered in the site-specific test for LSE in Annex A, with supporting quantification of impacts in Annex B.

Barrier effects caused by the physical presence of turbines may prevent clear transit of birds between foraging and breeding sites, or on migration.

4.3.157 In order to avoid flying through offshore wind farms many species have been recorded flying around or over them and consequently may have to fly further than prior to the construction of the offshore wind farm. The increase in flying distance may cause an increase in energy expenditure, which could have a detrimental effect on the fitness of the individual and reduce survival or fecundity rates. This is of particular concern should there be regular, daily, movements around an offshore wind farm (i.e., to and from foraging or roosting areas). This barrier effect only occurs once the turbines have been constructed and is therefore present for the duration of the operational period.

4.3.158 All the seabirds recorded within Subzone 1 have significantly large foraging ranges during breeding and non-breeding periods (e.g., Wernham *et al*., 2002). Many of the species migrate many thousands of kilometres each year and therefore are capable of flying around or over offshore wind farms should they choose to do so. The duration, magnitude and extent of impacts resulting from displacement due to indirect effects on prey species on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Consequently, no LSE with respect to designated SPA interests is concluded and no further assessment is required.

4.3.159 Although it is unlikely that barrier effects will occur as a result of Project One the potential for a LSE on qualifying features will be considered in the site-specific test for LSE in Annex A, with supporting quantification of impacts in Annex B, if applicable.

Attraction to lit structures during the operational and maintenance phase by migrating birds in particular may cause disorientation, reduction in fitness and possible mortality.

4.3.160 The offshore wind turbines and substations will be lit for safety and navigational purposes. There is evidence from offshore platforms that birds can be attracted to light and this can cause an increase in the rate of mortality primarily from an increase in the risk of collisions with the structure (Poot *et al.,* 2008; Bruinzeel *et al.,* 2009; OSPAR, 2012). The frequency and magnitude of these attraction events vary considerably with the time of year and the weather conditions at the time. Under certain conditions of low cloud and poor visibility and during periods of migration relatively large numbers of birds can be at risk of being attracted to lit platforms.

4.3.161 A study based on observations obtained from North Sea oil and gas platforms reported that such events were infrequent and that the species at greatest risk of being impacted were passerines. No seabirds were recorded as being attracted and low numbers of waders (Barton and Pollock, 2009). Few qualifying species (primarily waders) are at risk of being attracted to lit structures, further there is a large geographical range over which the impacted species might originate. Therefore, the duration, magnitude and extent of impacts resulting from attraction to lit structures on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Consequently, no LSEs, either alone or in-combination, with respect to designated SPA interests is concluded and no further assessment is required.

Accidental events including accidental spills and contaminant releases associated with rigs and supply/service vessels which may affect species' survival rates or foraging activity, during the construction, operational and maintenance and decommissioning phases.

4.3.162 Accidental events include potential oil or chemical spills during the construction, operational and maintenance, and decommissioning phases of the project. The worst-case spill considered within the EIA is the single tank rupture and the release of fuel 400,000 L of fuel diesel. The most likely cause for a single tank rupture would be in the case of a vessel collision. The risk of a collision from any vessel is low, for example the risk of collision with a commercial vessel is once every 878 years and with a fishing vessel once every 34 years. Consequently, the risk of such an impact occurring is negligible (See Environmental Statement Volume2, Chapter 8: Shipping and Navigation).

4.3.163 Potential releases of hydrocarbons from other sources will be smaller. Smaller diesel spills can result from equipment failures, such as the rupture of pipes or open valves but small spills most frequently occur during bunkering operations and are generally caused by hose failures. Spill records from the oil and gas industry indicate that 92.1% of diesel spills from bunkering operations are of 1 tonne or less (ERT, 2006).

4.3.164 The main mechanism in the removal of hydrocarbons from the sea is through evaporation. The light fraction of diesel (such as the aromatic compounds benzene and toluene) will rapidly evaporate removing a large proportion of the total diesel spilled. The remaining heavier components of the diesel will disperse into the water column. The fate of the accidental loss of diesel from a bunkering operation will be very localised.

4.3.165 The risk of an accidental spill is very low and controls and procedures will be in place to minimise the risk of such an event occurring including auditing of all vessels, implementation of bunkering and fuel transfer procedures, vessel management and co-ordination plans. Therefore, the duration, magnitude and extent of impacts resulting from accidental spills on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Consequently, no LSEs, either alone or in-combination, with respect to designated SPA interests is concluded and no further assessment is required.

4.3.166 Likely Significant Effects on SPA Bird Features A total of 77 SPAs were assessed from Hermaness in Shetland to Sandwich Bay in Kent and adjacent continental coasts (Annex A); from which SPAs for eight qualifying seabird species were identified as having a potential for a LSE on any of the sites and qualifying species from Project One (Table 4.3).

4.3.167 The main predicted effect on SPA features relates to the following potential impacts:

- Collisions with rotating turbine blades may result in direct mortality of individual birds during the operational phase;
- Displacement from physical presence of wind turbines during the operational and maintenance phase may result in effective habitat loss and reduction in survival or fitness rates; and
- Barrier effects caused by the physical presence of turbines may prevent clear transit of birds between foraging and breeding sites, or on migration.

4.3.168 These three impacts are therefore the only impacts that require consideration at the Appropriate Assessment stage.

4.3.169 For non-seabird species for which collision mortality during periods of migration may cause an impact, the screening assessment considered the results of the migration modelling undertaken for 12 non-seabird species (seven waders and five wildfowl) that were selected in consultation with JNCC and Natural England and are based on a relatively high proportion of birds occurring within the SPAs close to Subzone 1 (APEM, 2012 – see the Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix D for details). Very small numbers of each species were predicted to collide with turbines each year and so no LSEs were concluded for any qualifying feature.

4.3.170 Table 4.3 presents the results of the first step of the screening of SPAs for consideration of LSE, which are assessed in detail in Annex A. This is informed by the results of baseline surveys and relevant evidence in the scientific literature, which indicates the propensity of a particular species being affected by a particular impact.

4.3.171 Although Annex A determines a possible impact pathway at a species level, on its own it does not take into consideration the likelihood of an individual bird from a SPA occurring within the proposed development area. In particular, it does not apportion the potential impacts across different SPA populations based on the size of the SPA's breeding population.

4.3.172 Annex B, using qualifying interests and SPAs screened in during Annex A, therefore helps apportion the potential scale of any impact specific to each SPA, based on the relative size of the site's population compared to all other SPAs in the non-breeding season. This approach was agreed with stakeholders during consultation.

Table 4.3 Summary of Screening Assessment for SPAs.

Species	SPA Site Name	Potential impact
Fulmar	Flamborough Head and Bempton Cliffs	Displacement
Gannet	Hermaness Saxa Vord and Valla Field, Noss, Fair Isle, Forth Islands, Flamborough Head and Bempton Cliffs, Seevogelschutzgebiet Helgoland	Collision and Displacement
Kittiwake	Hermaness Saxa Vord and Valla Field, Noss, Foula, Sumburgh Head, Fair Isle, West Westray, Hoy, Marwick Head, Calf of Eday, Rousay, Copinsay, North Caithness Cliffs, East Caithness Cliffs, Troup Pennan and Lion's Heads, Buchan Ness to Collieston Coast, Fowlsheugh, Forth Islands, St Abb's Head to Fast Castle, Farne Islands, Flamborough Head and Bempton Cliffs, Littoral seino-Marin	Collision and displacement
Lesser black-backed gull	Forth Islands, Alde Ore Estuary, Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete, Östliche Deutsche Bucht, Seevogelschutzgebiet, Helgoland, Littoral seino-Marin, Baie de Seine Occidentale, Waddenzee	Collision
Herring gull	East Caithness Cliffs, Troup Pennan and Lion's Heads, Buchan Ness to Collieston Coast, Fowlsheugh, Forth Islands, St Abb's head to Fast Castle, Flamborough Head and Bempton Cliffs, Alde Ore Estuary	Collision
Razorbill	Foula, Fair Isle, North Caithness Cliffs, Fowlsheugh, Forth Islands, St Abb's Head to Fast Castle, Flamborough Head and Bempton Cliffs	Displacement
Guillemot	Hermaness Saxa Vord and Valla Field, Noss, Foula, Fair Isle, Sumburgh Head, West Westray, Marwick Head, Calf of Eday, Rousay, Copinsay, Hoy, North Caithness Cliffs, East Caithness Cliffs, Troup Pennan and Lion's Heads, Buchan Ness to Collieston Coast, Fowlsheugh, Forth Islands, St Abb's Head to Fast Castle, Farne Islands, Flamborough Head and Bempton Cliffs	Displacement
Puffin	Hermaness Saxa Vord and Valla Field, Noss, Foula, North Caithness Cliffs, East Caithness Cliffs, Forth Islands, Farne Islands, Coquet Islands, Flamborough Head and Bempton Cliffs, Hoy, Fair Isle	Displacement

4.3.173 Together therefore, Annexes A and B provide the reasoning for the judgements of no LSE for SPAs. Examples of no LSE include where qualifying species were not recorded during the site specific surveys or occurred beyond the mean maximum foraging range during the breeding period, whereby the numbers predicted to be impacted were relatively very small compared with the site's current population and are considered to be inconsequential. Another example of no LSE would be for behaviour reasons, such as very low flight heights, indicating that the risk of a collision impact is low, where any effects will therefore be trivial and cannot reasonably be predicted to affect the conservation objectives of the site.

4.3.174 Table 4.3 therefore shows that only two impacts have the potential to cause a LSE: collision mortality and operational displacement.

4.3.175 Potential collision risk is based on results from collision risk modelling (see Annex B and the Environmental Statement, Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix C). The modelling uses the worst-case scenario of 332 x 3.6 MW turbines for Project One, which provides the greatest number of potential collisions. A 98% avoidance rate has been used for all species with the exception of gannet (99%). Results from collision risk modelling were used as part of the screening assessment.

4.3.176 The potential impact of displacement will vary depending on the season. During the breeding period, birds are more restricted to foraging within a limited distance from their nesting sites, and also need to obtain sufficient food not just for themselves, but for young as well. Consequently, any displacement from foraging areas is predicted to have a greater level of impact than at other times as birds may struggle to meet their energy requirements. There is little or no evidence on what these impacts may be, but for the purposes of the assessment a mortality rate of up to 10% during the breeding period has been assumed for displaced birds, and taken forward to impact assessment. For gannet and fulmar, which have large foraging ranges and are able to forage for a wide variety of prey items, a 2% mortality rate has been used in the breeding season, since the proportion of habitat unavailable in comparison to total potential area is smaller than other species. Gulls are also considered to have a mortality rate of 2% because of the species' general tolerance to human structures and the mobility of their prey items. It is considered these rates are suitably precautionary for HRA requirements (a range up to 100% is however presented in all cases, as requested by JNCC, Natural England and RSPB).

4.3.177 During the 'non-breeding' period, seabirds are generally less constrained to restricted foraging ranges, free from providing food for young or breeding partners, and are more capable of relocating to other areas. The vast majority of individuals are therefore highly likely to find alternative foraging habitat if displaced. However for the purposes of this assessment it is conservatively considered that in the non-breeding season, one bird in one hundred may experience sufficient stress to suffer mortality – therefore a mortality rate of 1% of displacement birds has been adopted.

4.3.178 'Post-breeding' seabirds leave their colonies and disperse. For most species this period is little or no different from the 'non-breeding' period. However, guillemot and razorbill leaving their colonies accompanied by chicks are constrained to some extent, by both the adults and young being flightless and therefore unable to travel large distances rapidly in search of food. Displaced birds away from suitable foraging areas may be at higher risk of increased mortality than birds during the 'non-breeding period'. Post-breeding seabirds can, however, move further afield than breeding adults and therefore the potential effects from displacement are expected to be lower. Furthermore, the possible impacts from displacement are more transitory as the majority of birds are dispersing through the area. For the purposes of the assessment a 2% mortality rate for auks and gannet displaced in the post-breeding period is applied, which reflects the lower restrictions than during the breeding season, but the slightly increased potential for mortality on guillemot and razorbill due to the ongoing care required for young, as well as any stress incurred during the moult period when foraging range is more limited.

4.3.179 The levels of impact (1-10%) are not fixed, but are to be used as a guide to assess potential effects. However, they are considered to be suitably precautionary based on the primary species potentially impacted (i.e., piscivorous seabirds with mobile and often widespread prey that are therefore likely to have widespread foraging areas).

4.3.180 In order to assess the displacement effect the mean peak number of birds recorded within Project One (plus appropriate buffer where applicable) during each of the two or three seasons has been used in the first instance. The mean peak number within each season is considered sufficiently precautionary.

4.3.181 Based on the apportioning of collision and displacement mortality rates to species' SPA populations in Annex B, it was concluded that those qualifying features from the SPAs presented in Table 4.4 have the potential for a LSE arising from Project One alone and will be considered further as part of the information to inform an appropriate assessment.

Table 4.4 Potential likely significant effects from Project One alone on qualifying species at designated SPAs.

Site	Species
Flamborough Head and Bempton Cliffs	Fulmar (displacement), Gannet (collision and displacement), Kittiwake (collision and displacement), Herring gull (collision), Guillemot (displacement), Razorbill (displacement), Puffin (displacement).
Forth Islands	Gannet (collision and displacement).

4.3.182 This shows that LSEs due to collision mortality and operational displacement could not be discounted for qualifying features of two sites: Flamborough Head and Bempton Cliffs SPA, and the Forth Islands SPA.

4.3.183 For qualifying species from the Flamborough Head and Bempton Cliffs SPA it is assumed that all impacts on adults during the breeding period are on birds from that SPA, as these birds are in foraging range, hence why in many cases a LSE could not be discounted.

4.3.184 This is precautionary as Project One is beyond the mean maximum foraging ranges for the majority of the seabirds' breeding at that SPA (see Annex C). Outwith the breeding season birds from any colony may occur in the development area but it is not known from which colony they originate.

4.3.185 For fulmar and gannet other SPAs may be within foraging range of Subzone 1 in the breeding season, but evidence (e.g., Wakefield *et al.,* 2013 for gannets) suggests that connectivity is likely to be trivial at best.

4.3.186 For birds recorded during the non-breeding period it is assumed that the number of individuals potentially impacted is in direct proportion to the size of the colony, irrespective of the distance from Project One. Therefore, for the purposes of this assessment the proportion of birds occurring in the proposed development area outwith the breeding season is assumed to correlate directly with the size of the relevant breeding colony. Only collision and displacement to gannets from the Forth Islands SPA, the next nearest colony (after Flamborough Head and Bempton Cliffs SPA) was taken forward to the next stage.

In-combination Screening of Likely Significant Effects

4.3.187 The Habitats and Birds Directives require that the LSEs arising from a plan or project should be assessed for both the project alone and in-combination with other plans or projects (PINS 2013).

4.3.188 Species or habitats upon which it is determined that there is a potential for LSEs and are therefore screened into the appropriate assessment stage of the HRA process are also considered to have the potential for an in-combination impact.

Selection of Projects

4.3.189 A number of planned projects and on-going activities in the southern North Sea have been identified as having the potential to impact in-combination on Natura 2000 site features. This section presents the screening assessment for in-combination effects which has been carried out on a 'long list' of other projects or plans, (see Appendix B of Annex 4.5.1: Cumulative, Transboundary and Inter-related Effects Document'), to identify which other projects or plans could have the potential for LSEs in-combination with Project One. The approach to this screening of projects/plans is described in Section 3.2 and includes consideration of data confidence, effect-receptor pathways and spatial/temporal scales.

4.3.190 As discussed in Section 3.2, the range of projects to be included in the in-combination assessment is dependent on the scale of the particular impact as well as each species' population distribution and behaviour (e.g., foraging range). Some of the projects within the initial area of search have been excluded from assessment. The Docking Shoal application has been refused development consent and so this project has not been included in the in-combination assessment. Projects including the Inch Cape and Methil offshore wind farms falling within Tier 2 were also excluded from further assessment in the Environmental Statement Volume 2, Chapter 4: Marine Mammals, as, although applications have been, or are due to be submitted/approved, the Environmental Statements were not available, nor was sufficient other information in the public domain, to inform this assessment and so confidence was assessed as low and a meaningful assessment was not considered possible. For Tier 3 projects, Hornsea Project Two was considered to have a medium level of data confidence (i.e., information available in the public domain), as the Project One EIA team was able to access more robust data for Project Two, thereby allowing a meaningful in-combination assessment to be made.

4.3.191 Although some non-UK offshore wind farms may be within the potential zone of influence for particular bird and marine mammal receptors, data on these projects (including the relevant Environmental Statements) are largely unavailable and so these could not be included within the assessment due to the rationale presented in paragraph 4.3.190 above. In particular, information pertaining to the indicative construction schedules for these projects with which to make a meaningful assessment was unavailable. As an example, German projects generally do not carry out collision risk modelling as part of their EIA process (meeting 18 December 2012, BSH, German Federal Maritime and Hydrographic Agency). Of the non-UK offshore wind farms within a potential in-combination zone of influence with Project One, the Dutch Irene Vorrink and Lely offshore wind farms have been scoped out of the assessment for birds as they have been fully operational since 1996 and 1994, respectively.

4.3.192 The selection of projects within each of the 'tiers' described in paragraph 3.2.35 is dependent on the particular impact as well as each species' population distribution and behaviour. Consequently, the projects identified within each tier differ between birds and marine mammals (Table 4.5 and Table 4.6).

Table 4.5 Details of other projects and plans considered in the marine mammal in-combination assessment.

Tier	Phase	Project/plan	Round	Approximate distance from Project One (km)	Number of turbines	Dates of construction	Overlap of construction phase with Project One construction	Overlap of operation phase with Project One operation
1		Project One	3	-	Up to 332	2015-2019 (up to 5 years offshore construction in up to three phases). Note: piling will occur over a maximum of 36 months of the construction period, assuming a single vessel and a minimum of 18 months assuming two concurrent piling vessels.		
	Operational/On-going	Aggregate extraction activities	n/a	7.5 – 30 km	n/a	On-going vessel movements associated with Aggregate Areas 514/1 (was 102), Area 514/4 (was 105), 197, 106/1/2/3, 480, 440, 441/1/2, 408, 481/1/2 and 107	Yes	Yes
		Disposal Areas					Yes (potential)	Yes
		Oil and gas activities	n/a	Numerous gas fields within a 50 km buffer	n/a	On-going associated vessel movements	Yes	Yes
	Under Construction	Lincs	2	27.05 km	75	Expected to be fully operational in 2013		Yes
		Humber Gateway	2	6.88 km	73	Offshore construction commenced in 2013 with a target date for completion by spring 2015		Yes
		Teesside	1	100-150 km	27	2012-2013		Yes
		Gunfleet Sands 3 – Demonstration project	Demonstrator	200-250 km	2	2013		Yes
		BARD Offshore 1	n/a	200-250 km	80	Under construction but no information on dates		Yes
		Thornton Bank Phase II	n/a	200-250 km	30	Expected to be fully operational by mid-2013		Yes
		Thornton Bank Phase III	n/a	200-250 km	18	Expected to be fully operational by mid-2013		Yes
		Borkum Phase 1	n/a	200-250 km	40	Expected to be fully operational by Q3 2013		Yes
2	Consented or Submitted Applications	Race Bank	2	23.03 km	Up to 116	2014-2017	Yes	Yes
		Westernmost Rough	2	26.11	80	2013-2014 (offshore construction)		Yes
		Dudgeon	2	41.66 km	168	2015-2016	Yes	Yes
		Triton Knoll	2	2.22 km	Up to 288	2017-2021	Yes	Yes
		Dogger Bank Creyke Beck A and B	3	77.3 km	Up to 300	2016-2021	Yes	Yes
		East Anglia One	3	159.4 km	Up to 325	2016-2019	Yes	Yes
		Galloper	2.5	150-200 km	140	2015-2018	Yes	Yes

Tier	Phase	Project/plan	Round	Approximate distance from Project One (km)	Number of turbines	Dates of construction	Overlap of construction phase with Project One construction	Overlap of operation phase with Project One operation
		London Array Phase II	2.5	200-250 km	Up to 65	2014-2016	Yes	Yes
		Kentish Flats Extension	2.5	200-250 km	Up to 17	2013-2014	Yes	Yes
		Sheringham Shoal	2	51.11 km	88	Construction completed in 2013		Yes
		Moray Firth (MORL) – Telford, Stevenson and MacColl	3	>300 km	Up to 339	2015-2020	Yes	Yes
		Beatrice	3	>300 km	142-277	2014-2018	Yes	Yes
		Neart na Gaoithe	3	>300 km	64-125	2015-2016	Yes	Yes
		Firth of Forth (Project Alpha and Project Bravo)	3	>300 km	150 (total for two projects)	2015-2019	Yes	Yes
		Aberdeen European Offshore Wind Deployment Centre	n/a	>300 km	11	Offshore commencing in 2015	Yes	Yes
		Cygnus oil and gas platform	n/a	159.4 km	n/a	Construction to be completed in 2015		Yes
		Potential vessel movements associated with Aggregate Application Areas 514/1, 514/3, 493, 400, 439, 492, 506, 483, 490, 491 and 484	n/a	0.5-18 km	n/a	On-going	Yes	Yes
3	Future submissions	Hornsea Project Two	3	50 km	Up to 360	2016-2021	Yes	Yes
3	Future submissions	Tetney Sea-line Replacement (section of the submarine sea line which runs from the Tetney Oil Terminal to an offshore buoy)	n/a	1.6 km	n/a	March-December 2014		Yes

Table 4.6 Offshore wind farm projects considered within the ornithology in-combination assessment.

Tier	Phase	Offshore Wind Farm	Round	Distance from Subzone 1 + 4 km buffer	Number of turbines	Dates of Offshore Construction	Overlap with Project One Construction	Overlap with Project One Operation
		Hornsea Project One	3	-	332	2016-2018	NA	
1	Built and Operational Projects	Lynn and Inner Dowsing	1	100 km	54	Operational since March 2009	NA	Yes
		Thanet	2	200-250 km	100	Operational since May 2010	NA	Yes
		Gunfleet sands I, II and III	1 + 2	200-250 km	48 (+2 for phase III)	Phase I and II operational since March 2010	NA	Yes
		Kentish Flats	1	200-250 km	30	Phase 1 operational since June 2005	NA	Yes
		Egmond aan Zee	-	150-200 km	36	Operational since 2007	NA	Yes
		Thornton Bank Phase I	-	200-250 km	6	Operational since 2009	NA	Yes
		Greater Gabbard	2	200 km	140	Operational since 2012	NA	Yes
	Projects Under Construction	Lincs	2	95 km	75	Due to be completed in 2013	NA	Yes
		Sheringham Shoal	2	70 km	88	To be completed in 2013	NA	Yes
		London Array Phase I	2	200-250 km	175	First foundation was installed in March 2011, completion by 2013	NA	Yes
		Teesside	1	100-150 km	27	2012-2013	NA	Yes
		BARD Offshore 1	-	200-250 km	80	To be completed end of 2013	NA	Yes
		Thornton Bank Phase II	-	200-250 km	30	Fully operational by Quarter 4 2013	NA	Yes
		Thornton Bank Phase III	-	200-250 km	18	Fully operational by Quarter 3 2013	NA	Yes
		Borkum Phase 1	-	200-250 km	40	Fully operational by Quarter 3 2013	NA	Yes
2	Consented or Submitted Applications	Race Bank	2	75 km	88	2014-2017	Yes	Yes
		Humber Gateway	2	85 km	73	2012.-2015		Yes
		Moray Firth Project One (MORL)	3	>300 km	Up to 339	2015-2020	Yes	Yes
		Dogger Creyke Beck - Projects A and B	3	50-100 km	117-389	2015-2017	Yes	Yes
		East Anglia One	3	50-100 km	Up to 325	2016-2019	Yes	Yes
		Dudgeon	2	60 km	168	2015-2016	Yes	Yes
		Triton Knoll	2	53 km	50-96	2017-2021	Yes	Yes

Tier	Phase	Offshore Wind Farm	Round	Distance from Subzone 1 + 4 km buffer	Number of turbines	Dates of Offshore Construction	Overlap with Project One Construction	Overlap with Project One Operation
		Kentish Flats Extension	2.5	200-250 km	Up to 17	2013-2014		Yes
		Beatrice	3	>300 km	142-277	2014-2018	Yes	Yes
		Galloper	2.5	200 km	140	2015-2018	Yes	Yes
		London Array Phase II	2.5	200-250 km	166	2014-2016	Yes	Yes
		Westernmost Rough	2	90 km	80	2014-2017	Yes	Yes
		Aberdeen European Offshore Wind Deployment Centre	-	>300 km	11	2014-2015 (consent sought for 2013)	NA	Yes
		Firth of Forth Phase 1	3	>300 km	Up to 150 in two plans	2015-2019	Yes	Yes
		Neart na Gaoithe	3	>300 km	64-125	2015-2016	Yes	Yes
3	Future submissions	Hornsea Project Two	3	<50 km	360	2017-2021	Yes	Yes
		Dogger Teesside - Projects A and B	3	50-100 km	120-400 (each)	2016-2021	Yes	Yes
		Dogger Teesside - Projects C and D	3	50-100 km	120-400 (each)	2016-2021	Yes	Yes
		East Anglia Three	3	50-100 km	120-240	2016-2019	Yes	Yes
		East Anglia Four	3	50-100 km	120-240	2016-2019	Yes	Yes
		Inch Cape	3	>300 km	180	2015-2019	Yes	Yes
		Moray Firth Project Two	3	>300 km	unknown	2017-2020	Yes	Yes

SAC/SCI Features

4.3.193 The potential impacts for which other projects/plans listed in Table 4.5 were identified as having a potential in-combination effect with Project One included:

- Direct physical injury/behavioural disturbance to marine mammals as a result of underwater noise due to pile driving of foundations during construction;
- Direct behavioural disturbance to marine mammals as a result of underwater noise from vessels and other construction/decommissioning activities;
- Direct physical injury to marine mammals as a result of collisions with construction, operation and maintenance and decommissioning vessels; and
- Indirect physical injury to marine mammals as a result of changes to prey species (fish) distribution and/or abundance due to increased suspended sediment concentrations in the water column and sediment deposition on the seabed and underwater noise from the installation of foundations, cables and associated construction, operation and maintenance and decommissioning activities.

4.3.194 In assessing the in-combination effect for Project One it is important to bear in mind that other projects/plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to an in-combination impact with Project One. For example, relevant projects/plans that are already under construction are likely to contribute to an in-combination effect with Project One (providing effect or spatial pathways exist), whereas projects/plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason all relevant projects/plans considered in-combination alongside Project One have been allocated into 'Tiers' (see Section 3.2), reflecting their current stage within the planning and development process.

4.3.195 A number of potential impacts were screened out of the in-combination assessment for marine mammals, where these impacts were identified as being of small magnitude (i.e., small spatial and/or temporal scale) and not significant, such that the potential for in-combination effects with other projects/plans were considered to be negligible. Impacts screened out have been discussed in paragraphs 4.3.92 to 4.3.124 and included: increased suspended sediment during construction, accidental pollution during construction and operation, and noise generated from operational turbines.

4.3.196 The in-combination assessment considers effects that may either be synergistic (resulting from impacts which, when combined, give a greater effect than they would acting separately), or additive (resulting from a similar impact which, when added together, becomes greater in extent). Effects, such as those resulting from piling noise, however, are likely to extend over a much wider area and therefore in-combination effects on harbour porpoise are assessed on a wider scale, with reference to the North Sea as a whole, albeit with particular focus on the southern North Sea marine mammal study area. In comparison, for pinnipeds the cumulative effects of piling noise have been assessed within the southern North Sea marine mammal study area. This is because of the strong links that The Wash and North Norfolk Coast SAC population of harbour seals and the Humber SAC populations of grey seals have with the Project One site and based on likely foraging ranges for these species. This is consistent with the approach taken with the impact assessment for Project One alone and this approach has been adopted since it is important to understand potential effects at a population-level. Locations of developments within the southern North Sea in relation to Project One are shown in Figure 4.3 of the Environmental Statement Volume 2, Chapter 4: Marine Mammals.

4.3.197 Although some non-UK offshore wind farms may be within the potential zone of influence for marine mammal receptors, data on these projects are largely unavailable and so these could not be included within a detailed quantitative assessment. In particular, information pertaining to the indicative construction schedules for these projects with which to make a meaningful assessment was unavailable.

In-combination physical injury/behavioural disturbance from underwater noise due to construction piling and cable installation, vessel noise during construction, operation and maintenance and decommissioning and removal of turbines/cables activities

4.3.198 The main source of an in-combination increase in subsea noise is pile driving activity during construction of offshore developments. There is no Tier 1 assessment for in-combination piling noise because as there are no offshore wind farm projects which are currently under construction and are anticipated to overlap with the construction phase, and therefore piling activity at Project One (see Table 4.5). For the Tier 2 assessment, there may be overlap in the construction phases of several Round 2 and Round 3 offshore wind farms that are within the southern North Sea marine mammal study area and include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B and East Anglia One which are all within 160 km of Project One. Consequently, these projects have the most potential for an in-combination impact since noise effects may occur in adjacent areas or even overlap.

4.3.199 Construction dates may also coincide with offshore wind farm projects further afield, including Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Firth of Forth (Project Alpha and Project Bravo), Beatrice and the Aberdeen European Offshore Wind Deployment Centre, which are over 300 km from Project One. Whilst the focus of the in-combination assessment on marine mammals is on projects that have the most potential for in-combination effects (i.e., those in the southern North Sea marine mammal study area), this particular assessment also considers a broader perspective by looking at projects in the North Sea as a whole.

4.3.200 There may be overlap in construction with Tier 3 projects including East Anglia Three and Four, and Dogger Bank Teesside (see Table 4.5). However, based on consideration of data confidence, these are excluded from the in-combination assessment. Tier 3 projects therefore include all the projects listed above in paragraph 4.3.198 for the Tier 2 assessment plus Hornsea Project Two and Tetney Sea-line Replacement.

4.3.201 Installation of the Cygnus oil and gas platform (a Tier 2 project) and the Project One offshore HVAC reactive compensation substation represent single installation events of extremely short duration (i.e., hours to days) compared to the extended periods over which offshore wind farm construction would be expected to occur (i.e., years) and therefore these are not considered further in the in-combination assessment.

4.3.202 Potential in-combination LSEs due to underwater noise during the construction, operation and maintenance and decommissioning phases of Project One have been screened in for those Projects identified in Table 4.5.

In-combination changes to prey species availability and vessel collision

4.3.203 The scale over which some effects are considered depends largely on scale in relation to the reference population. For example, screened in effects such as increases in vessel traffic and changes to prey resources have been assessed within a representative 50 km buffer of Project One (i.e., focussing the assessment on a discrete area of the southern North Sea.

4.3.204 As discussed in paragraph 4.3.21 *et seq.*, potential vessel collision and changes to prey species distribution and/or abundance were identified as having the potential for LSEs due to Project One alone, and these impacts and those projects within 50 km of Project One (Table 4.5) have therefore been screened into the in-combination assessment.

In-combination summary

4.3.205 Based on the results of the screening assessment (see paragraphs 4.3.92 *et seq.*) and projects/plans considered in the in-combination assessment (see Table 4.5), potential LSEs were identified for SAC/SCI qualifying marine mammal species due to in-combination impacts with Project One (Table 4.7), and have been considered further in Section 5.3.

Table 4.7 UK and non-UK SAC/SCIs with potential for in-combination LSEs with Project One for marine mammals.

Species	Natura 2000 Site Name	Potential impact
Grey seal (*Halichoerus grypus*)	Humber Estuary SAC (UK) Berwickshire and North Northumberland Coast SAC (UK) Doggersbank pSCI (Netherlands) Klaverbank pSCI (Netherlands)	Physical injury and/or behavioural disturbance (noise during construction, operation/maintenance and decommissioning) Physical injury from increased risk of vessel collision Indirect effect due to change in prey species availability
Harbour seal (*Phoca vitulina*)	The Wash and North Norfolk Coast SAC (UK) Doggerbank SCI (Germany) Doggersbank pSCI (Netherlands) Klaverbank pSCI (Netherlands)	
Harbour porpoise (*Phocoena phocoena*)	SBZ 1 / ZPS 1 (Belgium) SBZ 2 / ZPS 2 (Belgium) SBZ 3 / ZPS 3 (Belgium) Vlakte van de Raan pSCI (Belgium) NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany) Doggerbank SCI (Germany) Östliche Deutsche SCI (Germany) Sylter Außenriff SCI (Germany) Steingrund SCI (Germany) Helgoland mit Helgoländer Felssockel SCI (Germany) Hamburgisches Wattenmeer SCI (Germany) Unterelbe SCI (Germany) Borkum-Riffgrund SAC (Germany) Nationalpark Niedersächsisches Wattenmeer SCI (Germany) Gule Rev SAC (Denmark) Sydlige Nordsø SAC (Denmark) Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France) Bancs des Flandres pSCI (France) Recifs Gris-nez Blanc-nez pSCI (France) Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France) Baie de canche et couloir des trois estuaries pSCI (France) Doggersbank pSCI (Netherlands) Klaverbank pSCI (Netherlands) Vlakte van de Raan SAC (Netherlands) Noordzeekustzone SAC (Netherlands) Noordzeekustzone II pSCI (Netherlands)	

<u>SPA Features</u>

4.3.206 The in-combination assessment considers only those sites and qualifying features for which a LSE has been concluded for Project One alone, since it is considered that the approach in Annex A is a suitably coarse filter to include those features that may present a LSE in-combination with other sites, where Project One may contribute a non-trivial level of impact. Where the impact is clearly trivial for Project One, then an in-combination assessment is not considered necessary. This procedure was discussed with Natural England and JNCC at a consultation meeting on 19 March 2013.

4.3.207 For the bird in-combination assessment, Scroby Sands has been operational since 2004 and so its effects on migratory birds are considered to be incorporated into the baseline survey results for Project One from 2010 to 2012. Because it has been operational over a long period, the data contained in its environmental impact assessment would be of low confidence, particularly since survey and assessment methods have evolved considerably. As a small site, its impact is expected to be negligible. This is also considered to be the case for the two-turbine Beatrice Demonstrator site in the Moray Firth, which has been operational since 2008, and the two-turbine Blyth Wind Farm, Northumberland, operational since 2000. These sites are therefore excluded from the in-combination assessment.

Data presentation and interpretation of other project data for ornithological in-combination effects

4.3.208 Owing to the evolution of the methods used to determine impacts of offshore wind farm projects on birds in the UK over the last decade, there is considerable variation in style and detail of presentation of results and subsequent assessment in other projects' Environmental Statements and Technical Reports. In many cases, particularly with the older, smaller Round 1 and 2 projects, no attempt has been made to apportion predicted impacts between seasons, or between regional breeders and non-regional breeders for example. Instead the total annual impact (e.g., collision mortality, if this has been estimated) has been assessed against an undetermined population, or a defined breeding population, as a 'worst-case' scenario, which would likely overestimate actual impacts on (e.g. regional breeding populations), if it is assumed all deaths are to this population.

4.3.209 For some impacts, particularly disturbance-displacement related, often only a qualitative assessment was deemed sufficient, and there is no reference to displacement rates and/or mortality rates particular to that project.

4.3.210 It has therefore been concluded that if relevant, and directly applicable data for any given species and from any given project are not included within the application documentation published for that project, then there will be no attempt to produce, apportion or reinterpret data for that site.

4.3.211 Whilst this may lead to an incomplete quantitative assessment, other projects have been considered in a qualitative manner, acknowledging that they may contribute to an in-combination impact.

4.3.212 It should be recognised that some projects are currently within the application process (e.g., Dogger Bank Creyke Beck A and B, East Anglia One, Seagreen Alpha/Bravo), and are known to be refining their predicted estimates of impacts during ongoing consultations. These projects should therefore be seen as having lower data confidence than would otherwise be the case.

4.3.213 The scope of projects for inclusion in the quantitative or qualitative in-combination ornithological assessment is presented in (Table 4.8).

Table 4.8 Scope of projects where data can be quantitatively or qualitatively included in ornithology in-combination collision risk and displacement assessments

Tier	Offshore Wind Farm	Collision Risk Assumptions and Conclusions in ES Impact Assessment	Operational Displacement Assumptions and conclusions in ES Impact Assessment	Level of inclusion in Project One In-combination assessment for Collision Risk	Level of inclusion in Project One In-combination assessment for Displacement
1	Lynn and Inner Dowsing	Usage of Band (2000) model to estimate annual mortality (gannet only Project One receptor considered). Avoidance rate of 99.98% based upon collision rate of 0.01-0.02% for passerine migrants (Winkelman, 1992a). Very low annual mortality rates predicted so no further assessment was conducted and no significant effects predicted.	Disturbance to breeding and migratory birds considered separately, but in both cases only a qualitative approach was used.	Annual Mortality only **Qualitative**	**Qualitative**
	Thanet	Use of Band (2000) model to create annual mortality rate based on a 99% avoidance rate. No further assessment on regional etc. mortality.	Qualitative approach. No reference to mortality as a result of displacement.	**Quantitative** (for gannet and great black-backed gull only)	**Qualitative**
	Gunfleet sands I, II and III	Qualitative approach only due to low numbers of each species recorded.	Qualitative approach. No reference to mortality as a result of displacement.	No quantitative approach **Qualitative**	**Qualitative**
	Kentish Flats	Common tern and guillemot only Project One VORs considered. Qualitative approach only.	Common tern and guillemot only Project One VORs considered. Qualitative approach only.	No quantitative approach **Qualitative**	**Qualitative**
	Egmond aan Zee	Report on flight activity predicts annual mortality rates at wind farm using Band model (Krijgsveld *et al.,* 2011). This is however mainly at a species group level and does not determine seasonal distribution or regional impacts.	No data available.	Annual mortality at species group level **Quantitative** (for gannet only)	**Qualitative**
	Greater Gabbard	Lesser black-backed gull and great skua the only Project One VORs considered. Only mean monthly mortality rates presented for these species (at 99.82% avoidance rate), with no regional apportioning. Qualitative assessment for other species.	Qualitative approach based on population estimates. No reference to resulting mortality.	Mean monthly mortality rates **Quantitative (lesser black-backed gull and great skua only)**	**Qualitative**
	Lincs	Use of Band (2000) model. Predicted collisions on regional populations which equate to the Greater Wash aerial survey sectors (95% avoidance used). No breakdown into seasons.	Qualitative approach. No reference to mortality as a result of displacement.	Annual Mortality only **Qualitative**	**Qualitative**

Tier	Offshore Wind Farm	Collision Risk Assumptions and Conclusions in ES Impact Assessment	Operational Displacement Assumptions and conclusions in ES Impact Assessment	Level of inclusion in Project One In-combination assessment for Collision Risk	Level of inclusion in Project One In-combination assessment for Displacement
	London Array Phase I	No annual mortality estimates presented - instead a threshold avoidance rate that is predicted to give significant effect.	The approach considers peak population estimates within wind farm and 1 km buffer and assigns a worst-case mortality rate of 100%, i.e. that all displaced birds will be effectively lost from the population. No determination of seasonal distribution or regional impacts.	No mortality rates **Qualitative**	**Qualitative**
	Sheringham Shoal	Estimation of annual mortality on regional (Greater Wash) populations using the Band (2000) model and 98% avoidance. No breakdown into seasons.	Qualitative based on % of birds feeding and importance of habitat	Annual Mortality only **Qualitative**	**Qualitative**
	Teesside	99.62% avoidance rate used. All deaths assumed to be on one population - but not clear from the text whether this is a regional or SPA population for each species. No apportioning to seasons.	Qualitative assessment - worst case would be complete displacement but this was considered unrealistic. No link to mortality mentioned.	Annual Mortality only **Qualitative**	**Qualitative**
	Humber Gateway	Annual mortality rate and 98% avoidance rate used. Estimates taken from Triton Knoll Appropriate Assessment.	Qualitative assessment in Triton Knoll Environmental Statement based on proportion of regional population found within site and proportion that were foraging.	**Quantitative** (for gannet and kittiwake only)	**Qualitative**
2	Race Bank	For most species, assessment against regional population using estimated annual mortality rates and initially a 95% avoidance rate. No seasonal breakdown. For gannet, fulmar and lesser black-backed gull the impact of predicted collisions over background mortality on the estimated passage population deemed likely to pass through the Wash on passage was thought to be more appropriate. Various avoidance rates considered, no apportioning to seasons or non-regional birds.	Qualitative approach.	Annual Mortality only **Qualitative**	**Qualitative**
	Moray Firth Project One (MORL)	Different avoidance rates used for each species group - from 98.5 to 99.5%. Presentation of breeding and non-breeding mortality at 99.5% avoidance rate for each key species	Failure rates for breeding rather than any mortality assumed - numbers displaced are presented (worst-case and 'realistic' case), but no mortality. Apportioning did not consider Flamborough Head and Bempton Cliffs SPA.	**Quantitative** (non-breeding season mortality rate only)	**Qualitative**
	Dogger Creyke Beck - Projects A and B	Mean annual avoidance rate obtained from Band (2012) model Option 3 is broken down into SPA mortality during the breeding and non-breeding periods, and proportion of adults. 98% avoidance rate used.	Matrix approach using 2010 and 2011 population estimates to derive a species-specific mortality rate from a chosen displacement rate and 2 km buffer.	**Quantitative** for breeding and non-breeding seasons	**Quantitative** Assessment:

Tier	Offshore Wind Farm	Collision Risk Assumptions and Conclusions in ES Impact Assessment	Operational Displacement Assumptions and conclusions in ES Impact Assessment	Level of inclusion in Project One In-combination assessment for Collision Risk	Level of inclusion in Project One In-combination assessment for Displacement
	East Anglia One	Mean annual avoidance rate obtained from Band (2012) model is broken down into regional mortality during the breeding and non-breeding periods. 98% avoidance rate used.	Qualitative assessment only - 100% displacement to peak population estimates mentioned in some cases but no reference to resulting mortality levels - assumption that birds will be displaced to surrounding region (effectively zero mortality).	**Quantitative** for breeding and non-breeding seasons	**Qualitative**
	Dudgeon	Annual mortality at a range of avoidance rates. Compared to local/regional and east coast annual mortality rates for some species. No regional or seasonal breakdown.	Qualitative approach. No reference to mortality as a result of displacement.	Annual Mortality only **Qualitative**	**Qualitative**
	Triton Knoll	Annual mortality only, but Appropriate Assessment (DECC, 2013) assessed impacts on Flamborough Head and Bempton Cliffs SPA populations of gannet and kittiwake. SoS decision letter (11 July 2013) agreed with the use of 99% avoidance rate for gannet which is used here. For kittiwake, 98% avoidance rate used.	Qualitative approach. No reference to mortality as a result of displacement.	**Qualitative** (gannet and kittiwake SPA population only)	**Qualitative**
	Kentish Flats Extension	Annual mortality presented at a 98% avoidance rate. No breakdown to regions or seasons.	Qualitative approach. No reference to mortality as a result of displacement.	Annual Mortality only **Quantitative** (for gannet and great black-backed gull only)	**Qualitative**
	Beatrice	Band (2011) model estimates of annual and breeding season mortality (99% avoidance). Allows estimates of non-breeding season mortality, although no regional population reference.	Approach consists of estimating radial avoidance around turbines. Numbers displaced are predicted, but results in birds failing to breed rather than mortality.	**Quantitative** (non-breeding season mortality rate only)	**Qualitative**
	Galloper	Annual collision mortality assessed against regional populations. Use of variant of Band *et al.* (2007) model adapted to offshore survey data	Qualitative assessment on regional populations.	**Quantitative** (for gannet and great black-backed gull only)	**Qualitative**
	London Array Phase II	As London Array Phase 1	As London Array Phase 1.	No mortality rates **Qualitative**	**Qualitative**
	Westernmost Rough	Annual mortality rate at 95% avoidance. No apportioning to season or regional populations.	Qualitative approach. No reference to mortality as a result of displacement.	Annual Mortality only **Qualitative**	**Qualitative**

Tier	Offshore Wind Farm	Collision Risk Assumptions and Conclusions in ES Impact Assessment	Operational Displacement Assumptions and conclusions in ES Impact Assessment	Level of inclusion in Project One In-combination assessment for Collision Risk	Level of inclusion in Project One In-combination assessment for Displacement
	Aberdeen European Offshore Wind Deployment Centre	For some VORs a 98% avoidance rate is used. Separated into breeding/non-breeding season mortality and apportioned to SPAs.	Qualitative approach for most VORs. Matrix approach for auks was assessed up to 100% mortality and 50% displacement. Range of mortality apportioned to SPAs but no seasonality.	**Quantitative** (non-breeding season mortality rate only)	**Quantitative** (non-breeding season mortality rate only)
	Seagreen Alpha	Separation of annual mortality rate into breeding season, and those from designated sites within mean maximum foraging range. 98% avoidance rate assumed for all species.	Matrix approach based on % of wind farm site lost around turbines. 1% mortality rate used to estimate proportion of population affected. No actual mortality rates presented. No consideration of Flamborough Head and Bempton Cliffs SPA.	**Quantitative** (non-breeding season mortality rate only)	**Quantitative** (non-breeding season mortality rate only)
	Seagreen Bravo	Separation of annual mortality rate into breeding season, and those from designated sites within mean maximum foraging range. 98% avoidance rate assumed for all species.	Matrix approach based on % of wind farm site lost around turbines. 1% mortality rate used to estimate proportion of population affected. No actual mortality rates presented. No consideration of Flamborough Head and Bempton Cliffs SPA.	**Quantitative** (non-breeding season mortality rate only)	**Quantitative** (non-breeding season mortality rate only)
	Neart na Gaoithe	Collision mortality broken down into seasons and regional population in Environmental Statement chapter and months in Technical Appendix. Species-specific avoidance rates used.	Assessment based on relative importance of site from mean population estimates, in relation to regional numbers potentially present. No reference to mortality rates as a result of displacement - assumed that birds will forage elsewhere.	**Quantitative** (non-breeding season mortality rate only)	**Qualitative** Assessment
3	Hornsea Project Two	Same assumptions as Project One regarding regional breeding populations and non-breeding season populations.	Same assumptions as Project One - species-specific and season-specific displacement rates.	**Quantitative** Assessment	**Quantitative** Assessment

In-combination Collision Mortality

4.3.214 In order to assess potential in-combination impacts arising from collision, results from collision risk modelling have been used. Data from Project One is based on the results from modelling using 332, 3.6 MW turbines. The selection of 332, 3.6 MW turbines is precautionary as results from modelling collision using a larger number of smaller turbines, predicts a higher level of impact compared to a smaller number of larger turbines.

4.3.215 As described above, direct comparison of the collision risks predicted by the wind farms in the wider area is problematic due to the differing assumptions made in the calculations used in the different studies, and the limited amount of species data presented in Environmental Statement chapters (e.g., Maclean *et al.,* 2009). Nevertheless, a combined quantitative and qualitative assessment of the in-combination impacts posed by Project One in conjunction with other projects has been undertaken, based on the information presented in other projects' supporting documentation available to date. The scope of assessment is presented in Table 4.10.

4.3.216 It is possible that migratory birds may pass through a number of projects within the central North Sea each year and so the initial scope of the in-combination for collision mortality has taken into account all relevant projects along the east coast of Britain plus other non-UK projects.

4.3.217 Table 4.10 provides a summary of the collision modelling results of projects included in the Tier 1 to Tier 3 in-combination collision risk assessment for each ornithological receptor that was recorded in sufficient numbers at potential collision height to be included in the Project One collision risk assessment. Due to a lack of compatible project information it has not been possible to undertake a comprehensive quantitative assessment. Suitable data from relevant projects are therefore presented in each species assessment below, and this is considered alongside a qualitative assessment for other projects.

4.3.218 Due to a lack of available information, the Tier 3 level assessment has been restricted to a consideration of Project Two mortality estimates, which were obtained using the 6 km transect Hornsea Zone survey data from years 1 and 2 (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix C). It should however be noted that these results are preliminary and will be subject to change upon completion of Project Two surveys and analysis.

4.3.219 The in-combination impact assessment has been separated into breeding season and non-breeding season mortality, based on relevant reference populations. In-combination impacts of Project One and different projects during the breeding season have been based on mean maximum, or maximum foraging ranges given for each species. For species breeding within foraging range of Project One, each essentially has a main colony within mean maximum foraging range, which can be used to determine the scope of the in-combination impact assessment (i.e., what projects overlap with foraging range), assuming that the vast majority of collisions are on such individuals from that colony.

4.3.220 For the purposes of this HRA, the definition of in-combination effects is the effect of Project One alongside the effect of other developments on a single receptor. Although further mortality will occur during the breeding season due to collisions from birds from other colonies with other projects outside of foraging range (e.g., kittiwakes at Scottish east coast projects), Project One will contribute zero collisions to this as it is outside of foraging range, and so these projects not require inclusion in a breeding season in-combination assessment.

4.3.221 During the non-breeding season birds from a wider geographical area will occur within Project One. Collision risk modelling predicts that for seven species (fulmar, common tern, Arctic tern, guillemot, razorbill, Arctic skua and great skua) low annual collisions are predicted are predicted within the context of reference populations. Apportioning the potential impact from these species across the possible suite of SPAs for which they are qualifying species predicts virtually no impacts per year (see Appendix B for Arctic skua and great skua).

4.3.222 For two species (little gull and common gull) there are little or no data available from other offshore wind farms on predicted collision mortality. It therefore follows that there is no potential for cumulative LSE and therefore, these species are not considered further.

4.3.223 For great-black backed gull the predicted number of collisions of adults per year apportioned across the relevant SPAs is presented in Appendix B. However, the nearest SPA to Project One for which great black-backed gull is a qualifying species is 430 km away and therefore beyond the maximum foraging range for great black-backed gull during the breeding period. During the non-breeding period, great black-backed gulls in northern Britain remain largely within 100 km of their breeding grounds (Wernham *et al.,* 2002) and therefore Project One will not have impact on these sites and therefore no in-combination impact arising from Project One is predicted to occur.

4.3.224 Based on results in Annexes A and B, the only qualifying features of any SPA that will be taken forward to assessment for collision mortality are therefore gannet, kittiwake and herring gull.

In-combination Displacement

4.3.225 In-combination displacement impacts may arise from any and all plans or projects occurring in the North Sea. Disturbance from vessels associated with commerce, fishing, oil and gas, renewables, aggregates and other activities will all cause some level of displacement. However, such displacement is localised and temporary and cannot be quantified. The scale and temporary nature of the displacement impacts are such that any displacement caused from other activities will not be measurable in-combination with Project One.

4.3.226 Existing offshore wind farms may also cause a level of in-combination displacement on a particular SPA population. This is difficult to quantify as birds displaced from one development area may not always be the same as those displaced from another location. However, a predicted total number of birds displaced can be estimated based on applicants' site specific data.

4.3.227 For Project One, the mean peak population estimates were based on the extent of displacement (i.e., buffer zone around the wind farm), which was based references of sensitivity to disturbance summarised in Langston (2010) and Furness and Wade (2012), and in other literature sources. So, as described in Section 5.4 for example, gulls have low sensitivity to disturbance/displacement, and so any displacement impacts will extend no further than the wind farm itself, whereas a moderate vulnerability species such as guillemot will show displacement up to a buffer of 1 km.

4.3.228 The scope of species included in the in-combination displacement section is the same as those assessed in Section 5.4 for Project One alone (i.e., it is not considered that there will be a significant displacement impact on species that are only present within a study area briefly on migration). Project One is beyond maximum foraging range of breeding colonies of migratory species, and so carries a negligible connectivity – hence no in-combination impact is predicted during the breeding season. Birds are unlikely to be present in the Subzone 1 during prolonged periods in winter, and so again the impacts of displacement will be negligible. As a result, Arctic skua, great skua, Arctic tern, common tern and little gull are therefore excluded from the in-combination displacement assessment.

4.3.229 Species for which displacement impact could cause a LSE are the auks (guillemot, razorbill and puffin), the kittiwake and the fulmar. All five species are considered to be potentially impacted by displacement for Project One alone and therefore are subject to an in-combination assessment at the nest stage of the HRA. All other regularly occurring species, (e.g., gulls), do not exhibit any avoidance behaviour at offshore wind farms and therefore no displacement impacts will occur.

In-combination Barrier Effects

4.3.230 No LSEs have been identified to be arising from barrier effects with Project One alone. All the seabirds recorded within Subzone 1 have significantly large foraging ranges during breeding and non-breeding periods (e.g. Wernham *et al*. 2002). Many of the species migrate many thousands of kilometres each year and therefore are capable of flying around or over offshore wind farms should they choose to do so.

4.3.231 The geographical spread of the offshore sites will ensure that it is unlikely that any individual bird will encounter an in-combination barrier effect during migration or passage and no in-combination impacts that will cause a LSE will occur.

In-combination Summary

4.3.232 Based on the results of the screening assessment for SPA bird species (Annexes A and B), and the summary of in-combination effects above, it is judged that only those species for which Project One has already been identified as having a LSE alone will have a LSE in-combination (Table 4.9). For any other qualifying features of any other SPAs, although it is acknowledged that it is possible that an in-combination effect may occur due to the presence of wind farm projects, the proportion of the impact magnitude attributable to Project One will not be significant in comparison with other projects, and so an in-combination assessment is not required.

Table 4.9 Potential in-combination impacts on qualifying bird species at SPA designated sites.

Site	Species
Flamborough Head and Bempton Cliffs	Fulmar (displacement), Gannet (collision and displacement), Kittiwake (collision and displacement), Herring gull (collision), Guillemot (displacement), Razorbill (displacement), Puffin (displacement).
Forth Islands	Gannet (collision and displacement).

4.4 Test of Likely Significant Effect – Humber Assessment

4.4.1 As discussed in Section 1.5, the scope of the Humber assessment on the effects of the Project One export cable landfall and onshore infrastructure focuses on the Humber Estuary EMS (SAC, SPA, Ramsar) and other Natura 2000 sites with potential connectivity to the Humber Estuary (i.e. sites with mobile features which are known to transit through the Humber Estuary; see Figure 4.2). Annex E provides a description of the Humber Estuary EMS, River Derwent SAC, Coquet Island SPA and the Farne Islands SPA and background information on the qualifying features (including extents of qualifying features) and the conservation objectives for these sites. This information has been prepared with appropriate reference to the English Nature (now Natural England) advice on the Humber Estuary European Marine Site, given under Regulation 33(2) of the Conservation (Natural Habitats & c.) Regulations 1994 (English Nature, 2003). Annex E also provides information on the distribution of qualifying features of the Humber Estuary EMS relative to the Project One area as identified through the data sources and site specific surveys summarised in Section 3.2.

4.4.2 As the Project One export cable route corridor was located within the boundary of the Humber Estuary SAC and SPA, with the export cable landfall located at Horseshoe Point (see Figure 4.2) within the SAC and SPA boundary, no initial screening was necessary to determine whether any Natura 2000 sites would be affected by the proposed activities. Instead, a screening assessment was undertaken on the basis of the known presence and distribution of the qualifying features within the Humber Estuary (from both the Humber Estuary SAC, SPA and Ramsar and other Natura 2000 sites with potential connectivity; see Annex E) and the proposed onshore components of Project One to determine whether Project One is likely to result in LSEs on the designated features of European sites.

Effects on Conservation Objectives

4.4.3 The main predicted effect on SAC habitat features relates to temporary habitat loss from cable installation in estuarine habitats (i.e., intertidal and subtidal habitats; see Figure 4.3). The conservation objectives which may be affected by cable installation in the Humber Estuary SAC are as follows:

- Reduction in extent of a number of SAC habitat features (see Table 2.1 for worst case scenarios for temporary habitat loss); and
- Water quality (i.e. resuspension of contaminated sediments and increases in suspended sediment concentrations).

4.4.4 The SAC species attributes which are most likely to be affected relate to disturbance to migrating (in the case of lamprey) or breeding populations (in the case of grey seal) within the SAC. Many of the population attributes associated with lamprey species (e.g. age structure, ammocoete density and spawning activity; see Annex E, Table 1.4) relate to effects on habitats further upstream (including within the River Derwent SAC) and would not be affected by cable laying in the outer estuary. Effects of plume effects from cable installation on adult and juvenile seal are not expected to occur and have therefore been screened out of this assessment (Volume 2, Chapter 4: Marine Mammals). For SAC species features, the population attributes which may be affected by cable installation within the Humber Estuary SAC and the River Derwent SAC (lamprey species only) are as follows:

- Lamprey: River morphology (i.e., potential for artificial barrier effects from suspended sediment plumes and EMF during operational phase);
- Lamprey: Water quality – Increase in suspended solids; and
- Grey seal: Accessibility of SAC for breeding (i.e., behavioural disturbance to adult grey seals during the breeding season).

4.4.5 For SPA features, the population attributes likely to be affected by cable installation in subtidal and intertidal habitats relate primarily to disturbance and displacement of bird populations and effects on habitats on which these rely. The potential for LSE was based on the peak counts recorded within the Horseshoe Point area, which was considered in relation to current SPA population estimates, with a 1% threshold value used as a rough guide. Also considered were the numbers recorded in the wider WeBS sectors, as well as the population trend for the species, so that it was possible that a species with a peak count of <1% at Horseshoe Point could have a LSE, or one with a peak count >1% could not.

4.4.6 SPA qualifying features were largely absent or, if present, were recorded at low abundances along the onshore cable route corridor and in the vicinity of the HVDC converter/HVAC substation (see Annex F and the Environmental Statement Volume 3, Chapter 3: Ecology and Nature Conservation and Volume 6, Annex 6.3.9: Wintering and Migratory Birds Survey). As such, no LSEs were predicted for SPA qualifying features as a result of cable installation in these areas (see paragraph 4.4.10 and Table 4.11 and Table 4.12), as agreed with Natural England during Phase 4 consultation (see Table 1.1). Population attributes likely to be affected by cable installation are as follows:

- Habitat extent: Temporary habitat loss due to cable laying operations (within the intertidal and onshore cable route corridor) and construction of onshore HVDC converter/HVAC substation (see Table 2.1 for worst case scenarios for habitat loss and paragraph 4.4.3 for effects on designated habitats);
- Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying (within the intertidal and onshore cable route corridor) and construction of onshore HVDC converter/HVAC substation (see Table 2.1 for worst case scenarios for area affected by cable installation and duration of works); and

- Indirect effects: Temporary reduction or redistribution of prey species due to disturbance during cable installation, or changes in water quality due to increase in suspended sediments etc. (see paragraph 4.4.3 for effects on designated habitats).

Other SPAs with potential connectivity and potential for LSEs

4.4.7 During consultation NE raised a concern that common tern may be migrating from other SPAs where they are listed features and that the Horseshoe Point area has been identified by NE to be a common tern roost site in late summer, likely coinciding with birds on southward migration.

4.4.8 There are two SPAs further north on the east coast of England which have the greatest likelihood of hosting common terns that may roost in the vicinity of the cable landfall site. While there are other sites further north, these were in excess of 300 km from the Horseshoe Point landfall and therefore not likely to be affected by the works within the Humber Estuary. The two sites considered in the current assessment are the Coquet Island SPA and Farne Islands SPA. Further details of these SPAs and conservation objectives with respect to common tern are provided in Annex F.

Project One screening of likely significant effects

4.4.9 Table 4.10 presents the interest features of the Humber Estuary SAC and Ramsar and the River Derwent SAC and the findings of the screening assessment. The interest features of the Humber Estuary SPA and the Coquet Island and Farne Islands SPAs are presented, with the findings of the screening assessment, in Table 4.11 and Table 4.12 respectively. The categories used to conclude potential for LSE are presented in paragraph 3.2.24.

Construction

4.4.10 As described in Section 2.3, cable laying and construction of a HVDC converter/HVAC substation and the intertidal cable route could result in temporary habitat loss/disturbance, a potential increase in noise and visual disturbance as well as a potential reduction in water quality.

Operation and Maintenance

4.4.11 As discussed in paragraph 2.3.3, cables are to be buried to a maximum depth of up to 3 m, subject to a pre-construction cable burial assessment, with greater burial depths (i.e. 5 m) only expected to be required in the intertidal and subtidal areas in a limited number of places to allow for seasonal changes in seabed levels. These burial depths were informed by data from the EA for Horseshoe Point on shoreline topography over a 20 year period and bathymetric survey data covering a 13 year period (see the Environmental Statement Volume 5, Annex 5.1.7: Landfall Assessment, Section 3.6). Maintenance of cables is not expected as the target burial depths should be adequate to ensure cables are not exposed during the operational phase. Routine inspections of the export cables in the intertidal will be required during the operational phase to confirm the status of the export cables and assess the risk of cables becoming unburied (though exposure of cables is not expected to occur).

4.4.12 As detailed in paragraph 2.3.25, operational, maintenance and emergency access to the intertidal at Horseshoe Point will be gained along the top of the sea defences from Horseshoe Point car park when construction is complete, with suitable protection for vehicle access will be agreed with the EA Disturbance to designated habitats will therefore be minimal and no LSE is predicted as a result of access to the intertidal during the operational phase (see Table 2.1).

4.4.13 As discussed in paragraph 2.4.4, onshore cables will not require frequent or significant maintenance measures to be undertaken and any such activities will likely be limited in frequency and not out of keeping with typical levels of activity on agricultural land.

4.4.14 As such, operational impacts (with the exception of EMF effects on lamprey; see Table 2.1) related to this have been screened out of the assessment.

Decommissioning

4.4.15 To minimise environmental disturbance at the export cable landfall site during decommissioning, the cables will remain buried with the cable ends cut, sealed and securely buried as a precautionary measure. Similarly, the onshore cable route corridor will be left in place in the ground with the cable ends cut at the onshore substation. As detailed in the Environmental Statement Volume 1, Chapter 3: Project Description, the case for decommissioning the onshore substation in the event of the wind farm being decommissioned will be reviewed in discussion with the transmission system operator and the regulator in the light of any other existing or proposed future use of the onshore substation.

Figure 4.2 Location of the onshore cable route for Project One and sites potentially affected by cable laying in the Humber Estuary.

Figure 4.3 Humber Estuary SAC habitat features at Horseshoe Point.

Table 4.10 Screening matrix of the potential effects on the qualifying features of the Humber Estuary SAC and Ramsar and River Derwent SAC (lamprey only).

Qualifying Feature	Potential Effects	LSE
Estuaries Mudflats and sandflats not covered by seawater at low tide; *Salicornia* and other annuals colonising mud and sand.	<u>Humber Estuary SAC and Ramsar</u> Extent: Temporary habitat loss during cable laying operations in the intertidal. Water quality: Temporary increase in suspended sediments, resuspension of sediment bound contaminants and smothering during cable laying.	LSE as these habitats occur at the Horseshoe Point landfall site and are likely to be directly affected by the proposed works (see Figure 4.3 and Annex E for details of habitat extents and locations of qualifying habitats relative to Project One).
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`).	<u>Humber Estuary SAC and Ramsar</u> Extent: Temporary habitat loss/disturbance during cable laying operations in the intertidal.	Potential for LSE as these habitats occur at the Horseshoe Point landfall site, though may not be directly affected by the proposed works (see Figure 4.3 and Annex E for details of habitat extents and locations of qualifying habitats relative to Project One).
Estuaries Mudflats and sandflats not covered by seawater at low tide; *Salicornia* and other annuals colonising mud and sand ; Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`).	<u>Humber Estuary SAC and Ramsar</u> Extent: Temporary habitat disturbance due to access to the intertidal during the operational phase for routine inspections of export cables in the intertidal.	No LSE as a result of access during the operational phase as access to the intertidal will be gained along a permitted access route and will result in minimal disturbance to qualifying features.
Sandbanks which are slightly covered by sea water all the time; Dunes with *Hippophae rhamnoides* ; Fixed dunes with herbaceous vegetation ('grey dunes'); Coastal lagoons; Standing open water and canals.	<u>Humber Estuary SAC and Ramsar</u> No predicted effects due to distance between cable route and qualifying feature (i.e., sandbanks and dune habitats) and the use of HDD to avoid qualifying features (i.e., coastal lagoons).	No LSE as, although some of these habitats occur at the Horseshoe Point landfall site, these will not be affected by cable laying operations (see Figure 4.3 and Annex E for details of habitat extents and locations of qualifying habitats relative to Project One).
Sea lamprey *Petromyzon marinus;* River lamprey *Lampetra fluviatilis.*	<u>Humber Estuary SAC and Ramsar and River Derwent SAC</u> Lamprey – Water quality: Temporary increase in suspended sediments during cable laying in the intertidal. Lamprey – River morphology: Disruption of migratory pathways, or creation of artificial barriers during cable laying operations and operational phase (i.e., EMF).	Potential for LSE as these species may occur in the vicinity of the cable laying operations.
Grey seal *Halichoerus grypus.*	<u>Humber Estuary SAC and Ramsar</u> Grey seal – Accessibility of SAC for breeding: Disturbance to grey seal due to underwater noise and collision risk between cable installation vessels and adult seals.	Potential for LSE as this species may occur in the vicinity of the cable laying operations.
Natterjack toad *Bufo calamita.*	<u>Humber Estuary Ramsar</u> No predicted effects due to likely absence of this species from the cable route.	No LSE, as breeding ponds and appropriate terrestrial habitats do not occur in the vicinity of Horseshoe Point or the onshore cable route.

Table 4.11 Screening matrix of the potential effects on the qualifying features of the Humber Estuary SPA.

Qualifying Feature	Potential Effects	LSEs
Bittern	Breeding and wintering: Habitat extent: Temporary habitat loss due to cable laying operations and construction of HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE as no bitterns were recorded during surveys. Habitat surrounding cable landfall, onshore cable route corridor and onshore HVDC converter/HVAC substation is unsuitable for this species.
Marsh harrier	Breeding: Habitat extent: Temporary habitat loss due to cable laying operations and construction of HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation.	No LSE as cable landfall area is unsuitable breeding habitat for this species. Recorded single individuals are probably passage or wandering individuals and area is of little importance to SPA population. No LSE for onshore cable route corridor and onshore HVDC converter/HVAC substation as there was no evidence of feeding or roosting during surveys.
Avocet	Breeding and wintering: Habitat extent: Temporary habitat loss due to cable laying operations and construction of HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE as this species is largely absent from the Horseshoe Point landfall site due to unsuitable habitat (peak of 0.3% of current SPA population). No LSE for onshore cable route corridor or onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Little tern	Breeding: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE as this species no longer breeds in the vicinity of Horseshoe Point landfall site, with the small number of individuals recorded during WeBS counts only likely to be loafing or feeding offshore away from the nearest colonies. No LSE for onshore cable route corridor or onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Hen harrier	Wintering: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation.	No LSE as the sandy substrate at Horseshoe Point is unsuitable for foraging hen harrier, although with occasional individuals recorded during baseline surveys, the area may form a minor part of the wintering range of the SPA population. Birds disperse from roost sites during daylight hours so are unlikely to be affected by activities. No LSE for onshore cable route corridor or onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.

Qualifying Feature	Potential Effects	LSEs
Bar-tailed godwit	Wintering and on passage: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species is known to roost near the cable landfall site in numbers that are potentially significant in the context of the SPA population (up to 13% of current SPA value, although numbers appear to be highly variable between and within years). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Golden plover	Wintering: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species was found near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<16% of current value), despite considerable growth since the citation figure. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Ruff	On passage: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE as the species is found predominantly on the north estuary, and only a small number of individuals (peak count of 3) have been recorded briefly within the cable landfall site area on passage or over winter. Not significant within the context of the SPA population. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Dunlin	Over winter and on passage: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species was found near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<10%), particularly since there is evidence of decline since the citation figure. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Knot	Over winter and on passage: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species was found near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<7.8% of passage citation), despite growth since the citation figure. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.

Qualifying Feature	Potential Effects	LSEs
Black-tailed godwit	Over winter and on passage: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE as very small peak numbers within the context of cited and current SPA populations, during all surveys, were recorded in the vicinity of the cable landfall site, indicating that the area is of unsuitable habitat and little significance to this species at an SPA level. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Shelduck	Over winter: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species as numbers are increasing within the SPA and peak counts suggest that the population within the potential zone of influence of the cable landfall site is insignificant (<1%) compared to the cited SPA population, and that the habitat is unsuitable. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Redshank	Over winter and on passage: Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE. Although peak numbers in the area of the cable landfall site are relatively low compared to the overall SPA passage and wintering populations (<2%), the species has undergone a recent decline in numbers, and so significant effects cannot be ruled out at this stage. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Teal	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species, as low numbers recorded during surveys suggest that the area of the cable landfall site is of little importance in the context of the SPA (<0.2% of population) and the habitat is unsuitable. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Wigeon	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species. Wigeon are distributed widely across the whole estuary, and despite an apparent decrease in overall numbers, the area around the cable landfall site appears to be of little importance within the context of the SPA population (<0.3%), and the habitat is unsuitable. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.

Qualifying Feature	Potential Effects	LSEs
Mallard	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species. Mallard are distributed widely across the whole estuary, and despite an apparent sharp decline in overall numbers, the area around the cable landfall site appears to be an unfavoured habitat and of little importance within the context of the SPA population (<0.1%). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Turnstone	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE. WeBS surveys generally recorded low numbers, although recent surveys in the vicinity of the cable landfall site recorded higher numbers in late October. This however appeared to be a brief occurrence, as numbers were very low during the remainder of the survey period and habitat is generally unsuitable as the species prefers more rocky shorelines. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Pochard	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species as no individuals were recorded during surveys in the area of the cable landfall site. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Greater scaup	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species as no individuals were recorded during surveys in the area of the cable landfall site. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Dark-bellied brent goose	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species was found near the cable landfall site in numbers that are potentially significant (<18% of current SPA population) in the context of the cited SPA population (although there has been a large growth in SPA population since). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.

Qualifying Feature	Potential Effects	LSEs
Goldeneye	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species as no individuals were recorded during surveys in the area of the cable landfall site. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Sanderling	Over winter and on passage (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species was found roosting near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<15% of current SPA population). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Ringed plover	Over winter and on passage (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE. The species was recorded in high numbers on passage and possibly over winter, (<4.8% of current SPA population) and although the SPA population appears to have stabilised over the recent past, a significant effect cannot be ruled out at this stage. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Oystercatcher	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE. The species was recorded in very high numbers within the context of the SPA population (<91% of current population). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Curlew	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species. The cable landfall site is not within a recognised key feeding or roosting area within the SPA, and in general peak numbers found close to this site are unlikely to be important in the context of the SPA population (<1.7% of current population recorded within the Horseshoe Point survey area). Onshore cable route corridor and the onshore the onshore substation habitats outside of the SPA do not appear to provide significant functional support for curlew (i.e., not important as an important feeding or roost site).

Qualifying Feature	Potential Effects	LSEs
Whimbrel	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species, as peak counts were very low during all surveys, with a peak of four birds during low tide counts in the vicinity of the cable landfall site. Only recorded on one occasion near to the onshore HVDC converter/HVAC substation site.
Grey plover	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE. Although SPA numbers appear to have increased since the citation date, peak survey counts during brief passage periods were relatively high (<31% of current SPA population) and distributed throughout the Horseshoe Point survey area, and so a LSE cannot be discounted. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Greenshank	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE for this species. Although up to seven individuals were recorded near the cable landfall site in late August and September, these were the only surveys where this species was recorded. Birds are therefore likely only to be briefly on-site during passage periods. No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.
Lapwing	Over winter (assemblage): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	No LSE. Although the wider Grainthorpe area (to the south) appears to hold significant numbers, evidence from surveys at Horseshoe Point suggests that closer to the cable landfall site, numbers are much lower and unlikely to be important within the context of the SPA population (<1.9% of current SPA population). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.

Table 4.12 Screening matrix of the potential effects on the qualifying features of the Coquet Island and Farne Islands SPAs.

Qualifying Feature	Potential Effects	LSEs
Common tern	Breeding (Coquet Island and Farne Islands): Habitat extent: Temporary habitat loss due to cable laying operations and construction of the onshore HVDC converter/HVAC substation. Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of the onshore HVDC converter/HVAC substation. Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Potential for LSE as the species was found roosting on passage near the cable landfall site in numbers that are potentially significant in the context of the two SPA populations (i.e., Coquet Island and Farne Islands SPAs). No LSE for onshore cable route corridor or the onshore HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas.

In-combination Screening of Likely Significant Effects

4.4.16 The approach to the in-combination assessment is described in paragraph 3.2.26 *et seq*., though this was informed by the onshore cumulative impact assessment (CIA). For the onshore EIA, the CIA follows the advice given in Version 2 of the PINS' Advice Note Nine: Rochdale Envelope (April 2012) for NSIPs. Full details of the approach taken to the onshore CIA are presented in the Environmental Statement Volume 1, Chapter 5: Environmental Impact Assessment Methods, paragraphs 5.3.30 to 5.3.43. Projects and plans were screened on the basis of a 5 km buffer around the cable route corridor and a 15 km buffer around the onshore HVDC converter station/HVAC substation, depending on the EIA topic being considered. The study area for the Humber in-combination assessment was 15 km from the proposed development as this was considered to be adequately precautionary for consideration of projects in the middle to lower Humber Estuary with the projects within this range having the potential to affect the same SPA and SAC features in-combination with Project One. Where detailed project information was not available for particular projects, these projects were deemed to have too low data confidence to carry out a meaningful assessment and therefore were not included in the in-combination assessment. The in-combination assessment for the HRA was also informed by consultation with Natural England who highlighted a number of projects to be considered in the in-combination assessment (see Table 1.1).

4.4.17 Table 4.13 presents the potential in-combination LSE assessment results of Hornsea Project One with the other projects in the search area shown on Figure 5.1. The projects which had the potential to affect features of the Humber Estuary SAC, SPA and Ramsar site (and species from other SACs/SPAs transiting through it) are listed below (for a full list of the projects considered see the Environmental Statement Volume 1, Chapter 5: Environmental Impact Assessment Methods and Volume 5, Annex 4.5.1: Ornithology Technical Report). All other projects considered in the onshore CIA were not predicted to have any effects on designated features of the Humber Estuary EMS. Projects considered in the in-combination assessment were as follows (for more details, see below, Table 4.13 and Figure 4.4):

- The Tetney to Saltfleet Tidal Flood Defence Scheme;
- The Phillips 66 Tetney sea line replacement project;
- Land at Bishopthorpe Farm Newton Marsh Wind Farm Extension;
- Combined Heat and Power (CHP) plant at Energy Park Way;
- CHP Plant at Lenzing Fibres, Moody Lane, Healing;
- Bioethanol production facility at Moody Lane, Great Cotes;
- Bioethanol plant, Hobson Way, Stallingborough;
- Ten wind turbines on land west of Brigg Road, Horkstow;
- Wind turbine on land north of A180/A1173, Stallingborough;
- National Grid: Proposed Substation Extension;
- Hornsea Project Two export cable route.
- The Able Marine Energy Park (AMEP) development;
- C. GEN North Killingholme Power Plant;
- Able Humber Ports Northern Area;
- Port of Hull Local Development Order (LDO);
- LDO for land west of Paull Road, Paull;
- Three wind turbines on land north of Far Marsh Farm, Ottringham;
- Grimsby Docks Flood Risk Management Scheme;
- Green Port Hull; and
- Recreational and non-construction activities.

Tetney to Saltfleet Tidal Flood Defence Scheme

4.4.18 An application was approved in July 2011. Construction has commenced but the anticipated duration is not known.

4.4.19 Over the Tetney to Grainthorpe section of the scheme that includes the cable landfall site, plans are only shown to raise embankment defence by approximately 0.3 m. On other sections of the scheme to the south, old tidal defences are to be removed, changing land use from agriculture to wildlife habitat.

4.4.20 The work in the vicinity of Horseshoe Point is currently underway and will be completed in late 2012 or early 2013 and therefore prior to the construction of Project One. As a result, there is no potential for in-combination effects on SPA features due to disturbance, though there is potential for an in-combination LSE as a result of loss of Annex I habitats and the SPA features on which these rely.

Phillips 66 Tetney Sea Line Replacement Project

4.4.21 The Phillips 66 Tetney sea line replacement project (located approximately 1.6 km to the north of Horseshoe Point) involves a section of the submarine sea line which runs from the Tetney Oil Terminal to offshore in the Humber Estuary. The work is likely to affect many of the same intertidal features of the Humber Estuary SAC and SPA as Hornsea Project One, although since this project is at an early stage, there is not sufficient information currently available to accurately quantify the risks relating to extent, duration or timing of such works. As a precaution therefore, an in-combination LSE cannot be ruled out for qualifying SAC and SPA features.

Land at Bishopthorpe Farm Newton Marsh Wind Farm Extension

4.4.22 An application is under consideration by East Lindsey Council for this eight turbine wind farm, located approximately 5 km northwest of the Project One convergence zone, and 0.6 km of the intertidal area at Tetney. As all works are anticipated to take place well outside of the Humber Estuary SAC, no in-combination LSE are predicted on SAC habitats or species.

4.4.23 A series of ornithological surveys were carried out from 2009 to 2012 (Arcus, 2012). Those SPA qualifying species which recorded on more than one occasion both during surveys at Bishopthorpe Farm and at Horseshoe Point (for Project One) were golden plover, redshank and shelduck (though these were all recorded infrequently). The assemblage species mallard, dark-bellied brent goose, teal, curlew, oystercatcher and lapwing; and rarely: wigeon and whimbrel were also recorded. A maximum count of 1,000 golden plover, 654 brent geese, and 895 lapwing were recorded in November 2011 within the buffer area of the wind farm, but numbers for other species were in single figures, and generally very low during summer.

4.4.24 Construction of the wind farm is expected to take approximately 9-12 months, although disturbance activities were assessed as being of negligible magnitude and not significant for each key species. It was not proposed to mitigate disturbance on site by limiting construction activities during winter because the baseline condition is one that includes frequent disturbance to brent geese to prevent crop damage. However mitigation measures included a large section of the site boundary (within 600 m of the Humber Estuary SPA) being scoped-out of potential development due to potential significant effects to birds associated with the SPA (identified as a key foraging/roosting resource). Direct in-combination disturbance to the same individuals is therefore unlikely, although due to large numbers recorded in winter months an in-combination LSE cannot be ruled out for some SPA features at this stage.

National Grid: Proposed Substation Extension

4.4.25 In order to accommodate the likely generation of power from Project One, National Grid are currently extending the substation at Killingholme. It is likely that this work will be completed prior to the construction of Project One, and so no in-combination LSE with Hornsea Project One is therefore predicted.

Hornsea Offshore Wind Farm - Project Two

4.4.26 Project Two within the Hornsea Round 3 Zone is likely to be of similar specification to Project One. It is also assumed that Project Two will use an adjacent cable corridor, with a second convergence corridor adjacent to Project One. A Scoping Report for Project Two was submitted in October 2012 (SMart Wind, 2012d), but the detailed implementation programme, extent and likely effects for Project Two has not yet been confirmed, although they are likely to be similar to those of Project One, with the potential for cable laying associated with these projects to occur simultaneously or separately to Project One. At this stage it is assumed that Project Two will affect a similar area as Project One. Therefore a potential in-combination LSE is predicted to occur with Project One and Project Two for all SAC and SPA features assessed.

Able Marine Energy Park (AMEP)

4.4.27 The application for this project, located at Killingholme Marshes, was lodged to PINS. The examination phase closed in December 2012 and the Examining Authority has issued its recommendation to the Secretary of State (decision to be made in July 2013). This project includes reclamation of habitat from the Humber Estuary, with LSEs identified on Annex I qualifying habitats and Annex II qualifying species and on SPA qualifying features with a reduction in feeding or roosting areas. The Appropriate Assessment concluded adverse effects on Annex I habitat features and SPA qualifying features as a result of long term loss of intertidal and subtidal habitats and functional loss of habitats used by SPA qualifying species. As such, compensatory habitats will be created as part of this development. Construction is due to start in 2013 and last 24 months. Construction overlap with the cable landfall activities is therefore a possibility.

4.4.28 There are potential in-combination effects on SAC habitat features (i.e., loss of Annex I habitats), SAC species features (i.e., disturbance to migrating lamprey) and SPA species as a result of Project One and the development works at AMEP, particularly due to noise associated with piling operations and displacement from intertidal habitat. An LSE is therefore predicted to occur as a result of in-combination effects with this project. No effects were predicted on grey seals from the AMEP development and therefore no in-combination LSE is predicted for this feature.

C. GEN North Killingholme New Power Station

4.4.29 An application was submitted in March 2013. Construction is indicated to take 36 months to complete. Although details of the construction commencement date have yet to be identified, this is likely to be after 2015.

4.4.30 LSEs on the Humber Estuary SAC were predicted as a result of construction and operation of the power station, including temporary disturbance of intertidal and subtidal habitats, contaminant deposition and pollution (including dust) during construction and thermal and water quality impacts from cooling water discharge and impacts on migratory fish from cooling water intake during operation. Measures to avoid construction related impacts included the implementation of a Construction Environment Management Plan (CEMP) to ensure that no contaminants are released into the SAC and to minimise dust release and deposition (e.g. through the use of dedicated dust minimisation measures). During operation, the design and operation of the cooling water intake will be subject to a range of controls including operating within the Environmental Permitting Regulations 2010, and compliance with Environment Agency best practice regulations in respect of migratory fish. These measures will ensure that no adverse effects occur on the Humber Estuary SAC and therefore no in-combination LSE is predicted for the Humber Estuary SAC (Parsons Brinckerhoff, 2013).

4.4.31 LSEs on the Humber Estuary SPA as a result of construction of this project included disturbance to intertidal habitats, disturbance to SPA species as a result of noise, vibration, lighting and movement of vehicles and humans and contaminant release and pollution (including dust). Adverse effects were, however, not predicted as a result of construction operations due to mitigation measures being employed including piling restrictions to avoid sensitive periods and screening of the construction site to minimise visual and noise disturbance to SPA features (in addition to the measures to reduce the potential for water quality impacts discussed above). During operation, LSEs were predicted as a result of increased levels of disturbance to SPA species, though the level of disturbance was predicted to be low with birds predicted to become acclimatised to this low level disturbance and therefore was not predicted to lead to an adverse effect (Parsons Brinckerhoff, 2013). Considering the mitigation measures to be employed for the C. GEN project, the absence of an adverse effect as a result of this project and the distance between this project and the Horseshoe Point landfall site (i.e., over 20 km), no LSE is predicted for this project in-combination with Project One.

Able Humber Ports Northern Area

4.4.32 Planning permission was granted for this project at Halton Marshes in June 2011, with Phase 1 to be completed in 2012 and further phases to be completed by the end of 2016. This will, however, need to be revised following the granting of planning permission in July 2013.

4.4.33 This project will take place within approximately 500 m of the proposed cable route, where it reaches the grid connection point at North Killingholme. No significant effects on any SPA species are predicted from works taking place in this area as it is of sufficient distance from the SPA and its key habitats for waterbirds. There are no predicted effects on SAC qualifying species or habitats from this project.

4.4.34 Because of the size and nature of this development (379.9 ha), a phasing strategy is in place. Phase one of seven was programmed to commence construction during 2010 with the final phase of the development currently scheduled to commence in 2016. Construction periods may therefore overlap with the Hornsea cable landfall construction activities.

4.4.35 Information to inform the EIA process recorded that golden plover, lapwing, ruff and curlew, are present in greatest numbers in the part of the estuary closest to the port development (ALAB, 2009). Many of the works, including to the flood defence wall can however be undertaken without taking access to the foreshore, and therefore disturbance to waterfowl will likely be at a lower level than may otherwise have been the case. At high tide, waders and wildfowl move onto adjacent land and roost on the land and may be at disturbance risk. However, only lapwings use fields on the proposed development site in great numbers, although this is only periodically.

4.4.36 A coastal bird survey, carried out between May 2006 and February 2007 inclusive, recorded a peak of 21 redshank in December 2006 throughout the tidal cycle. This is contrasted with a peak of only six recorded in October and December 2006 at high tide. Surveys indicated that the site occasionally supports more than 1% of the golden plover SPA citation population, but most of the time (82% of the overwintering period) it supports less than 0.5% of the SPA citation population. A peak of 630 birds was recorded in November 2007, likely linked to high tide roosting. The numbers of birds foraging across the site are likely to be less than 1% of the SPA population.

4.4.37 The design of the proposed development will provide 51 ha of land and 8 ha of lakes which will be permanently managed for optimal benefit for over wintering birds. With this mitigation, the proposed development was predicted to have no significant adverse impact on SPA birds (ALAB, 2009). North Lincolnshire Council, as the competent authority, completed the AA and determined that there will be no significant adverse effect on the integrity of the Natura 2000 site, provided specific conditions are met. These include a prohibition on floodbank works or other works within the Humber Estuary SPA between October and February within, and up to 500 m of the main bird usage to the south of East Halton Skitter.

4.4.38 With mitigation measures in place for this project (i.e., Able Humber Ports Northern Area), it can be reasonably concluded that there will be no in-combination LSE with this project and the Project One cable route works. The low number records of SPA bird species in the vicinity of the HVDC converter/HVAC substation and the large distance between the landfall site at Horseshoe Point (where LSE were predicted to occur for Project One) also provide support for this conclusion.

Port of Hull Local Development Order (LDO)

4.4.39 The Port of Hull LDO will apply to three sites at the Port of Hull, all of which are within the Humber Enterprise Zone. These are located at Alexandra Dock (Site 1), Queen Elizabeth Dock north (Site 2a) and Queen Elizabeth Dock south (Site 2b). The proposed LDO will grant outline planning permission for development associated with renewable and low carbon industries. Due to the outline nature of the LDO, the programme for the construction and operation periods is currently unclear, though construction may commence within 5 years.

4.4.40 All three sites are adjacent to the Humber Estuary EMS, though the LDO will not result in any direct impacts on the marine environment and therefore no effects on the Humber Estuary SAC are predicted. Disturbance to SPA qualifying species were predicted to occur as a result of noise and visual disturbance to foraging birds on the adjacent mudflats. These were predicted to result in a minor level of displacement of birds to a distance of tens of metres, with mitigation measures (i.e., work being undertaken during summer months only in certain areas) minimising these effects in sensitive areas. In addition, effects on qualifying bird species were predicted as a result of loss of roosting and loafing habitat within Site 2b (i.e., on existing flood defences). This was to be mitigated by the creation of an undisturbed loafing/roosting area in this east of the site (URS, 2012a).

4.4.41 Due to the limited level of effects predicted on SPA qualifying species and the measures employed to minimise these effects, no in-combination LSE with this project and the Project One cable route works are predicted.

Local Development Order (LDO) for land west of Paull Road, Paull

4.4.42 The Paull LDO will apply to a site of approximately 80 ha at Paull, on the north shore of the Humber Estuary, within the Humber Enterprise Zone. The proposed LDO will grant outline planning permission for development associated with renewable and low carbon industries. Due to the outline nature of the LDO, the programme for the construction and operation periods is currently unclear, though construction may commence within 5 years.

4.4.43 The site is located adjacent to the Humber Estuary EMS, though will not result in any direct impacts on the marine environment or the SAC. As such no effects on the Humber SAC are predicted as a result of this LDO. Disturbance to SPA qualifying species was predicted to occur as a result of noise and visual disturbance during the construction phase. Any disturbance would, however, result in short term behavioural effects of limited extent and therefore was not predicted to be significant. In addition, the LDO was predicted to result in loss of loafing/roosting habitat within the site, though due to the high level of anthropogenic disturbance in this area (i.e., public use), this habitat was not considered to be of a high quality compared to the abundance of alternative arable fields in the immediate vicinity. As such, any effects were not considered to be significant (URS, 2012b).

4.4.44 Due to the limited level of effects predicted on SPA qualifying species, no in-combination LSE with this project and the Project One cable route works are predicted. In addition, both the Paull LDO and the Port of Hull LDO sites are 7-10 km from the proposed Project One HVDC converter station/HVAC substation and over 30 km from the Horseshoe Point landfall and due to this large distance, in-combination effects are unlikely.

Three wind turbines on land north of Far Marsh Farm, Ottringham

4.4.45 This project involves the erection of three wind turbines with a maximum tip height of 102 m at Far Marsh Farm, 3.5 km to the south of Ottringham. The site is located approximately 2.5 km to the north of the Humber Estuary EMS and therefore was not expected to have any effects on the Humber Estuary SAC. Effects on SPA qualifying species during the construction and operational phases were expected to include disturbance effects (e.g. noise and visual disturbance), displacement, effects relating to collision and barrier effects were predicted.

4.4.46 The main species considered in the HRA screening for the Far Marsh Farm project were golden plover, lapwing, curlew and mallard. Although effects on these species were predicted, the proposed development site was not considered to be particularly important for these species and the effects were not considered likely to result in adverse effects on the qualifying features considered (Pegasus Planning Group, 2011).

4.4.47 The nature of the impacts expected at Far Marsh Farm as a result of construction and particularly operation of the wind turbines are not comparable with those expected to occur as a result of cable installation at Horseshoe Point. For example operation of wind turbines at Far Marsh Farm would have the potential to result in collision risk or barrier effects for the duration of the operational phase (though these were not considered to result in adverse effects), while cable installation at Horseshoe Point has the potential to result in temporary disturbance to birds during the construction phase, with no effects during operation. Furthermore, the habitats affected by the two projects are also very different, with arable fields used for roosting/loafing at Far Marsh Farm and extensive sandflats used for feeding/roosting at Horseshoe Point. For these reasons, the lack of significant effects on SPA bird species at Far Marsh Farm and the distance between the projects (over 20 km from the Horseshoe Point landfall and over 7 km from the Project One onshore HVDC converter station/HVAC substation, in-combination effects are unlikely to occur.

Grimsby Docks Flood Risk Management Scheme (FRMS)

4.4.48 The Environment Agency is proposing to improve approximately 3.5 km of existing defences in the vicinity of the Grimsby Docks, with the majority of improvements within the operational Grimsby Docks site. This may include installation of sheet piled and concrete sea walls, rock armouring of defences, reprofiling of embankments and repairs to existing revetments. The proposed works are expected to be undertaken in 2013 and 2014 (Environment Agency, 2013).

4.4.49 It was predicted that these works may lead direct (e.g., habitat loss/disturbance) and indirect impacts (e.g., increases in non-native species) on estuarine and intertidal habitats, though the proportion of habitats affected was predicted to be small and mitigation measures were predicted to reduce the potential for indirect impacts. Disturbance to SAC qualifying species due to increased suspended sediment concentrations and piling operations were also predicted though the effects of these were expected to be limited in extent and duration. No LSE was therefore predicted for the Humber Estuary SAC (Environment Agency, 2013).

4.4.50 Disturbance to SPA bird species was also predicted to occur as a result of the proposed flood defence works, though any disturbance to these species was expected to be small with birds using this part of the estuary likely to be accustomed to elevated levels of noise and human activity. In addition, seasonal restrictions to avoid sensitive periods were expected to minimise any disturbance effects. As a result, no LSEs were predicted on the Humber Estuary SPA (Environment Agency, 2013).

4.4.51 Potential adverse effects on the Humber Estuary EMS were predicted due to coastal squeeze effects, though compensatory habitat will be delivered as part of the Donna Nook Realignment Scheme which has been developed to deliver compensatory habitat for all losses within the Outer Estuary South region (Environment Agency, 2013).

4.4.52 No in-combination effects are predicted to occur between the Grimsby Docks FRMS with the Project One export cable installation works due to the limited level of effects predicted on SAC and SPA qualifying features and the difference in timings (i.e. Grimsby Dock FRMS to be completed by 2014, while Project One construction is due to commence in 2015). This conclusion is also supported by the large distance between these projects (i.e.. approximately 13 km from the Horseshoe Point landfall) and the relatively small extent over which disturbance effects would be expected from both projects.

Green Port Hull

4.4.53 Associated British Ports (ABP) sought consent from Hull City Council and the MMO for the construction, within the Port of Hull, of a new facility to manufacture, testing and onward shipment of wind turbines. The Green Port Hull development lies within and adjacent to the Humber Estuary SAC and SPA and as a result Hull City Council (as the competent authority) undertook an Appropriate Assessment for this development. This concluded that the proposed development would have an adverse effect on the integrity of the Humber Estuary SAC and SPA as a result of habitat loss and disturbance and displacement of birds from construction of a marine quay (Hull City Council, 2012). The development was granted permission in October 2012, though habitat was to be created as part of the development to compensate for the losses of intertidal and estuarine habitats. Construction is expected to take around 28 months to complete and the site is expected to be operational in 2014 (URS Scott Wilson, 2011).

4.4.54 Due to the lack of overlap between the construction phases of this project and Project One and the large distance between these developments (i.e., 36 km from the Horseshoe Point landfall), no LSEs are predicted for Project One in-combination with this project.

Other construction projects

4.4.55 A number of other projects, including CHPs at Moody Lane, Healing and Energy Park Way, the bioethanol plants on Hobson Way, Stallingborough and Moody Lane and the ten wind turbines on the land west of Brigg Road, Horkstow, were identified as having the potential to have an adverse effect on designated features of the Humber Estuary SPA (no in-combination effects on the SAC were predicted). However, due to the mitigation measures to be employed during construction of these projects to minimise effects on SPA bird species (e.g., screening to reduce noise and visual disturbance of bird species), no in-combination LSE was predicted for these projects (see Table 4.13).

Recreational and non-construction activities

4.4.56 In addition to the projects listed above, recreational and non-construction activities that occur in the Humber Estuary have been considered in relation to potential in-combination disturbance impacts on SPA species.

4.4.57 According to JNCC's Natura 2000 Standard Data Form for the SPA, the Humber Estuary bird populations are potentially vulnerable to the impacts of human activities such as flood defence works, dredging, and the construction, operation and maintenance of ports, pipelines and other infrastructure, built development and recreation. The majority of projects associated with these activities are likely to have been implemented over a long period of time, and so many impacts of these on ornithological interests will already be incorporated into baseline counts. Nevertheless, recently-implemented and future activities within or close to the SPA that may potentially affect birds in-combination with the cable landfall works require consideration.

4.4.58 Anthropogenic activities occurring in the MSE and MSF WeBS sectors were identified by Cutts *et al*. (2009) as wildfowling and cockle gathering, which are considered 'moderate-low' and 'moderate' disturbance sources for waterfowl respectively. It was noted by Cutts *et al*. (2009) that birds have been recorded habituating well to the presence of cockle pickers.

4.4.59 Cruickshanks *et al*. (2010) conducted an investigation into recreational disturbance within the Humber Estuary. It was concluded that the evidence presented indicates that disturbance could be causing a reduction in bird numbers, productivity and displacement. However, the issues are complex and it was not possible for the authors to identify the extent to which disturbance is, or could be, having an adverse effect.

4.4.60 In the Cruickshanks *et al*. (2010) review, conducted on a WeBS sector scale, Grainthorpe Haven sector was shown to be subject to various disturbance sources, including walkers, dogs, vehicles, wildfowling, shell fishing and aircraft. Horseshoe Point has been identified by Cruickshanks *et al*. (2010) as being a common dog walking area, used regularly by bait-diggers and also has a flying club nearby at Northcotes. It was noted that the high tide wader roost can be easily disturbed by walkers and low flying pleasure aircraft.

4.4.61 Although birds found at Horseshoe Point are therefore currently subject to unpredictable disturbance from various sources, it is possible that a level of habituation within individuals, particularly those that overwinter locally, exists. Increased disturbance in the local area due to cable installation may in theory increase the pressure on individuals, but it is likely that the main sources of disturbance at present, namely dog walking and bait-digging will be reduced due to the presence of cable installation activities and access restrictions during the period of works. Although such recreational activities may be displaced along the shore, the access restrictions may result in a safe haven for some birds, albeit in areas beyond likely disturbance distances from cable installation activities. It is therefore concluded that recreational disturbance and human activity levels are not likely to cause any in-combination LSE with the Project One cable landfall construction activities.

4.4.62 As detailed in paragraph 2.3.25, operational, maintenance and emergency access to the intertidal at Horseshoe Point will be gained along the top of the sea defences from Horseshoe Point car park when construction is complete; with suitable protection for vehicle access will be agreed with the EA. Recent discussions with Natural England have highlighted potential alternative access options. These will be discussed further post-submission The agreed access (e.g., the southern access route or alternative access proposed by Natural England) may also be used by other users, (e.g., for Phillips 66, the EA, the coastguard and the general public), following completion of Project One cable installation works. Although this continued access will result in some disturbance to designated features of the Humber Estuary SAC, any effects would be limited and therefore no in-combination LSE with the Project One operational phase is predicted.

Table 4.13 Screening matrix of the in-combination likely significant effects from Project One and other projects and activities.

Scheme (see Figure 4.4 for locations of these projects relative to Project One)	Description	Description of potential cumulative impact
Tetney to Saltfleet tidal flood defence scheme (1)	0.4 km from the landfall. Raise sea embankments by 0.3 m (Tetney to Grainthorpe). Construction due to be completed by the end of 2013.	Potential in-combination LSE on SAC qualifying habitats. No in-combination LSE with SAC qualifying species. Potential in-combination LSE on SPA qualifying features due to loss of foraging or breeding habitat.
Phillips 66 Tetney sea line replacement pipeline (36)	Approximately 1 km from landfall. Replacement of the subsea and a section of the onshore crude oil pipeline from on offshore bouy to Tetney Tank Farm. The landfall for the pipeline is at Northcoates Point to the north of Horseshoe Point. Pipeline construction programme expected to take approximately 15 months, between March 2014 and the end of 2015 dependent on when development consent is secured.	Potential in-combination LSE on SAC qualifying features. Potential in-combination LSE on SPA qualifying features.
Eight wind turbines on land at Bishopsthorpe Farm (41)	1.8 km from the onshore cable route, 5 km from the Horseshoe Point landfall. Erection of eight wind turbines, each with a maximum height from the ground to the blade tip of between 105 m to 115 m. Construction likely to commence in 2013 taking place over a 9 to 12 months period.	No in-combination LSE with SAC qualifying features. Potential in-combination LSE (disturbance) with SPA qualifying features.
Combined Heat and Power (CHP) plant at Energy Park Way (33)	10.4 km from the HVDC converter/HVAC substation, 17 km from the Horseshoe Point landfall. Gas fired CHP plant with 50 m high chimney. Planning permission must be implemented by11 December 2014.It is anticipated that the construction and commissioning of the proposed development and progression to full operation will take approximately 15 months.	No in-combination LSE on SAC qualifying features. No in-combination LSE on SPA qualifying species, due to mitigation measures (e.g., screening to reduce noise and visual disturbance of bird species).
CHP plant at Lenzing Fibres, Moody Lane, Healing (34)	10.5 km from the onshore HVDC converter/HVAC substation, 17 km from the Horseshoe Point landfall. 7.5 MW gas fired CHP plant including 46 m high stack. Planning permission must be implemented by 19 March 2015. It is anticipated that the construction and commissioning of the plant and progression to full operation will take approximately 15 months.	
Bioethanol production facility at former Acordis Site, Moody Lane, Great Cotes (35)	10.5 km from onshore HVDC converter/HVAC substation, 17 km from the Horseshoe Point landfall. Bioethanol production facility with 40 m high stack. Planning permission must be implemented by 10 August 2014. It is anticipated that the construction and commissioning of the plant will take approximately 30 months.	
Bioethanol plant, Hobson Way, Stallingborough (29)	9.4 km from onshore HVDC converter/HVAC substation, 18 km from the Horseshoe Point landfall. Erect bioethanol plant with 45 m high stack. Planning permission must be implemented by 21 December 2013. Construction will take place over a series of 24 months followed by a 3 month commissioning period.	
Ten wind turbines on land west of Brigg Road, Horkstow (47)	14.6 km from onshore HVDC converter/HVAC substation, 40 km from the Horseshoe Point landfall. Erect 10 wind turbines with 125 m to blade tips and 80 m high hubs. Twelve month construction timetable. Date of commencement of construction unknown.	
National Grid Substation Extension (7)	0.5 km from onshore HVDC converter/HVAC substation, 28 km from the Horseshoe Point landfall. Extension to existing sub-station to accommodate Project One. Construction has commenced. Programme unknown but the extension has to be operational before Hornsea Project One is operational.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.

Scheme (see Figure 4.4 for locations of these projects relative to Project One)	Description	Description of potential cumulative impact
Hornsea Offshore Wind Farm Project Two (8)	Adjacent to Project One onshore HVDC converter/HVAC substation, onshore cable route and landfall. Off-shore wind farm - Project Two will be capable of delivering is 1.8 GW. The onshore development will comprise of a landfall, cable route corridor and onshore HVDC converter /HVAC substation similar to that of Project One. Construction work is currently proposed to commence in 2015/2016, subject to relevant project approvals. Preliminary engineering design and construction logistics work indicate that the construction period, including pre-construction and commissioning for Project Two, will last for up to five years. Could be built simultaneously or separately from Project One.	Potential in-combination LSE on SAC qualifying features. Potential in-combination LSE on SPA qualifying features.
Able Marine Energy Park (14)	0.4 km from onshore cable route, 25 km from the Horseshoe Point landfall. New quay and wind turbine manufacture. The maximum height to eaves of the tallest building (foundation factory) would be 45 m. The development covers an area of approximately 150 ha. Decision expected in July 2013. Construction is programmed to start in 2013 for 24 months.	Potential in-combination LSE on SAC qualifying habitats and species (lamprey only). Potential in-combination LSE on SPA qualifying features.
C. GEN power plant, North Killingholme (11)	0.2 km from onshore HVDC converter/HVAC substation, 27 km from the Horseshoe Point landfall. 470 MW power station. The Non-Technical Summary states that plant could be up to 65 m in height and a flare stack could be up to 135 m in height. Construction is indicated to take 36 months to complete. Details of the construction commencement date have yet to be confirmed.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.
Able Humber Ports Northern Area, Halton Marshes (13)	Adjacent to onshore HVDC converter/HVAC substation site, 28 km from the Horseshoe Point landfall. Port-related logistics and business park. The development covers an area of approximately 380 ha. Phase 1 was programmed to commence in 2010 and be completed in 2012 and further phases to be completed by the end of 2016. However, this will need to be revised upon planning permission being granted.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.
Port of Hull Local Development Order (LDO) Alexandra Dock and Queen Elizabeth Dock, Marfleet (51)	9.7 km from onshore HVDC converter/HVAC substation site, 36 km from the Horseshoe Point landfall. Port of Hull Local Development Order for a renewable manufacturing site. The built form is lower than 50 m high. Outside storage allows for structures up to 100 m high. Due to the outline nature of the LDO it is not possible to accurately anticipate the date of commencement or programme of the construction period. The LDO will expire after five years of adoption, and only development commenced before this time will be permitted. Mitigation measures to include seasonal restrictions with being undertaken during summer months only in certain areas. In addition, creation of an undisturbed loafing/roosting area to mitigate for the loss of loafing/roosting area.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.

Scheme (see Figure 4.4 for locations of these projects relative to Project One)	Description	Description of potential cumulative impact
LDO for development associated with renewable energy and low carbon industries on land west of Paull Road, Paull, East Riding of Yorkshire (48)	7.1 km from onshore HVDC converter/HVAC substation site, 31 km from the Horseshoe Point landfall. Local Development Order granting planning permission for development associated with renewable energy and low carbon industries relating to 80 ha of agricultural land between Saltend and Paull. Due to the outline nature of the LDO it is not possible to accurately anticipate the date of commencement or programme of the construction period. However, for the purpose of assessment, reasonable assumptions have been made. It is assumed that the construction of Phase 1 will take place between late 2013 and early 2015 (approximately 18 months) and construction of Phase 2 will take place between late 2014 and early 2016 (approximately 18 months). This includes an approximate six month overlap between the two construction phases.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.
Three wind turbines on land north of Far Marsh Farm, Marsh Road, Ottringham, East Riding of Yorkshire (43)	7 km from onshore HVDC converter/HVAC substation site, 22 km from the Horseshoe Point landfall. Erection of three wind turbines (75 m to hub, 102 m to tip). Five month construction timescale anticipated. Date of commencement of construction unknown.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.
Grimsby Docks Flood Risk Management Scheme (60)	7 km from the onshore cable route, 13 km from the Horseshoe Point landfall. Maintenance and improvement works to the coastal flood defences between the upstream boundary of Grimsby Docks and Cleethorpes. Phase One and Two of these works are to be undertaken in spring/summer of 2013 and 2014, though these are permitted developments. Phase Three, which has required planning permission, is expected to commence in 2014.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.
Green Port Hull (61)	9.7 km from onshore HVDC converter/HVAC substation site, 36 km from the Horseshoe Point landfall. Associated Britis Ports (ABP) sought consent from Hull City Council and the MMO for the construction, within the Port of Hull, of a new facility to manufacture, testing and onward shipment of wind turbines. The development was granted permission in October 2012. Construction is expected to taken around 28 months to complete and the site is expected to be operational in 2014 (URS Scott Wilson, 2011).	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.
Recreational and non-construction activities	Recreational disturbance likely limited to walkers, shell fishing and motorbikes in the area around Horseshoe Point. Ongoing use of the southern access route to the intertidal (e.g., by Phillips 66, the EA, the coastguard and the general public) following completion of Project One cable installation works.	No in-combination LSE with SAC qualifying features. No in-combination LSE with SPA qualifying features.

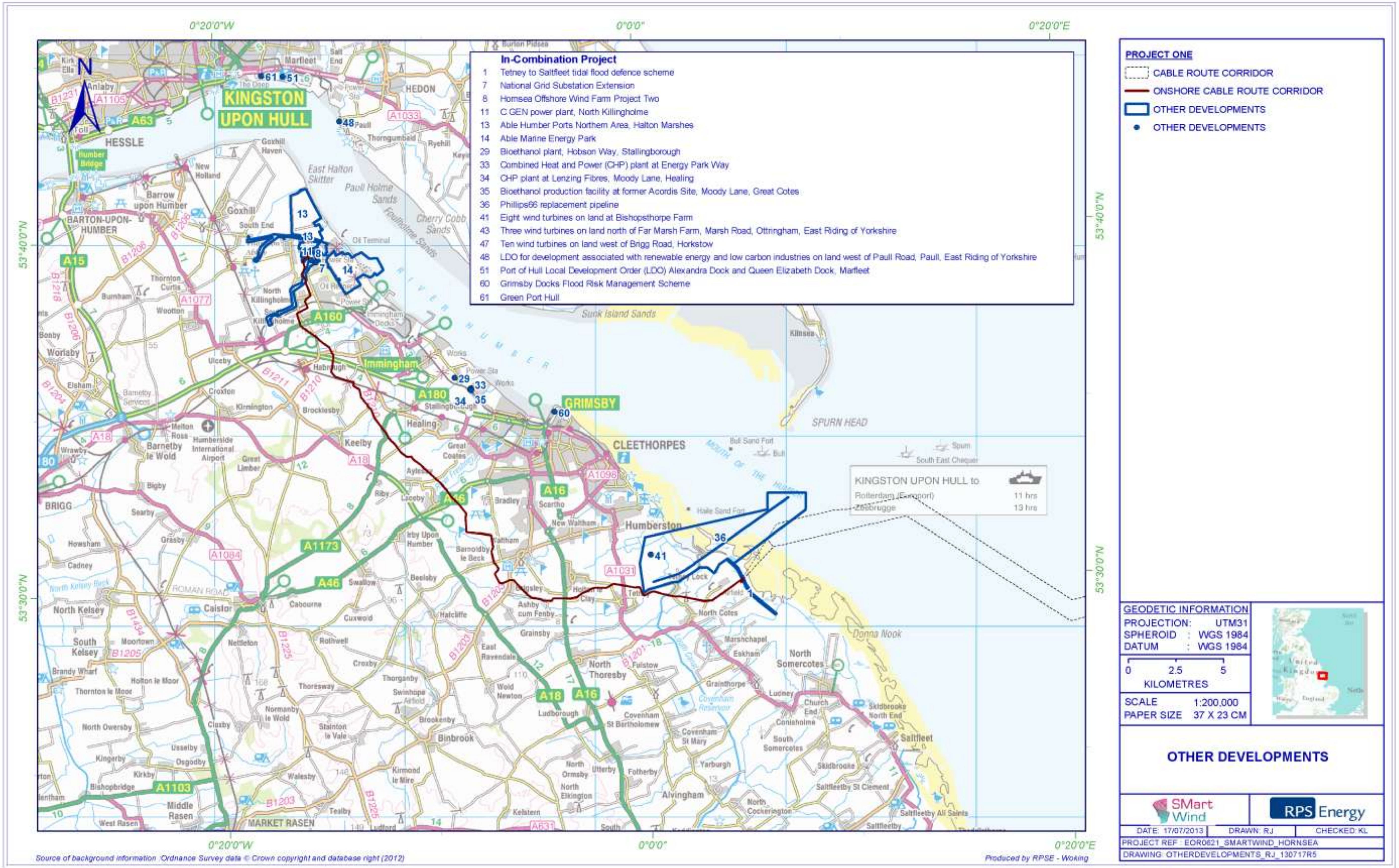


Figure 4.4 Developments considered for the in-combination assessment.

4.5 Summary of Screening Assessment Findings

4.5.1 This section presents a summary of the results from the screening assessment undertaken for Project One (Sections 4.3 and 4.4). Detailed screening assessment tables for some sites considered in this HRA are provided in Annexes A, B and D.

4.5.2 Table 4.14 presents the European sites that have been identified as having qualifying species that have the potential to be affected by Project One both alone and in-combination with other plans or projects. All species for which there is a predicted impact from Project One alone are also considered for in-combination impacts.

4.5.3 Of these sites, nine are UK designated European sites, namely the Humber Estuary SAC and SPA (features of the SAC and SPA for which LSE is determined are also features of the Humber Estuary Ramsar), the River Derwent SAC, the Berwickshire and North Northumberland Coast SAC, The Wash and North Norfolk Coast SAC, Flamborough Head and Bempton Cliffs SPA, Coquet Island SPA, Farne Islands SPA and Forth Islands SPA.

4.5.4 Other qualifying features of these SAC and SCI sites, including Annex I habitats and migratory bird/fish species, have been screened out as they are considered to be located outside of the zone of influence for potential impacts (paragraphs 4.3.3 *et seq.* and 4.3.46 *et seq.*, respectively).

Table 4.14 Designated Sites, Qualifying Features and Impacts Screened into the Appropriate Assessment.

Activity	Impact	Direct / Indirect	Effect	Project One Alone and / or In-combination	Designated Site / Qualifying Feature Screened In	How / Where Assessed
Birds						
Construction Phase						
Installation of export cables	Disturbance to birds during cable installation	Direct/ Indirect	Habitat loss, disturbance and displacement and indirect effects on prey items.	Project One Alone and/or In-combination	Humber Estuary SPA - Bar-tailed godwit, Golden plover, Dunlin, Knot, Redshank, Dark-bellied brent goose, Sanderling, Ringed plover, Oystercatcher, Grey plover; Farne Islands SPA – Common tern; Coquet Island SPA – Common tern.	Section 6.3
Operational and Maintenance Phase						
Operation of the wind turbines	Collision with wind turbine generators	Direct	Mortality	Project One Alone and/or In-combination	Flamborough Head and Bempton Cliffs SPA – Gannet, Kittiwake, Herring gull Forth Islands SPA – Gannet.	Sections 5.4 and 5.5
Physical presence of wind turbines	Displacement of birds from wind farm area	Direct	Reduced foraging locations, increased inter- and intra-specific competition, lowered survival rates, mortality.	Project One Alone and/or In-combination	Flamborough Head and Bempton Cliffs SPA – Fulmar, Kittiwake, Gannet, Guillemot, Razorbill, Puffin; Forth Islands SPA – Gannet.	

<table>
<tr><th>Activity</th><th>Impact</th><th>Direct / Indirect</th><th>Effect</th><th>Project One Alone and / or In-combination</th><th>Designated Site / Qualifying Feature Screened In</th><th>How / Where Assessed</th></tr>
<tr><td colspan="7">Marine Mammals</td></tr>
<tr><td colspan="7">Construction and Decommissioning Phases</td></tr>
<tr><td>Foundation piling of turbines and/or offshore substations, vessels and other construction activities</td><td>Underwater noise</td><td>Direct</td><td>Physical injury or disturbance to marine mammals.</td><td>Project One Alone and/or In-combination</td><td rowspan="4">Berwickshire and North Northumberland Coast SAC – Grey seal;
Humber Estuary SAC – Grey seal;
The Wash and North Norfolk Coast SAC – Harbour seal;
SBZ 1 / ZPS 1 (Belgium) SPA – Harbour porpoise;
SBZ 2 / ZPS 2 (Belgium) SPA – Harbour porpoise;
SBZ 3 / ZPS 3 (Belgium) SPA – Harbour porpoise;
Humber Estuary SAC – Grey seal;
Vlakte van de Raan (Belgium) SCI – Harbour porpoise;
NTP S-H Wattenmeer und angrenzende Küstengebiete (Germany) SCI – Harbour porpoise;
Doggerbank (Germany) SCI – Harbour porpoise, Harbour seal;
SPA Östliche Deutsche (Germany) – Harbour porpoise;
Sylter Außenriff (Germany) SCI – Harbour porpoise;
Steingrund (Germany) SCI – Harbour porpoise;
Helgoland mit Helgoländer Felssockel (Germany) SCI – Harbour porpoise;
Hamburgisches Wattenmeer (Germany) Ramsar, WII, SCI – Harbour porpoise;
Unterelbe (Germany) SCI, SPA – Harbour porpoise;
Borkum-Riffgrund (Germany) SCI – Harbour porpoise;
Nationalpark Niedersächsisches Wattenmeer (Germany) SCI – Harbour porpoise;
Gule Rev (Denmark) SCI – Harbour porpoise;
Sydlige Nordsø (Denmark) SPA – Harbour porpoise;
Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant (France) – Harbour porpoise;
Bancs des Flandres – Harbour porpoise;
Recifs Gris-nez Blanc-nez (France) – Harbour porpoise;
Ridens et dunes hydrauliques du detroit du pas-de-calais (France) – Harbour porpoise;
Baie de canche et couloir des trois estuaires (France) – Harbour porpoise;
Doggersbank SCI (Netherlands) – Harbour porpoise, Harbour seal, Grey seal;
Klaverbank SCI (Netherlands) – Harbour porpoise, Harbour seal, Grey seal;
Vlakte van de Raan (Netherlands) – Harbour porpoise;
Noordzeekustzone (Netherlands) – Harbour porpoise, Harbour seal;
Noordzeekustzone II (Netherlands) – Harbour porpoise, Harbour seal.</td><td rowspan="4">Sections 5.2 and 5.3 (offshore components).

Section 6.2 (grey seal – cable laying in the Humber Estuary SAC/Ramsar)</td></tr>
<tr><td>Removal of foundations, vessels and other decommissioning activities</td><td>Underwater noise</td><td>Direct</td><td>Physical injury or disturbance to marine mammals.</td><td>Project One Alone and/or In-combination</td></tr>
<tr><td>Construction and decommissioning vessel traffic</td><td>Risk of vessel strikes</td><td>Direct</td><td>Physical injury or disturbance to marine mammals.</td><td>Project One Alone and/or In-combination</td></tr>
<tr><td>Foundation piling and removal of turbines and/or offshore substations, vessels and other construction activities</td><td>Underwater noise</td><td>Indirect</td><td>Changes in prey (fish) species distribution / abundance.</td><td>Project One Alone and/or In-combination</td></tr>
</table>

Activity	Impact	Direct / Indirect	Effect	Project One Alone and / or In-combination	Designated Site / Qualifying Feature Screened In	How / Where Assessed
Fish and Shellfish						
Construction Phase						
Cable installation within the Humber Estuary	Temporary increase in suspended sediments	Indirect	Indirect effects on water quality and disruption of lamprey migration during cable laying.	Project One Alone and/or In-combination	Humber Estuary SAC – River lamprey, Sea lamprey; River Derwent SAC – River lamprey, Sea lamprey.	Section 6.2
Operation and Maintenance Phase						
Presence of operational export cables	Behavioural effects due to electro-magnetic fields emitted from export cables	Direct	Disruption of migratory pathways, or creation of artificial barriers due to EMF.	Project One Alone and/or In-combination	Humber Estuary SAC – River lamprey, Sea lamprey; River Derwent SAC – River lamprey, Sea lamprey.	Section 6.2
Benthic Subtidal and Intertidal Ecology						
Construction Phase						
Installation of export cables	Habitat loss/ disturbance	Direct	Temporary loss/ disturbance of Annex I habitats.	Project One Alone and/or In-combination	Humber Estuary SAC – Estuaries, Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Embryonic shifting dunes, Shifting dunes along the shoreline with Ammophila arenaria (`white dunes`).	Section 6.2

5 INFORMATION TO INFORM APPROPRIATE ASSESSMENT (STAGE 2 OF THE HRA) – OFFSHORE ASSESSMENT

5.1 Introduction

5.1.1 This section of the HRA presents an assessment of the potential effects of Project One, (alone and in-combination), to inform the competent authority should an Appropriate Assessment be required on those designated sites and qualifying features (birds and marine mammals) screened into this stage of the assessment (Stage 2 of the HRA process).

5.1.2 Information is provided on each of the qualifying species of the designated sites identified from the screening assessment where there is a potential for a LSE (Section 4.3). This document does not unnecessarily duplicate information provided elsewhere within the application documents but aims to present a concise summary of the key information required to inform the appropriate assessment. Therefore, this document should be read in conjunction with the Environmental Statement, (Volume 2, Chapter 4: Marine Mammals and Chapter 5: Ornithology), and the additional information provided to support this chapters.

5.2 Effect on SAC/SCI Features – Project One Alone

5.2.1 The information to inform the Appropriate Assessment for Annex II species and their associated designated European sites screened into the assessment (Table 4.14) follows the methodology described in Section 3.3. The potential effects on marine mammal receptors for each potential impact screened into the assessment (Table 4.18) have been described in the Environmental Statement Volume 2, Chapter 4: Marine Mammals.

5.2.2 The assessment describes the sensitivity of marine mammals considered within this HRA to each screened in impact and provides an assessment of significance based on the conservation objective for the feature with the magnitude of the impact. The sensitivity of each marine mammal receptor is based on the vulnerability of the receptor to a given change, potential for recovery from that change, and the favourable conservation status (FCS) of the receptor as a qualifying feature of the European sites considered in this assessment. Where relevant the FCS of some species, for example harbour porpoise, are considered at the southern North Sea harbour porpoise population level rather than on a site level as it is not possible to determine whether harbour porpoise present within the marine mammal study area for Project One may form part of the designated population(s) of any European sites close to or further afield from the Project One boundary.

Grey Seal

<u>Information on European sites</u>

5.2.3 The screening assessment (Section 4.3) identified European sites for which grey seal is a primary or qualifying feature and where a potential LSE from Project One activities could occur.

5.2.4 A total of three European sites in UK waters and two transboundary (i.e. non-UK) sites were identified in the southern North Sea with supporting grey seal populations (Table 4.14). These sites were identified as supporting grey seal in the offshore environment, with foraging ranges falling within range of Project One, where grey seal were recorded as foraging up to 145 km from their haul-out sites (Thompson *et al*., 1996).

5.2.5 The UK and transboundary Natura 2000 sites considered in this assessment are:

- Humber Estuary SAC – qualifying feature (grade C);
- Berwickshire and North Northumberland Coast SAC – primary reason for designation (grade B);
- Doggersbank pSCI (Netherlands) – qualifying feature (grade C); and
- Klaverbank pSCI (Netherlands) – qualifying feature (grade C).

5.2.6 The standard data forms and conservation objectives for these sites are presented in full in Annex I and Annex J, respectively, and summarised below.

Humber Estuary SAC and Ramsar

5.2.7 The Humber Estuary SAC lies 102 km to the west of Project One, containing the largest haul-out along the Lincolnshire and Norfolk Coast at Donna Nook (Figure 5.1). The conservation objective for grey seal as a qualifying feature of this SAC is broadly summarised as *'to maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards'.*

5.2.8 Specific conservation objectives have been defined for the grey seal population attributes listed below for which site specific target ranges/measures have been set:

- pup production within the SAC/Site of Special Scientific Importance (SSSI) – target of a stable or increasing number of breeding female grey seals in the SAC/SSSI (baseline 34 pups in 1981);
- distribution of grey seal pups within the SAC/SSSI – target of a stable or increasing area of usage within the SAC/SSSI; and
- accessibility of the SAC/SSSI for breeding – target of an accessible breeding site, namely the site at Donna Nook.

5.2.9 The Humber Estuary is also designated a Ramsar site due to the site supporting a breeding colony of grey seals at Donna Nook (Annex F). The conservation objectives for the Humber Estuary Ramsar site for grey seal are included in Annex I and are broadly similar to that of the SAC, (paragraph 5.2.8), and are to *'maintain, in favourable condition, the habitats for the populations of grey seal'*.

5.2.10 The Humber Estuary SAC and Ramsar lies 102 km east of Subzone 1 and is crossed by the export cable route. Grey seal tagging studies undertaken at Donna Nook indicate widespread nearshore usage and it is expected that at sea sightings of grey seals within the Project One marine mammal study area include seals from Donna Nook.

5.2.11 On the Lincolnshire coast grey seal start to aggregate in mid-September to begin breeding and pupping at Donna Nook commences in late October and continues until December (Lincolnshire Wildlife Trust (LWT), *pers. comm.*). Further south on the North Norfolk coastline the breeding season is slightly later with pupping occurring at the end of October/early November and finishing in January (LWT, *pers. comm.*). In 2009, ground counts carried out during the breeding season by the LWT, estimated pup production to be 1,318 individuals (Volume 5, Annex 5.4.1: Marine Mammal Technical Report). The population of grey seals at Donna Nook has increased at an average rate of 15% per year since the 1980s (Thompson and Duck, 2010) with peak counts recorded during 2009 of up to 2,068 individuals hauled out (SMRU, 2011).

5.2.12 During the pupping period, grey seals remain largely nearshore but become more widespread at other times. Seal tagging studies undertaken at Donna Nook indicate widespread nearshore usage and regular trips further offshore to the north and east (Figure 5.1) (SMRU, 2011; Jones and Matthiopoulos, 2012).

Berwickshire and North Northumberland Coast SAC

5.2.13 The Berwickshire and North Northumberland Coast SAC lies 258 km to the north of Project One, stretching 115 km along the southern Scottish and northern English coastlines from Alnmouth in Northumberland and north to Fast Castle Head in Berwickshire. This site is considered the most south-easterly site selected for grey seal. The conservation objectives for grey seal as a primary reason for designation of this SAC are to:

- *'Avoid the deterioration of the qualifying natural habitats and the habitats of grey seal, and the significant disturbance of grey seal, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of grey seal.*
- *Subject to natural change, to maintain or restore;*
- *The extent and distribution of qualifying natural habitats and habitats of grey seal;*
- *The structure and function (including typical species) of qualifying natural habitats and habitats of grey seal;*
- *The supporting processes on which qualifying natural habitats and habitats of grey seal rely;*
- *The populations of grey seal; and*
- *The distribution of grey seal within the site'.*

5.2.14 Grey seal breeding colonies within the Berwickshire and North Northumberland Coast SAC are among the largest in the UK, producing around 2.5% of grey seal pups born along its coast each year. Within the SAC there are two major grey seal breeding groups inhabiting the Farne Islands and the mainland coast at Fast Castle. Additionally, there are also several breeding sites in immediate vicinity of the SAC (Thompson and Duck, 2010).

5.2.15 Grey seals breed at the base of cliffs at Fast Castle and on the Farne Islands within the SAC. The population at Fast Castle has increased rapidly in recent years with an average pup production of 16.6% per annum (Thompson and Duck, 2010). Grey seals have bred on the Farne Islands for centuries and they have long been hunted or culled on the islands. Between 1962 and 1983 up to 1,500 females and pups were culled each year, which caused a significant decline in the overall pup production at the colony (Thompson and Duck, 2010). Since the cessation of culling in 1983 the number of pups per year increased in 2009 to 1,346 and 1,715 in Farne Islands and Fast Castle, respectively (Sparling *et al*., 2011).

5.2.16 Tagging studies have been carried out by SMRU for grey seal since 1988, which indicate that the majority of seal movements from the Fast Castle and Farne Island colonies were to the north and east of the Scottish and northern English coastlines (Sparling *et al*., 2011; Jones and Matthiopoulos, 2012).

Transboundary sites

5.2.17 Grey seal are a qualifying feature of a number of transboundary SACs and SCIs in the southern North Sea (paragraph 5.2.5). Grey seal is present in two geographically isolated populations: the marine north-east Atlantic region along the coasts of the UK, Ireland and on the European mainland coasts from Sweden to France, and the marine Baltic region (including Finland, Estonia, Latvia). The overall favourable conservation status for grey seal assessed from 2001 to 2006 in the marine Atlantic region is 'favourable' as more than 93% of the Atlantic population lies in UK waters where the species has an overall favourable conservation status (EEA, 2009a). Some countries such as Belgium, Germany and Netherlands assessed grey seal as 'unfavourable-inadequate' due to some parameters (population, habitat and future prospects) not reaching favourable conservation status even though the population trend in these countries is increasing (EEA, 2009a).

5.2.18 There is the potential for LSEs on grey seals from the Doggersbank pSCI and Klaverbank pSCI during the construction, operational and maintenance and decommissioning phases of Project One. These sites are marine designated areas located on the Dutch Continental Shelf approximately 44 km and 64 km, respectively, to the east of Project One. Grey seal is listed as a qualifying feature (but not the primary reason for designation) for both sites, with a population coded as C in both site's data form (EEA, 2013). This indicates each site holds between 0% and 2% of the Dutch grey seal population.

5.2.19 The current population in the Netherlands is 2,500 adults (Brasseur *et al*., 2010). Tagging studies on grey seals in the Netherlands, indicates that the majority of movements are inshore with few records of tagged seals in offshore waters near or in the Klaverbank pSCI (Brasseur *et al*., 2010). Although there is potential for grey seals associated with the Klaverbank pSCI to occur within Project One, the results of these tagging studies indicate that few grey seals will do so as the majority remain within Dutch coastal waters (Brasseur *et al*., 2010).

5.2.20 The conservation objectives for grey seal as a feature of transboundary (non-UK) Natura 2000 sites has been assumed for the purpose of this assessment to be to maintain or restore this species' population (and their habitats) in favourable condition (subject to natural change).

Baseline environment

5.2.21 Grey seal occur throughout the Project One marine mammal study area and are present in particularly high densities along the southern boundary and towards their haul-outs to the southwest. High densities coincide with the area through which the export cable will be routed.

5.2.22 Of the 70,000 grey seal that haul-out in the North Sea, approximately 90% breed in Scotland, (Baxter, *et al*., 2011). The east coast of England is also considered to be important for grey seal and the largest breeding colony in this area is at Donna Nook in the Humber Estuary SAC and Ramsar site (Figure 5.1), where an estimated 2,068 seals haul-out here at any one time (SMRU, 2011). Other sites, including The Wash (an intertidal haul-out) and Scroby Sands in Norfolk, are also known breeding locations, although they are less important than Donna Nook, Blakeney Point and East Horsey (Smith, 1998).

5.2.23 Grey seal spend longer hauled out during their annual moult (December to April) and their breeding season (August to January) compared to other times of year (SMRU, 2010). Seals breed earliest in southwest Britain and latest at colonies on the North Sea coast and subsequently there is a clockwise cline in mean birth date from the southwest coast of Britain (pups born between August and September) to the south east coast (pups born between early November to mid-December) (Duck, 2010; SCOS, 2011). Grey seal pupping at Donna Nook occurs in between October to January (LWT, *pers. comm.*) with the adult moulting season in February and March. During these periods the majority of the population will be on land for several weeks. Subsequently densities at sea will be much lower at this time when compared to other times of the year. The number of pups has increased at Donna Nook and at other sub-colonies along the Lincolnshire and North Norfolk coasts (SMRU, 2011).

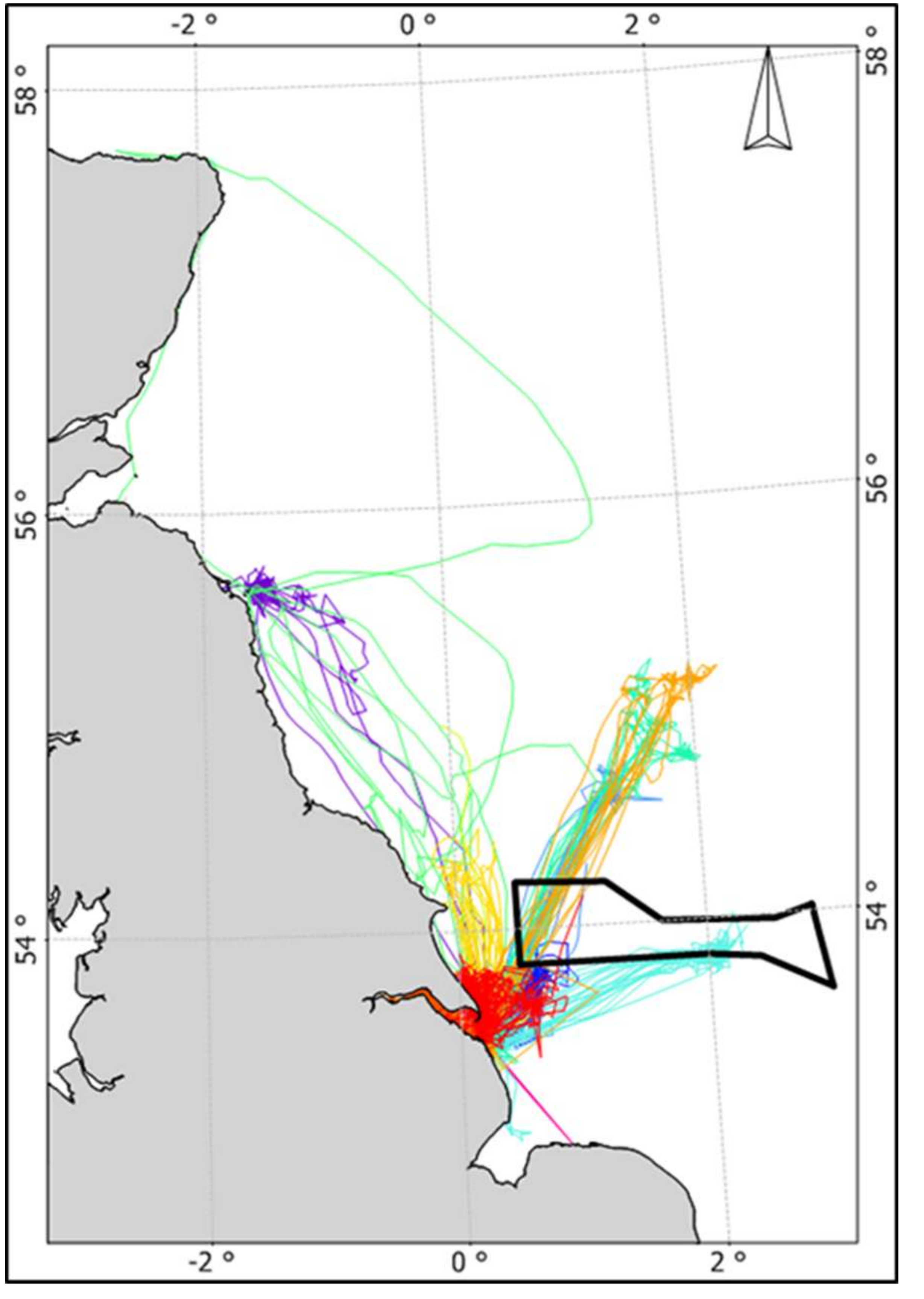


Figure 5.1 Tracks of 12 grey seals tagged at the Donna Nook haul-out. Each seal is represented by a different colour (SMRU, 2011).

5.2.24 Grey seal movements offshore occur on two scales: long distance travel (up to 2,100 km) and local repeated trips to discrete offshore areas (88% of trips). However, most foraging ranges have generally been recorded as up to 145 km from their haul-out sites (Thompson *et al*., 1996). A tracking study on the east coast population of grey seals has shown that these foraging trips tend to partially cross the Project One marine mammal study area (Figure 5.1) (SMRU, 2011). Similarly, a tracking study undertaken by SMRU for the Dogger Bank Creyke Beck offshore wind farm also showed that seals transited between haul-outs at Donna Nook and Dogger Bank (moving across the Hornsea Zone) (Forewind, 2013). The site-specific surveys recorded grey seal throughout the Project One marine mammal study area, including in inshore waters in the vicinity of the export cable route corridor.

5.2.25 The grey seal population estimate within the Project One marine mammal study area was based on the grey seal haul-out count at Donna Nook within the Humber Estuary SAC and Ramsar site, however it is expected that grey seal moving through the Project One marine mammal study area are likely to also be from other haul-outs further afield.

5.2.26 Numbers of grey seal hauled out along the eastern English coast have remained steady, except at Donna Nook, where numbers have increased significantly (SMRU, 2011). Since this count represents 35% of the population (SCOS, 2011), with the remainder at sea, the population estimate can be scaled from the haul-out count. Based on a count of 2,068 individuals at Donna Nook, the Humber Estuary SAC population of grey seals is estimated at 5,908 individuals (SCOS, 2011).

5.2.27 At sea, grey seal were sighted throughout the Project One marine mammal study area. In Subzone 1 plus 4 km buffer area, grey seal were recorded throughout the year, with peaks in October and February in Years 1 and 2 of the survey, respectively.

5.2.28 Foraging grounds are usually characterised by gravel and sand seabed sediment which is the preferred habitat of their key prey; sandeels. During these offshore foraging trips, target prey is usually composed of (in order of importance) sandeels, gadoids and flatfish, although seasonal and regional variations may occur (DTI, 2001). At Donna Nook sandeels and common sole *Solea solea* are the staple diet of the local grey seal population. Sandeels were recorded throughout the Project One marine mammal study area, and the area to the north of the Hornsea Zone was identified as a region of high spawning intensity for this group of species (Environmental Statement, Volume 5: Annex 5.3.1; Fish and Shellfish Technical Report, Figure 3.23 and Figure 3.24).

5.2.29 Grey seal densities averaged 0.043 animals per km^2 in the Hornsea Zone plus 10 km buffer, with a slightly lower density recorded in Subzone 1 plus 4 km buffer (0.038 animals per km^2). Historical data provided by SMRU showed similar patterns, with the highest numbers occurring in the southwest corner of the Hornsea Zone, with an increase in density towards the haul-out sites at Donna Nook (SMRU, 2011). Density estimates given in the SMRU (2011) dataset were higher than those estimated using the site-specific survey data collected for Project One, with numbers in the range of 0.4 to 2 animals per km^2 in the areas of highest density. The reason for these differences in densities between the two datasets is due to the different survey methodologies employed. Site-specific data were collected using boat-based visual methods whilst the SMRU data were collected using both aerial surveys of haul-out sites and tagging studies (see the Environmental Statement Volume 2, Annex 5.4.1: Marine Mammal Technical Report for a description of both methods).

<u>Potential Impacts during Construction</u>

5.2.30 This section identifies and assesses the impacts that have been predicted to affect grey seal during the construction phase for Project One as follows:

- Physical injury and/or behavioural disturbance from underwater noise as a result of foundation installation (i.e., piling), vessel noise and other construction activities (e.g., cable installation);
- Behavioural disturbance from underwater noise from vessel noise and other activities;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

5.2.31 As discussed in Section 4.3, the offshore components associated with construction of Project One will not have any direct or indirect effects on habitats within UK or transboundary SACs/SCIs designated for grey seal populations, and so there will be no effect on the conservation objectives for those habitat features.

Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities

5.2.32 The impact of underwater noise from construction piling of foundations is discussed in Section 4.6 of the Environmental Statement Volume 2, Chapter 4: Marine Mammals, and summarised below.

Magnitude

5.2.33 Two worst case scenarios have been considered in the HRA. The worst case spatially considered the maximum area of ensonification, whereby two installation vessels, separated by a distance of 3 km, would pile-drive concurrently using hammer energies up to a maximum of 2,300 kJ hammer (i.e., ‘concurrent piling’). The worst case temporally considered the maximum duration of piling whereby only one installation vessel would be used throughout construction (i.e., ‘single piling’). This would lengthen the time required to install all the turbine foundations from 18 months (concurrent) to 36 months (single) and therefore extend the period of possible disturbance of animals from the affected area.

5.2.34 Modelled hammer energies showed that the potential for physical injury or permanent auditory injury in grey seal is highly localised with effects only occurring out to a maximum of 100 m from the source (Table 5.1). Beyond this distance, out to a maximum of 1.7 km, temporary auditory impairment can occur and noise levels sufficient to cause temporary threshold shift (TTS) will elicit a fleeing response in seals. The range of effects will therefore be confined mainly to within the Project One marine mammal study area.

5.2.35 Based on the limited data available on the response of pinnipeds to noise, and the resulting limitations on the noise modelling results for the modelled Sound Exposure Level (SEL) dose, the impact assessment presents both the instantaneous permanent threshold shift (PTS) (186 dB re 1 μPa^2·s) and TTS/fleeing (171 dB re 1 μPa^2·s) thresholds for pinnipeds as the metrics requiring assessment (Table 5.1). The rationale for the use of both thresholds is discussed in detail in the Environmental Statement Volume 2, Chapter 4: Marine Mammals.

Table 5.1 Summary of pinniped impact range estimates for pile driving during construction at Project One.

Impact criterion	Potential range of impact for pinnipeds			
	600 kJ hammer energy	800 kJ hammer energy	1,400 kJ hammer energy	2,300kJ hammer energy
Instantaneous injury/PTS * (M_{pw} weighted 186 dB re 1 μPa^2·s)	<50 m	<100 m	<100 m	<100 m
TTS/Fleeing response/ Likely avoidance (M_{pw} weighted 171 dB re 1 μPa^2·s) **	<700 m	<1.0 km	<1.2 km	<1.7 km

*Southall et al. (2007) Injury Criteria, **Southall et al. (2007) Single pulse behavioural disturbance.

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.2.36 Based on the worst case temporal scenario of single piling, the impact would occur over a period of 36 months. The assessment has included a 30 minute soft-start for all piling scenarios, where piling commenced at 20% of the hammer energy and with a reduced strike rate (see Section 5.5), in order to reduce the ranges for potential onset of PTS and TTS/fleeing. The impact is therefore predicted to be low, as it will be of local spatial extent, intermittent (during pile driving activity) and reversible.

Sensitivity

5.2.37 Based on the predicted ranges of noise impacts for single piling, the average number of animals predicted to be affected by piling noise was estimated using the site-specific data as 0.049 animals for the 800 kJ and 1,400 kJ hammer energies, and 0.105 animals for the 2,300 kJ worst case hammer energy. Effects were greater using the SMRU modelled at-sea density estimates, with an average of 0.66, 1.66 and 3.24 animals affected by TTS/fleeing using the 800 kJ, 1,400 kJ and 2,300 kJ hammer energies, respectively. Whether using the site-specific, or the SMRU data, only a small proportion (up to a maximum of 0.05%) of the Humber Estuary SAC population is predicted to be affected (Table 5.2).

Table 5.2 Summary of number of grey seal individuals potentially affected by piling noise based on a single piling scenario at different hammer energies.

Impact criterion	800 kJ		1,400 kJ		2,300 kJ	
	Number of animals	% Humber Estuary SAC	Number of animals	% Humber Estuary SAC	Number of animals	% Humber Estuary SAC
Site-specific data						
TTS/fleeing 171 dB	0.049	0.0008	0.049	0.0008	0.105	0.0028
SMRU at-sea data						
TTS/fleeing 171 dB	0.660	0.01	1.66	0.028	3.24	0.05

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.2.38 For concurrent piling where two piles are simultaneously driven, the number of animals affected by TTS/fleeing calculated from the site-specific data was relatively small, with a maximum of 0.164 animals affected, accounting for only 0.003% of the Humber Estuary SAC population (Section 4). SMRU modelled at-sea densities provided a greater predicted effect with a maximum of 6.29 animals affected by TTS/fleeing, accounting for 0.106% of the Humber Estuary SAC population (Table 5.3).

Table 5.3 Summary of number of grey seal individuals potentially affected by piling noise based on a concurrent piling scenario at different hammer energies.

Impact criterion	800 kJ		1,400 kJ		2,300 kJ	
	Number of animals	% Humber Estuary SAC	Number of animals	% Humber Estuary SAC	Number of animals	% Humber Estuary SAC
Site-specific data						
TTS/fleeing 171 dB	0.107	0.002	0.107	0.002	0.164	0.003
SMRU at-sea data						
TTS/fleeing 171 dB	1.34	0.022	3.15	0.053	6.29	0.106

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.2.39 The zone of noise disturbance for grey seal does not extend as far as their haul-out locations, the closest of which (Donna Nook) lies over 100 km from Subzone 1. Therefore, the effects predicted are behavioural displacement over a small area of their foraging habitat. The maximum area affected for pinnipeds based on single piling using the 2,300 kJ hammer energy is estimated as 7.44 km^2. It is likely, therefore, that during pile driving grey seal would tend to avoid these areas of disturbance and move to other areas of suitable habitat elsewhere. Whilst there may be some energetic costs of displacement (either from expending more energy whilst circumventing disturbed areas, or from possible reduced foraging due to density-dependent competition in other areas), it is considered unlikely that this would lead to population-level effects due to the area affected at any one time being extremely small in comparison to the extent of similar habitat available elsewhere (see Volume 5, Annex 5.2.1: Benthic Subtidal and Intertidal Ecology Technical Report).

5.2.40 Grey seals are not hearing specialists. They have good vision in clear waters and sensitive mystacilia vibrissae to locate prey in waters with poor visibility and therefore the temporary loss of hearing may not affect the ability of grey seals to forage effectively (Miersch *et al*., 2011). The predicted duration of any TTS is less than 24 hours (Kastak *et al*., 2005). Empirical evidence from seismic research demonstrates that seals may be tolerant of loud noise pulses, particularly if attracted to the area for feeding or reproduction (Richardson *et al.,* 2005). However, in close proximity, grey seal are more likely to exhibit strong avoidance behaviour as demonstrated by a controlled experiment on the effects of seismic surveys whereby grey seal changed from making foraging dives to v-shaped transiting dives to move away from the source (Thompson *et al*., 1998).

5.2.41 Based on the available data presented in this assessment, grey seal sensitivity to noise from construction piling is assessed as low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.91 *et seq.*)

Conclusion

5.2.42 Piling will result in a short to medium-term (18 to 36 months depending on whether single or concurrent piling is adopted) effect. However, due to the distance of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs to Subzone 1 within which piling will occur, the local spatial extent and intermittent nature of the impact from construction piling noise and the low sensitivity of grey seal, no adverse effects are predicted on the grey seal at a population level or as a feature of these Natura 2000 sites. Furthermore, with regard to the Humber Estuary SAC, only a small proportion of grey seal from this population are predicted to be affected and these seals are known to be currently undergoing a prolonged period of sustained population growth and high pup production at Donna Nook and at other sub-colonies along the Lincolnshire and North Norfolk coasts (see paragraph 5.2.19).

Behavioural disturbance from underwater noise from vessel noise and other activities

Magnitude

5.2.43 During the construction phase there is the potential for an increase in noise due to construction vessel traffic and other construction activities to cause negative effects on grey seal.

5.2.44 The current level of vessel activity passing through the Project One marine mammal study area is 28 to 30 vessels per day passing within a 10 nautical mile (NM) radius of Subzone 1, and there was little season variation in vessel movements across this study area (Environmental Statement Volume 2, Chapter 8: Shipping and Navigation). This equates to an annual total of 10,950 vessel movements within a 10 nm radius of Subzone 1. During the construction period it is anticipated that up to 6,966 vessel movements will be made in total over the offshore construction phase (i.e., up to 5 years, over a possible three phases). Assuming that vessel activity is spread equally over the 5 years, this equates to an up-lift in vessel activity of 12.7 % per year above the baseline within Subzone 1 including 10 NM radius. It is important to note that in reality vessel activity may in some years be higher than this average (e.g., during piling periods) and in others may be lower and therefore there could be considerable variation around this mean.

5.2.45 There will be a variety of vessels used in the construction phase. Larger vessels include the jack up barges, heavy lift vessels, large cable laying vessels and pre-piling vessels (in the case of jacket foundations). Smaller vessels include the anchor handling tugs, small cable laying vessels and crew transport vessels.

5.2.46 The increased vessel activity will, for the most part, be localised to within the Project One area, and existing shipping routes to and from ports and the frequency intermittent over the construction phase. Based on this, the magnitude of effect is considered to be low**.**

Sensitivity

5.2.47 Grey seal react to the noise generated from the engine of vessels. The main source of noise from vessels comes from propeller cavitation and for any vessel, noise increases with speed and loading (Senior *et al.*, 2008). In addition, noise may also increase if boats with smaller engines are working harder to attain cruising speed; this is particularly true of older vessels. Reactions can be at distances and are often linked to changes in the engine and propeller speed (Richardson *et al.*, 1995). Richardson *et al.* (1995) report that noise levels for large surface vessels indicate that physiological damage to marine fauna is unlikely, although the levels may be sufficient to cause local disturbance of animals in the immediate vicinity of the vessel, depending on their sensitivity, and the ambient noise levels. The ambient noise levels within the site would be expected to be lower than those present in the vicinity of shipping lanes within the southern North Sea (Environmental Statement Volume 4, Annex 4.3.2: Subsea Noise Technical Report).

5.2.48 Most published information on effects of vessel disturbance to seals is largely anecdotal. In areas where there are high levels of vessel traffic, harbour and grey seals have been noted to closely approach tour boats that regularly visit an area, and may habituate to sounds from tour vessels (Bonner, 1982).

5.2.49 As with the effects of piling noise, there are uncertainties in predicting the potential effects of vessel noise on grey seal since the science is still poorly understood. Based on the precautionary approach it is therefore assumed that grey seal will respond to disturbance from vessel noise through avoidance behaviour.

5.2.50 Disturbance from vessel noise is predicted to occur primarily as a series of short-term events (e.g., during the crew transfer times) over the construction period (i.e., up to five years, over three phases), which would most likely result in avoidance behaviour for grey seal. The sensitivity of grey seal to noise from vessel traffic is therefore considered to be low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.158 *et seq.*).

Conclusion

5.2.51 Due to the localised spatial extent of increased vessel activity within the Project One area, the intermittent frequency of vessel movements over the entire construction phase, the low sensitivity of grey seal and the predicted consequences of any impact on a relatively small proportion of the population, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Physical injury from increased risk of collision with vessels

Magnitude

5.2.52 Over the construction phase (i.e., up to 5 years, over up to three phases), there is a predicted increase in vessel traffic of 6,966 vessel transits over the five year. It is likely that some of these vessels will use ducted propellers, and approximately a quarter of vessels (22.4%) will be for crew transfers and support, which have a capacity for higher speeds of up to 25 knots.

5.2.53 Existing levels of vessel traffic within the Project One marine mammal study area from oil industry support, shipping, fisheries and recreation, contribute to approximately 10,950 shipping movements per year, (Volume 2, Chapter 8: Shipping and Navigation). As such marine mammals are likely to have habituated to the current levels of activity. The additional 6,950 vessel transits over the construction phase represents an uplift in vessel activity of approximately 12.7% above baseline levels, however, it is likely that the noise generated by the construction vessels will, to some extent, deter grey seal from the immediate vicinity (see paragraphs 5.2.38 to 5.2.50) and therefore collision with construction vessels in the proximity of turbine locations is unlikely.

5.2.54 The magnitude of effect is therefore low as the increase in vessel activity is both limited in temporal and spatial extent.

Sensitivity

5.2.55 The risk of injury to seals from vessel collisions is a potential concern, particularly close to pupping or haul-out sites. A recent review has highlighted concerns that harbour and grey seals may be vulnerable to corkscrew injuries from ducted propellers, such as a Kort nozzle or some types of Azimuth thruster (Thompson *et al*., 2010b). These propellers are used on a wide range of vessels utilised in offshore industries including tugs, self-propelled barges, rigs, offshore support vessels and research boats. Since 2008, a number of seal carcasses with spiral lacerations have been found around the UK, including 42 cases in the North Norfolk coast centred around the Blakeney National Nature Reserve (JNCC, 2012). Investigations are on-going to determine the cause of such injuries, as at present the links between corkscrew injuries and ducted propellers remains unproven. In order to adopt the precautionary approach, the guidelines on risk assessment for corkscrew injuries to seals (JNCC, 2012) have been followed here, with recommendations for mitigation or monitoring highlighted. Table 5.4 summarises the guidelines and recommendations produced by the SNCBs.

5.2.56 Subzone 1 lies 102.2 km (55.1 NM) from the Humber Estuary SAC and Ramsar site, designated for grey seal. According to the JNCC guidelines this presents a low risk to grey seal and therefore no mitigation is recommended. Effects assessed regarding the risk of collision between cable laying vessels and grey seal from the Humber Estuary SAC and Ramsar site as part of the onshore components for Project One have been discussed in Section 6.2. Due to scientific uncertainties regarding the risk to grey seals from corkscrew injury in particular, the sensitivity has been assessed as low to medium (Table 5.4). The Developer commits to developing a MMMP in consultation with statutory advisors. This protocol will set out the detail of any specific marine mammal mitigation and or monitoring.

5.2.57 The cable route corridor boundary crosses the Humber Estuary SAC and Ramsar site. According to the distances given in the JNCC guidelines (Table 5.4) this presents a medium risk to grey seal and the recommendations are to consider alternatives to the use of ducted propellers and/or to avoid the breeding season if possible. The Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors.

5.2.58 The sensitivity of grey seal is assessed as being low to medium (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.172 *et seq.*).

Table 5.4 Summary of the risk assessment for corkscrew injuries and recommended mitigation measures from the SNCBs (JNCC, 2012).

Risk	Recommendations
High	
Activity proposed to take place within 4 NM of a harbour seal SAC and areas where the harbour seal population is in significant decline.	Consider alternatives to using ducted propellers or Avoid the breeding season. (If avoiding the breeding season or using alternatives to ducted propellers are not possible then a Seal Corkscrew Injury Monitoring Scheme should be considered).
Medium	
Activity proposed to take place between 4 and 30 NM of a harbour seal SAC and not covered above.	Consider alternatives to using ducted propellers. Avoid the breeding season if possible.
Activity proposed to take place within 4 NM of a grey seal SAC.	Consider alternatives to using ducted propellers. Avoid the breeding season if possible.
Low	
Activity proposed to take place beyond 30 NM from a harbour seal SAC.	None.
Activity proposed to take place beyond 4 NM distance from a grey seal SAC.	None.

Conclusion

5.2.59 Due to the already high existing level of vessels in the vicinity of Project One supporting other industries, the localised spatial extent of increased vessel activity, the intermittent risk of collision with vessels over the entire construction phase (i.e. up to five years), and the low to medium sensitivity of grey seal collision with vessels no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Changes in prey (fish) species distribution and/or abundance

5.2.60 The key prey species a number of clupeids (e.g., herring), gadoids (e.g., cod, whiting), flatfish and sandeels. These species have been identified as important components of the fish community within the study area and subsequently negative effects on the fish assemblages identified in the Project One impact assessment may have indirect effects on grey seal. The impact assessment for fish (prey) species is presented in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology.

Magnitude

5.2.61 Fish and shellfish receptors are vulnerable to a number of impacts during construction including temporary habitat loss during installation works, increased sediment concentrations and sediment deposition, underwater noise as a result of installation of foundations and subtidal cables, and accidental pollution. The potential effects of these impacts on fish receptors are described in Volume 2, Chapter 3: Fish and Shellfish Ecology. A summary of the impact assessment is presented in the following paragraphs.

5.2.62 Temporary habitat loss is predicted to be localised in extent, of short term duration (over the construction phase which may be up to five years, over a possible three phases) and reversible. Sandeel and herring were considered to be the most vulnerable as they are known to spawn within, or near to, the study area. However, only a small proportion (0.04%) of sandeel spawning habitat is likely to be affected and at present there are no mapped herring spawning grounds within the Project One fish and shellfish study area. The impact assessment concluded that the potential effects on these species, of medium sensitivity, and all other fish and shellfish, of low sensitivity, would be of minor significance.

5.2.63 The impact of increased sedimentation as a result of construction activities is unlikely to affect fish and shellfish communities, which are acclimatised to an environment with high variability in suspended sediment concentration. Most fish and shellfish species were assessed as being of low sensitivity to both increased suspended sediment concentration and sediment deposition, with the exception of brown crab and lobster (not key prey items for marine mammals), the effects were therefore considered to be of minor significance.

5.2.64 Fish are sensitive to the potential effects of increased noise during the turbine installation works. Piling noise using the 2,300 kJ hammer energy is expected to cause behavioural avoidance of distances between 9.5 to 21.5 km for demersal species and 11.9 to 27.9 km for pelagic species. For concurrent piling using the largest hammer energy this could lead to displacement of species over a small proportion of their spawning and nursery habitats (Table 5.5). For the HVAC reactive compensation substation installation, the piling at the lower, 800 kJ hammer energy would also result in displacement with impact ranges of 5.4 to 10.8 km for demersal species and 7.0 to 15.6 km for pelagic species.

Table 5.5 Proportion of spawning and nursery habitats in the southern North Sea Marine Natural Area within underwater noise behavioural impact ranges for demersal and pelagic fish species. Proportions affected are for concurrent piling at two locations with 3 km spacing within Subzone 1 at 2,300 kJ.

Species	Proportion of habitat overlapping with noise contours for possible area of avoidance	
	Spawning	Nursery
Demersal Species		
Plaice	1.0% to 2.9%	0%
Lemon sole	1.0% to 2.6%	1.0% to 2.6%
Cod	1.1% to 3.0%	0.8% to 2.3%
Whiting	1.2% to 3.3%	0.8% to 2.3%
Sandeel	0.9% to 2.4%	1.0% to 2.8%
Pelagic Species		
Sprat	2.0% to 4.8%	2.6% to 6.2%
Herring	1.2% to 2.3%	1.2% to 2.6%
Mackerel	2.8% to 6.2%	1.6% to 3.9%

(Source: Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology).

5.2.65 Impacts were predicted to be of medium-term duration (during the pile driving activity), intermittent and reversible. The magnitude was considered to be low for turbine installation using the 2,300 kJ hammer energy and negligible for the offshore HVAC reactive compensation substation using the 800 kJ hammer energy. The impact assessment concluded that the potential effects on both pelagic fish species, of medium sensitivity, and demersal fish species, of low sensitivity, would be of negligible (for the offshore HVAC substation) or minor significance (for the offshore wind farm).

5.2.66 The potential for an accidental pollution event is very low provided that the CoCP is followed. Fish eggs and larvae are likely to be of medium sensitivity due to their lack of mobility, adults of most species are of low sensitivity due to their ability to avoid polluted areas. Any impacts are likely to be of limited spatial extent and short-term duration and potential effects are predicted to be of low magnitude. Therefore, it is concluded that the effects would be of minor significance.

5.2.67 In summary, potential effects of changes in prey resources on grey seal would occur over the five year construction phase and would be reversible. The magnitude of effect is therefore predicted to be low.

Sensitivity

5.2.68 Grey seal generally exploit a suite of different prey items and can travel great distances (up to 145 km) to forage. It is likely that the effects described for fish and shellfish will occur over a similar, or lesser, extent and duration as those for grey seal. For example, avoidance behaviour of fish during piling works will lead to displacement over potentially smaller ranges than those given for grey seal. In addition, as prey moves out of the areas of potential impact, so are grey seal likely to follow in order to exploit these resources.

5.2.69 The communities found here were characteristic of the fish and shellfish assemblages in the wider region and therefore, due to the highly mobile nature of grey seal, it is likely that they will be able to exploit similar resources elsewhere. However, there could be an energetic cost to this if animals have to travel further to a preferred foraging ground. For example, telemetry studies conducted by SMRU since 1988 showed that seals regularly transit between their haul-out locations on the Norfolk and Lincolnshire coasts to the southern boundary of the Hornsea Zone (SMRU, 2011). The noise impact range maps for fish (Figure 3.8 in Volume 2, Chapter 3: Fish and Shellfish Ecology) show that there is potential for avoidance of fish species along this southern boundary, and therefore potential for this displacement of prey species to lead to effects on seals. Therefore, given the potential for a temporary loss of a small proportion of available foraging habitat during construction (Table 5.5), the sensitivity of grey seal is assessed as being medium, (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.205 *et seq.*).

Conclusion

5.2.70 Due to the potential temporary loss of only a small area of available foraging habitat for grey seal, the large foraging range of this species and ability to exploit similar resources elsewhere and the short to medium term duration of potential effect over the construction phase (i.e., up to five years over a possible three phases), no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Potential Impacts during Operation and Maintenance

5.2.71 The potential impacts during the operational and maintenance phase that have been screened in as posing a potential for LSEs to grey seal are:

- Behavioural disturbance from vessel noise;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

Behavioural disturbance from underwater noise from vessel noise

Magnitude

5.2.72 Subsea noise from operational and maintenance vessels servicing the Project One wind farm are expected to increase to 10,950 vessel movements per year, resulting in an annual increase of 24% above current baseline levels within Project One (see paragraph 5.2.74).

5.2.73 Auditory injury from vessel traffic is unlikely given the current background levels of noise in the region. Disturbance is therefore most likely to be related to the noise generated from vessels, with the greater potential for disturbance likely arising from crew transport vessels to and from Subzone 1.

5.2.74 The magnitude of effect is low as it is limited in both spatial (i.e., within Subzone 1) and temporal (i.e., intermittent) extent.

Sensitivity

5.2.75 The sensitivity of grey seal was described previously for construction-related vessel disturbance (see paragraphs 5.2.47 *et seq.*). This would most likely result in avoidance behaviour for the more sensitive species, such grey seal. The distance over which effects will occur will vary according to the species and the ambient noise levels, but masking may potentially occur several kilometres from the noise source. Given the duration of the impact, and the current background levels of vessel noise in the study area, it is likely that grey seal will habituate to this increase in vessel activity. The sensitivity of grey seal to noise from vessel traffic during the operational and maintenance phase is considered to be low (Environmental Statement Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.229 *et seq.*).

Conclusion

5.2.76 Due to the localised spatial extent of increased vessel activity within the Project One area, the intermittent frequency of vessel movements and the low sensitivity of grey seal to vessel noise, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Physical injury from increased risk of collision with vessels

5.2.77 Collision risk is likely to occur as a result of increased vessel traffic during operation and maintenance activities of both the offshore wind farm and the cable route corridor. In particular, there is potential for mortality from corkscrew injuries which has been linked to vessels using ducted propellers (see paragraph 5.2.54 *et seq.*).

Magnitude

5.2.78 The current level of vessel activity passing through the Project One marine mammal study area is 10,950 vessel movements per year. During the operational phase there is predicted to be, on average, 2,630 vessel transits per year over the lifetime of the project (Volume 2, Chapter 8: Shipping and Navigation). This will result in an annual increase of 24% above current baseline levels within the Project One area.

5.2.79 The maintenance vessels will be similar to those used during construction (e.g., jack-up barges), and will therefore be operating at a slow speed between maintenance operations around the wind farm site. The greater potential for collision is likely to arise from crew transport vessels to and from Subzone 1. These will be smaller vessels of between 18 and 20 m in length.

5.2.80 The magnitude of effect is low as it is limited in both temporal (i.e., intermittent) and spatial (i.e., within Subzone 1) extent**.**

Sensitivity

5.2.81 The sensitivity of grey seal to increased collision risk was described previously for construction-related collision risk (paragraph 5.2.55 *et seq.*). In summary, there is little evidence to suggest that vessel activity is a significant threat to grey seal. The evidence for this comes from a recent study of seal carcasses which show corkscrew injuries that may be characteristic of collision with ducted propellers (Thompson *et al.,* 2010b). Although the links are currently unproven, in order to adopt a precautionary approach, the guidelines on risk assessment for corkscrew injuries to seals (JNCC, 2012) have been followed here, (see paragraph 5.2.55 *et seq.* and Section 5.6).

5.2.82 The sensitivity of grey seal is therefore assessed as being low to medium (see Table 5.4), (Environmental Statement Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.238 *et seq.*).

Conclusion

5.2.83 Due to the already high existing level of vessel activity in the vicinity of Project One supporting other industries, the localised spatial extent of increased vessel activity offshore (i.e., within Subzone 1), the intermittent risk of collision with vessels over the lifetime of the wind farm, and the low to medium sensitivity of grey seal collision with vessels, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.84 Fish and shellfish receptors are vulnerable to a number of impacts during operation including long-term habitat loss due to the presence of turbine foundations, introduction of new habitat types in the form of hard substrates from the foundations, underwater noise as a result of operation of the turbines, EMF from subsea cables, accidental pollution, temporary habitat loss during maintenance operations, and reduced fishing pressure within Subzone 1. The potential effects of these impacts on fish receptors are described in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology.

5.2.85 Long-term habitat loss would affect only a small proportion (0.01%) of the habitat within the southern North Sea and similar habitats are widespread throughout the region. The most vulnerable species were those that are known to spawn within the Project One marine mammal study area. Sandeel and herring were considered to be of medium sensitivity to habitat loss but due to the very small magnitude of the impact, the effect was considered to be of minor significance. However, there may also be some beneficial effects due to the introduction of new substrate and the possibility for a reef effect. Although this may benefit a different suite of species than those for which negative effects of habitat loss are felt, the varied diet of marine mammals means that they too may benefit from exploiting an alternative prey resource. For example, the increase in harbour porpoise at Egmond aan Zee offshore wind farm during operation, was attributed to a possible ‘reef’ effect which led to an increase in prey resources in the area. Another beneficial effect may also arise from reduced fishing pressure within the offshore wind farm, and subsequently a local increase in abundance of fish and shellfish. Sandeel in particular may benefit from a reduction in trawling activity, and as a key prey item for marine mammals, an increase in abundance would offer an increase in prey resources. The significance of this effect was considered to be minor.

5.2.86 Electrical and magnetic fields emitted from subsea cables may have a localised effect on fish and shellfish along the export cable route corridor. The most sensitive species are likely to be elasmobranchs, such as rays and dogfish, which use electroreceptors to detect prey and migratory species, such as salmon and European eel, which use the earth’s magnetic field to aid in navigation. Most species were considered to be of low sensitivity, with the exception of migratory fish, which were of medium sensitivity, but due to the low magnitude of the impact the significance of effect was considered to be minor.

5.2.87 There were not considered to be any negative effects of subsea noise or temporary habitat loss from turbine operation on fish and shellfish and therefore the significance for both was negligible.

5.2.88 Accidental pollution may represent a short-term effect of small magnitude, but such an impact is considered unlikely to occur, and due to rapid dispersal over the tidal cycle, would not result in any long-term significant effects on fish and shellfish.

5.2.89 The overall impact of changes in the fish and shellfish community resulting from operational impacts is predicted to be of local spatial extent and long-term (over the life-time of the project). The magnitude is predicted to be low.

Sensitivity

5.2.90 Grey seal exploit a range of prey resources and range widely to forage. Although some key prey items may be affected during operation, such as sandeel and herring, these effects are localised and unlikely to result in a significant effect on fish and shellfish assemblages. The potential for the operational wind farm to provide benefits to fish and shellfish may also indirectly benefit grey seal. Grey seal sensitivity to changes in prey species availability is therefore assessed as low (Environmental Statement Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.274 *et seq.*).

Conclusion

5.2.91 Due to grey seal ranging widely to forage and able to exploit similar resources elsewhere, the localised spatial and temporal impact on prey species (sandeel and herring) from Project One operational and maintenance activities in the offshore environment, and the potential benefits to fish and shellfish due to the wind farm, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Potential Impacts during Decommissioning

5.2.92 This section identifies and assesses the impacts that have been predicted to affect grey seal during the decommissioning phase for Project One as follows:

- Behavioural disturbance from underwater noise as a result of removal of turbines and cables and vessel noise;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

5.2.93 As discussed in Section 4.3, the offshore components associated with decommissioning of Project One will not have any direct or indirect effects on habitats within UK or transboundary SACs/SCIs designated for grey seal populations, and so there will be no effect on the conservation objectives for those habitat features.

Behavioural disturbance from underwater noise as a result of removal of turbines and cables and vessel noise

Magnitude

5.2.94 Decommissioning of offshore infrastructure for Project One may result in temporarily elevated underwater noise levels which may have behavioural effects on grey seal. These elevated noise levels may be due to increased vessel movements and removal of the turbine foundations within Subzone 1 with the resulting noise levels dependant on the method used for removal of the foundation. Abrasive cutting, often anticipated for wind turbine removal, would not be expected to be significantly higher than general surface vessel noise. Studies of underwater noise from decommissioning activities reported source levels which are similar to those reported for medium sized surface vessels and ferries (Malme *et al.,* 1989; Richardson *et al.,* 1995). The noise resulting from wind turbine decommissioning employing abrasive cutting is unlikely to result in any injury, avoidance or significant disturbance to grey seal. Some temporary minor disturbance might be experienced in the immediate vicinity of the decommissioning activity, for example, from decommissioning vessels. Therefore, the impact of decommissioning noise will be direct but over a very localised spatial extent, temporary and intermittent over the duration of the decommissioning phase.

Sensitivity

5.2.95 The sensitivity of grey seal to decommissioning noise is likely to be the same as described in paragraphs 5.2.43 *et seq.* for sensitivity to vessel noise, and is therefore low.

Conclusion

5.2.96 Due to the significantly lower noise levels that would occur during decommissioning and therefore no auditory damage expected, the local spatial extent and intermittent nature of the impact from noise during this phase and the low sensitivity of grey seal to decommissioning noise, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Physical injury due to vessel collision

Magnitude

5.2.97 An increase in vessel traffic during the decommissioning phase resulting in an increased disturbance or an increased potential of vessel strikes to grey seal is expected to result in effects that are the same or similar to the effects of construction (see paragraphs 5.2.52 *et seq.*). Some temporary minor disturbance might be experienced in the immediate vicinity of the decommissioning activity, for example, from decommissioning vessels. Therefore, the impact of increased risk of vessel collision during decommissioning will be direct and temporary for the duration of the decommissioning phase.

Sensitivity

5.2.98 It is expected that vessel movements will be the same as during construction and subsequent potential for physical damage to grey seals as a result of hull impacts or effects from ducted propellers would be similar to those during the construction phase. The sensitivity of grey seal to vessel collision during decommissioning is likely to be the same as described in paragraphs 5.2.55 *et seq.* for sensitivity during construction and is therefore low to medium.

Conclusion

5.2.99 Due to the already high existing level of vessel activity in the vicinity of Project One, the localised spatial extent of increased vessel activity offshore during decommissioning, the intermittent risk of collision with vessels over this phase, and the low to medium sensitivity of grey seal collision with vessels, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.100 The effects of changes in prey (fish and shellfish) species distribution and/or abundance, resulting from decommissioning activities, on grey seal is expected to be the same or similar to the effects of construction. Therefore, there are no expected population level effects predicted as described in paragraphs 5.2.61 *et seq.* for the duration of decommissioning.

Sensitivity

5.2.101 The sensitivity of grey seal to changes in prey species availability during the decommissioning phase is likely to be the same as described in paragraphs 5.2.68 *et seq.* for sensitivity during construction, and is therefore medium.

Conclusion

5.2.102 Due to grey seal ranging widely to forage and able to exploit similar resources elsewhere, the localised spatial impact on prey species (sandeel and herring) during decommissioning, and the short to medium term duration of effect over the this phase, no adverse effects are predicted on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Harbour Seal

<u>Information on European sites</u>

5.2.103 The screening assessment (Section 4.3) identified three European sites for which harbour seal is a primary or qualifying feature and where potential LSEs from Project One activities could occur.

5.2.104 Tagging studies have shown that harbour seals travel repeatedly to between 75 and 120 km offshore (Sharples *et al*., 2005). The Hornsea Zone would therefore be at the furthest edge of their likely range for the majority of mainland European haul-out sites. Telemetry studies conducted by Reijnders *et al*. (2010) showed very limited use of the central North Sea region by seals from colonies present in mainland Europe.

5.2.105 The UK and transboundary sites considered in this assessment are:

- The Wash and North Norfolk Coast SAC – primary reason for designation (grade A);
- Doggersbank pSCI (Netherlands) – qualifying feature (grade C); and
- Klaverbank pSCI (Netherlands) – qualifying feature (grade C).

The Wash and North Norfolk Coast SAC

5.2.106 The Wash and North Norfolk Coast SAC and Ramsar lies 94.5 km to the south of the proposed Project One. The presence of the Annex II species, harbour seal is a primary reason for the selection of this site. The conservation objectives for harbour seal for this SAC are with regard to the natural habitats and/or species for which the site has been designated:

- *'Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving favourable conservation status of each of the qualifying features:*
  - *Subject to natural change, to maintain or restore;*
  - *The extent and distribution of qualifying natural habitats and habitats of qualifying species;*
  - *The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;*
  - *The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;*
  - *The populations of qualifying species; and*
  - *The distribution of qualifying species within the site.'*

5.2.107 The SAC holds the largest harbour seal breeding colony in the UK with peak counts of 2,829 adults within The Wash and a further 372 at Blakeney in 2009. Pupping occurs during June and July followed by a period of moult during August. During this period harbour seals remain closer to the haul out sites than the rest of the year. The number of harbour seals (including pups) counted in The Wash during pupping has increased in recent years from 2,350 in 1999 to 5,125 in 2010.

5.2.108 Harbour seal tagging studies undertaken at The Wash indicate widespread nearshore usage with regular trips further offshore to the north-east (Jones and Matthiopoulos, 2012). Tagging results indicate that harbour seals from The Wash and North Norfolk Coast SAC may occur within the Project One (Figure 5.2).

5.2.109 Two years of site specific studies recorded a total of 18 harbour seals within Project One and 35 individuals when including the 4 km buffer. The results from the studies indicate that harbour seals occur in Project One at densities of 0.025 km^2.

Transboundary sites

5.2.110 Harbour seal is a qualifying feature of a number of transboundary SACs and SCIs in the southern North Sea (Section 4.2). The harbour seal population is also divided between two regions as for grey seal, the marine north-east Atlantic region and the marine Baltic region (EEA, 2009b). The overall favourable conservation status for harbour seal assessed from 2001 to 2006 in the marine Atlantic region is 'unfavourable-adequate' and is dictated by the status (i.e., decreasing trend and population numbers below reference values) of the UK population, which represents more than 50% of the marine regions population (EEA, 2009b).

5.2.111 There is the potential for LSEs on harbour seals from Doggersbank pSCI (Netherlands) and Klaverbank pSCI (Netherlands) during the construction, operational and maintenance and decommissioning phases of Project One. These sites are located approximately 44 km and 64 km, respectively, to the east of Project One. Harbour seal is listed as a qualifying feature (i.e., it is not the primary reason for designation) for both sites, with a population coded as C in both site's data form (EEA, 2013). This indicates each site holds between 0% and 2% of the Dutch harbour seal population. The Dutch harbour seal population has increased significantly in the last ten years with an estimated population of 2,350 individuals in 2002 increasing to 7,821 in 2011 (SeaonScreen, 2012). Results from tagging studies undertaken on harbour seals in the Netherlands indicate that harbour seals generally forage within coastal waters up to some tens of kilometres away from the haul-out sites (Brasseur, *et al.,* 2006).

5.2.112 The conservation objectives for harbour seal as a feature of transboundary (non-UK) Natura 2000 sites has been assumed for the purpose of this assessment to be to maintain or restore this species' population (and their habitats) in favourable condition (subject to natural change).

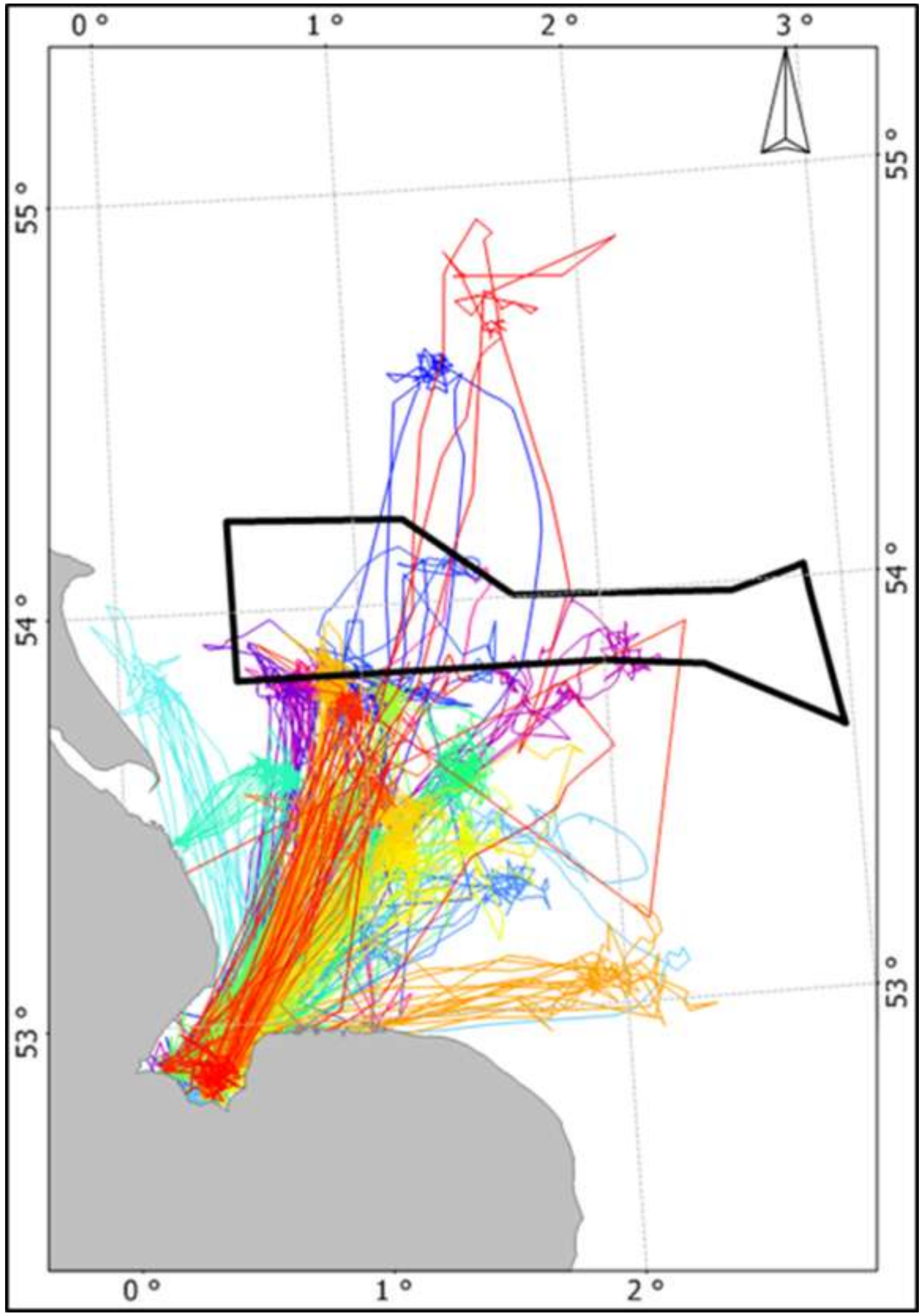


Figure 5.2 Tracks of the 24 harbour seals tagged in the Wash. Each seal is represented by a different colour (SMRU, 2011).

Baseline Environment

5.2.113 Harbour seal is the smaller of the two species of pinniped that breed in the UK. As with grey seal, the majority of the UK population is found in Scottish waters although the densest concentration of haul-out sites is found along the tidal sandbanks and mudflats of The Wash in East Anglia (SMRU, 2004). These sites are used in August during the annual moult, when harbour seal gather in large numbers at key sites, and during breeding season, when females disperse more widely across the sites to give birth. Most harbour seal haul-out sites are used daily, with individuals showing a great degree of site fidelity (Yochem *et al*., 1987).

5.2.114 Within the southern North Sea, the main August haul-out sites are located at The Wash (several haul-out sites), Blakeney Point, Donna Nook, and Scroby Sands (Figure 5.2). The Wash and North Norfolk Coast SAC is home to the largest colony of harbour seal in the UK, and hosts 7% of the total UK population of this species. The tidally exposed sandbanks and mudflats within this SAC provide an extensive habitat for this species (English Nature and Environment Agency, 2003). The closest haul-out site to the Project One marine mammal study area is at Donna Nook.

5.2.115 Harbour seal are generalist feeders and their diet varies both seasonally and from region to region (Hammond *et al*., 2001). Tagging of harbour seal in the UK suggests that harbour seal tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). Harbour seal hauled out in The Greater Wash region (which encompassed the North Norfolk and Lincolnshire coastlines), however, were found to travel between 75 and 120 km offshore to assumed foraging locations. The seal tagging study showed that in The Wash, harbour seal typically move between their haul-outs and the southern boundary of the Hornsea Zone.

5.2.116 The population of harbour seal in The Wash has fluctuated over the years due to outbreaks of Phocine Distemper Virus in 1988 and 2002. Since these events, the population has recovered and in 2009 it was only 7% less than pre-epidemic levels. The most recent published surveys in 2010 show that the number of harbour seal hauled out in The Wash alone, during the August moult, is 3,086 individuals. This figure was subsequently scaled up to estimate the total population in The Wash and North Norfolk Coast SAC based on the premise that at any one time 65% of the population is at sea (SCOS, 2011). The population of harbour seal was calculated as 8,817 individuals.

5.2.117 Offshore, the site-specific surveys showed that harbour seal are distributed throughout Subzone 1, with most sightings along the southern half of the Project One marine mammal study area and in the vicinity of the export cable route corridor. The mean density estimated across the Hornsea Zone plus 10 km buffer was relatively low with 0.028 animals per km^2. The highest density of harbour seal was observed in the southwest of the Subzone 1 plus a 4 km buffer with a maximum of 0.12 animals per km^2. This correlates well with the seal tagging study which showed movement between the haul-outs and the southern boundary of the Hornsea Zone. The SMRU at-sea modelled density estimates also showed highest densities of harbour seal between The Wash and the southern boundary of the Hornsea Zone, although the density estimates were higher than those estimated using the site-specific data, with a maximum density in the Project One marine mammal study area (along the cable route corridor) of 10 to 50 animals per km^2.

Prey species in the Project One study area

5.2.118 Volume 5, Annex 5.3.1: Fish and Shellfish Technical Report of the Environmental Statement describes the fish and shellfish assemblages in the Project One marine mammal study area as being characteristic of those in the wider region of the southern North Sea and present in similar abundances. Pelagic fish species were abundant throughout the study area, with sprat (identified as one of the key characterising species of the fish assemblage) and herring recorded throughout. Seasonal peaks in herring were recorded in spring, and to a lesser extent in autumn, with particularly high numbers inshore, where sublittoral coarse sediment provides a suitable substrate for spawning (see Figure 3.19 in Volume 5, Annex 5.3.1: Fish and Shellfish Technical Report). Key characterising demersal fish species are whiting, dab, plaice, gurnard and solenette. Sandeels, a key prey item for many marine mammals, were recorded throughout the Project One marine mammal study area, and the area to the north of the Hornsea Zone was identified as a region of high spawning intensity for this group of species (Figure 3.23 and Figure 3.24 in Volume 5, Annex 5.3.1; Fish and Shellfish Technical Report). Indeed, the dominant substrate to the north of the Hornsea Zone is deep circalittoral sand, which is a suitable habitat for spawning sandeels (see Volume 5, Annex 5.2.1: Benthic Subtidal and Intertidal Ecology Technical Report).

Potential Impacts during Construction

5.2.119 This section identifies and assesses the impacts that have been predicted to affect harbour seal during the construction phase for Project One as follows:

- Physical injury and/or behavioural disturbance from underwater noise as a result of foundation installation (i.e., piling), vessel noise and other construction activities (e.g., cable installation);
- Behavioural disturbance from underwater noise from vessel noise and other activities;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

5.2.120 As discussed in Section 4.3, the offshore components associated with construction of Project One will not have any direct or indirect effects on habitats within UK or transboundary SACs/SCIs designated for harbour seal populations, and so there will be no effect on the conservation objectives for those habitat features.

Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities

5.2.121 The impact of underwater noise from construction is discussed in Section 4.6 of the Environmental Statement Volume 2, Chapter 4: Marine Mammals and below.

Magnitude

5.2.122 The modelled hammer energies showed that the potential for physical injury or permanent auditory injury in harbour seal is localised with effects only occurring out to a maximum of 100 m from the source. Beyond this distance, out to a maximum of 1.7 km, temporary auditory impairment can occur and noise levels sufficient to cause TTS and may elicit a fleeing response in seals. The range of effects will therefore be confined mainly to within the Project One marine mammal study area.

5.2.123 The impact is predicted to be of local spatial extent, intermittent (during pile driving activity) and reversible. Based on the worst case temporal scenario of a single piling vessel, the impact would occur over a period of 36 months. It is predicted that the impact will affect harbour seal directly though the magnitude is assessed as low.

Sensitivity

5.2.124 The modelled noise contours from the 800 kJ, 1,400 kJ and 2,300 kJ hammer energies were overlaid on the site-specific visual data and the SMRU modelled at-sea densities based on telemetry and aerial surveys. As with grey seal, the sensitivity of harbour seal appears to be considerably greater using the SMRU modelled at-sea data compared with the site-specific data. For example, for single piling, based on the maximum hammer energy (2,300 kJ) the number of animals affected by TTS/fleeing was 0.0981 animals (0.0011% of The Wash and North Norfolk Coast SAC population) for the site-specific data compared with 5.779 animals (0.066% of The Wash and North Norfolk Coast SAC) for the SMRU at-sea data (Table 5.6).

Table 5.6 Summary of number of harbour seal individuals potentially affected by piling noise based on a single piling scenario at different hammer energies.

Impact criterion	1,400 kJ		2300 kJ	
	Number of individuals	% The Wash SAC	Number of individuals	% The Wash SAC
Site-specific data:				
TTS/fleeing 171 dB	0.02	0.0002	0.04	0.0005
SMRU at-sea data :				
TTS/fleeing 171 dB	2.99	0.03	5.77	0.06

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.2.125 Estimates of the number of harbour seal affected by concurrent piling using all hammer energies also showed that very small numbers would be potentially displaced from the zones of disturbance. Even using the higher estimates of seal abundance (i.e., the SMRU at-sea data), the effects are small, with a maximum (based on 2,300 kJ) of 11.15 animals disturbed, equating to just 0.126% of The Wash and North Norfolk Coast SAC population (Table 5.7).

Table 5.7 Summary of number of harbour seal individuals potentially affected by piling noise based on a concurrent piling scenario at different hammer energies.

Impact criterion	1,400 kJ		2300 kJ	
	Number of individuals	% The Wash SAC	Number of individuals	% The Wash SAC
Site-specific data:				
TTS/fleeing 171 dB	0.04	0.0005	0.12	0.0009
SMRU at-sea data :				
TTS/fleeing 171 dB	5.59	0.09	11.14	0.13

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.2.126 The main harbour seal haul-out in The Wash lies approximately 94 km from Subzone 1. It is therefore considered unlikely that individuals hauled-out will be disturbed or displaced during piling operations. The most likely effect will therefore be displacement from a small area of their habitat at sea, which has been estimated for pinnipeds as approximately 8.33 km^2. The area of effect differs slightly from that given for grey seal due to the differences in propagation at the two different modelled locations chosen for each species. As described for grey seal, there may be energetic costs of displacement due to increased swimming distances if seals have to deviate from their course around the zone of disturbance, or reduced foraging due to density-dependant competition in alternative foraging areas. However, due to the very small extent of habitat affected compared to the availability of similar suitable habitat in the wider area, it is considered unlikely that there will be any population-level effects (see Volume 5, Annex 5.2.1: Benthic Ecology Technical Report).

5.2.127 This is further supported by empirical studies at Horns Rev offshore wind farm in Denmark. This study on harbour seal showed that, although the proportion of time seals spent within the wind farm boundary during construction was reduced compared to baseline levels, animals were frequently observed in the area and continued to forage at their preferred habitat (Tougaard *et al.,* 2003). In addition, because harbour seal possess extremely sensitive vibrissae (whiskers) they have the ability to track prey using the hydrodynamic trails they emit (Dehnhardt *et al*., 2001) and discriminate between different sized or shaped objects (Wieskotten *et al*., 2011). Therefore, temporary reduction in their hearing capabilities is less likely to affect pinnipeds during foraging compared with cetaceans, which rely more heavily on their hearing during foraging.

5.2.128 Any effects that do occur are considered likely to be reversible following cessation of the piling. Evidence for this comes from a recent population modelling study for the effects of piling at the Moray Firth and Beatrice proposed offshore wind farms on harbour seal (Thompson *et al*., 2011). This study looked at the long-term effects on the population as a result of short to medium-term decreases in the population, including both potential mortality of animals exposed to noise levels that would induce PTS and behavioural displacement. The results of the modelling showed that over a 25 year period, even with considerable reductions in the population during the piling phase, for all worst case spatial and temporal scenarios, and for cumulative effects from both wind farms piling concurrently, the population of harbour seals would recover in the long-term.

5.2.129 Based on the available data presented in this assessment, harbour seal sensitivity to noise from construction piling is assessed as low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.104 *et seq.*)

Conclusion

5.2.130 Piling will result in a short to medium-term (18 to 36 months depending on whether single or concurrent piling is adopted) effect. However, due to the distance of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs to Subzone 1 within which piling will occur, the local spatial extent and intermittent nature of the impact from construction piling noise, the low sensitivity of harbour seal, no adverse effects are predicted on the harbour seal at a population level or as a feature of these Natura 2000 sites. Furthermore, with regard to The Wash and North Norfolk Coast SAC, only a small proportion of harbour seal from this population are predicted to be affected (paragraphs 5.2.124 and 5.2.125).

Behavioural disturbance from underwater noise from vessel noise

Magnitude

5.2.131 During the construction phase there is the potential for an increase in construction vessel traffic to cause negative effects on harbour seal. Most published information on effects of vessel disturbance to seals is largely anecdotal. Harbour seal hauled-out may show alert reactions or be displaced when vessels approach within 100 m of a haul-out (Richardson *et al*., 2005). In areas where there are high levels of vessel traffic, harbour and grey seals have been noted to closely approach tour boats that regularly visit an area, and may habituate to sounds from tour vessels (Bonner, 1982).

5.2.132 The existing level of vessel activity passing through the Project One marine mammal study area and the predicted level from Project One during the construction phase are described in paragraph 5.2.44 and 5.2.45.

5.2.133 The increased vessel activity will, for the most part, be localised to within the Project One area, and existing shipping routes to and from ports and the frequency intermittent over the construction phase. Based on this, the magnitude of effect is considered to be low.

Sensitivity

5.2.134 Disturbance from vessel noise is predicted to occur primarily as a series of short-term events (e.g., during the crew transfer times) over the construction period (i.e., up to five years, over three phases), which would most likely result in avoidance behaviour for harbour seal. The sensitivity of harbour seal to noise from vessel traffic is therefore considered to be low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.158 *et seq.*).

Conclusion

5.2.135 Due to the localised spatial extent of increased vessel activity within the Project One area, short to medium-term effect (i.e., up to five years) over the construction phase, the low sensitivity of harbour seal to construction vessel noise, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Physical injury from increased risk of collision with vessels

Magnitude

5.2.136 During the construction phase there is the potential for physical injury from increased risk of vessel collision. The risk of injury to seals from vessel collisions is described in paragraph 5.2.55 *et seq*.

5.2.137 There will be an additional 6,950 vessel transits over the construction phase, which represents an uplift in vessel activity of approximately 12.7% above baseline levels, however, it is likely that the noise generated by the construction vessels will, to some extent, deter harbour seal from the immediate vicinity (see paragraphs 5.2.44 and 5.2.45) and therefore collision with construction vessels in the proximity of turbine locations is unlikely. The magnitude of effect is therefore low as the increase in vessel activity is both limited in temporal and spatial extent.

Sensitivity

5.2.138 Subzone 1 lies 94.5 km (51.0 NM) from The Wash and North Norfolk Coast SAC, containing the closest harbour seal haul-out. According to the JNCC guidelines this presents a low risk to harbour seal and therefore no mitigation is recommended (Table 5.4).

5.2.139 The cable route corridor boundary lies 39.4 km (21.3 NM) from The Wash and North Norfolk Coast SAC. According to the distances given in the JNCC guidelines (Table 5.4) this presents a medium risk to harbour seal and the recommendations are to consider alternatives to the use of ducted propellers and/or to avoid the breeding season if possible. The sensitivity of harbour seal is therefore assessed as low to medium, (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.172 *et seq.*)

Conclusion

5.2.140 Due to the already high existing level of vessels in the vicinity of Project One supporting other industries, the localised spatial extent of increased vessel activity, the intermittent risk of collision with vessels over the entire construction phase (i.e., up to five years), and the low to medium sensitivity of harbour seal to vessel collision, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (Section 5.6).

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.141 During the construction phase there is the potential for indirect effects on harbour seal due to changes in prey species distribution and/or abundance. The potential effects of these impacts on prey species are described in Volume 2, Chapter 3: Fish and Shellfish Ecology and summarised in paragraph 5.2.90. In summary, potential effects of changes in prey resources on harbour seal would be short to medium term (up to five years) over the construction phase and are expected to return to baseline conditions following cessation of construction activities. The magnitude of effect is therefore predicted to be low.

Sensitivity

5.2.142 Harbour seal generally exploit a suite of different prey items and can travel great distances (up to 120 km) to forage. It is likely that the effects described for fish and shellfish will occur over a similar, or lesser, extent and duration as those for grey seal, with seals likely to follow displaced species in order to exploit resources. Furthermore, due to the mobile nature of harbour seal, it is likely that they will be able to exploit similar resources elsewhere, although there may be energetic costs associated with animals travelling further to a preferred foraging ground (see paragraph 5.2.69). Therefore, given the potential for a temporary loss of a small proportion of available foraging habitat during construction (Table 5.5), the sensitivity of harbour seal is assessed as being medium, (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.205 *et seq.*).

Conclusion

5.2.143 Due to the potential temporary loss of only a small area of available foraging habitat for harbour seal, their ability to exploit similar resources elsewhere and the short to medium term duration of effect over the construction phase (i.e., up to five years over a possible three phases), no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Potential Impacts during Operation and Maintenance

5.2.144 The potential impacts during the operational and maintenance phase that have been screened in as posing a potential for LSEs to harbour seal are:

- Behavioural disturbance from vessel noise;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

Behavioural disturbance from underwater noise from vessel noise

Magnitude

5.2.145 During the operational and maintenance phase there is the potential for behavioural disturbance to harbour seal due to underwater noise from vessels. The magnitude of this potential impact has been discussed in paragraph 5.2.131 *et seq.* and is predicted as low.

Sensitivity

5.2.146 Based on a precautionary approach it is assumed that harbour seal will respond to disturbance from vessel noise through avoidance behaviour. Furthermore, given the duration of the impact, and the current background levels of vessel noise in the study area, it is likely that harbour seal will habituate to this increase in vessel activity. The sensitivity of harbour seal to noise from vessel traffic during the operational and maintenance phase is considered to be low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.229 *et seq.*).

Conclusion

5.2.147 Due to the localised spatial extent of increased vessel activity within the Project One area, the intermittent frequency of vessel movements and the low sensitivity of harbour seal to vessel noise, no adverse effects are predicted on harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Physical injury from increased risk of collision with vessels

Magnitude

5.2.148 During the operational and maintenance phase there is the potential for physical injury to harbour seal from increased risk of vessel collision. During the operational phase there is predicted to be, on average, 2,630 vessel transits per year over the lifetime of the project, which will result in an annual increase of 24% above current baseline levels within the Project One area. The magnitude of this potential impact is the same as for grey seal and has been discussed in paragraphs 5.2.78 *et seq.* and is predicted as low.

Sensitivity

5.2.149 The sensitivity of harbour seal to increased collision risk was described previously for construction-related collision risk. In summary, there is little evidence to suggest that vessel activity is a significant threat to harbour seal. The evidence for this comes from a recent study of seal carcasses which show corkscrew injuries that may be characteristic of collision with ducted propellers (Thompson *et al.,* 2010b). Although the links are currently unproven, in order to adopt the precautionary approach, the guidelines on risk assessment for corkscrew injuries to seals (JNCC, 2012) have been followed here, with recommendations for mitigation highlighted (see Table 5.4 and Section 5.6).

5.2.150 The sensitivity of harbour seal is assessed as being low to medium (see Table 5.4) (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.238 *et seq.*).

Conclusion

5.2.151 Due to the already high existing level of vessel activity in the vicinity of Project One supporting other industries, the localised spatial extent of increased vessel activity offshore (i.e., within Subzone 1), the intermittent risk of collision with vessels over the lifetime of the wind farm, and the low to medium sensitivity of harbour seal collision with vessels, no adverse effects are predicted on the grey seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.152 During the operational and maintenance phase there is the potential for indirect effects on harbour seal due to changes in prey species distribution and/or abundance. The magnitude of this potential impact has been discussed in paragraph 5.2.84 *et seq.* and is predicted as low.

Sensitivity

5.2.153 Harbour seal exploit a range of prey resources and range widely to forage. Although some key prey items may be affected during operation, such as sandeel and herring, these effects are localised and unlikely to result in an adverse effect on fish and shellfish assemblages. The potential for the operational wind farm to provide benefits to fish and shellfish may also indirectly benefit harbour seal. Therefore, harbour seal sensitivity to changes in prey species availability is therefore assessed as low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.274 *et seq.*).

Conclusion

5.2.154 Due to the localised spatial and temporal impact on prey species (sandeel and herring) from Project One operational and maintenance activities in the offshore environment, harbour seal being able to exploit similar resources elsewhere and the potential benefits to fish and shellfish due to the wind farm, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

<u>Potential Impacts during Decommissioning</u>

5.2.155 This section identifies and assesses the impacts that have been predicted to affect harbour seal during the decommissioning phase for Project One as follows:

- Behavioural disturbance from underwater noise as a result of removal of turbines and cables and vessel noise;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

5.2.156 As discussed in Section 4.3, the offshore components associated with decommissioning of Project One will not have any direct or indirect effects on habitats within UK or transboundary SACs/SCIs designated for harbour seal populations, and so there will be no effect on the conservation objectives for those habitat features.

Behavioural disturbance from underwater noise as a result of removal of turbines and cables and vessel noise

Magnitude

5.2.157 Decommissioning of offshore infrastructure for Project One is described in paragraph 5.2.94, and may result in temporarily elevated underwater noise levels which may have behavioural effects on harbour seal. Some temporary minor disturbance might be experienced in the immediate vicinity of the decommissioning activity, for example, from decommissioning vessels. Therefore, the impact of decommissioning noise will be localised in spatial extent and temporary / intermittent over the duration of the decommissioning phase. Based on this, the magnitude of effect is considered to be low.

Sensitivity

5.2.158 The sensitivity of harbour seal to decommissioning noise is likely to be the same (i.e., low) for sensitivity to construction vessel noise, as described in paragraphs 5.2.134 *et seq*.

Conclusion

5.2.159 Due to the significantly lower noise levels that would occur during decommissioning, and therefore no auditory damage expected, the local spatial extent and intermittent nature of the impact from noise during this phase and the low sensitivity of harbour seal to decommissioning noise, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Physical injury due to vessel collision

Magnitude

5.2.160 An increase in vessel traffic during the decommissioning phase resulting in an increased disturbance or an increased potential of vessel strikes to harbour seal is expected to result in effects that are the same or similar to the effects of construction (see paragraphs 5.2.136 *et seq.*). These effects will be temporary for the duration of this phase and the magnitude is predicted to be low.

Sensitivity

5.2.161 It is expected that vessel movements will be the same as during construction and subsequent potential for physical damage to harbour seal as a result of hull impacts or effects from ducted propellers would be similar to those during the construction phase. Therefore the sensitivity of harbour seal to vessel collision during decommissioning is likely to be the same as described in paragraphs 5.2.138 *et seq.* for sensitivity during construction and is therefore low to medium.

Conclusion

5.2.162 Due to the already high existing level of vessel activity in the vicinity of Project One, the localised spatial extent of increased vessel activity offshore during decommissioning, the intermittent risk of collision with vessels over this phase, and the low to medium sensitivity of harbour seal, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.163 The effects of changes in prey (fish and shellfish) species distribution and/or abundance, resulting from decommissioning activities, on harbour seal is expected to be the same or similar to the effects of construction (see paragraphs 5.2.141 *et seq*.). Based on this, the magnitude of effect is considered to be low.

Sensitivity

5.2.164 The sensitivity of harbour seal to changes in prey species availability during the decommissioning phase is likely to be the same as described in paragraphs 5.2.142 *et seq.* for sensitivity during construction, and is therefore medium.

Conclusion

5.2.165 Due to the localised spatial and temporal impact on prey species (sandeel and herring) from Project One decommissioning activities in the offshore environment, harbour seal being able to exploit similar resources elsewhere and the short to medium term duration of effect over the this phase, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Harbour Porpoise

Information on European sites

5.2.166 The screening assessment (Section 4.3) identified 26 European sites for which harbour porpoise is a primary or qualifying feature and where potential LSEs from Project One offshore components could occur.

5.2.167 There are no UK SAC sites in UK North Sea waters that support qualifying populations of harbour porpoise. There is limited information available on the connectivity between Natura 2000 sites and Project One for this species, and there is only limited information on foraging ranges. The assessment for harbour porpoise has therefore been conducted at a southern North Sea population level and so the conclusions drawn for the sites screened into this assessment (Table 4.3) are relevant. All southern North Sea sites with harbour porpoise as a qualifying feature have been screened into the assessment (Table 4.7). A total of 26 transboundary (i.e., non-UK) sites were identified during the screening assessment in the southern North Sea that have been designated for harbour porpoise populations as qualifying features (Table 4.3).

5.2.168 The conservation objectives for harbour porpoise as a feature of transboundary Natura 2000 sites has been assumed for the purpose of this assessment to be to maintain or restore this species' population (and their habitats) in favourable condition (subject to natural change). The favourable conservation status for harbour porpoise from 2001 to 2006 in UK waters was assessed as 'favourable' (EEA, 2009c).

5.2.169 Harbour porpoise inhabits cold temperate to sub-polar continental shelf waters of the marine Atlantic, Baltic and marine Mediterranean regions (EEA, 2009c). The overall favourable conservation status for harbour porpoise assessed from 2001 to 2006 in the marine Atlantic region is 'unfavourable-adequate' due to the population decline recorded in the species' southeastern distribution range, which is most often attributed to large scale gillnet fishery bycatch mortality (EEA, 2009c). However, some countries such as Belgium, Denmark and the Netherlands assessed harbour porpoise as 'unfavourable-bad' due to the species' population decline (EEA, 2009c).

5.2.170 There is the potential for LSEs on harbour porpoise from the sites listed below during the construction, operational and maintenance and decommissioning phases of Project One:

- SBZ 1 / ZPS 1 SCI – qualifying feature (grade B);
- SBZ 2 / ZPS 2 SCI – qualifying feature (grade B);
- SBZ 3 / ZPS 3 SCI – qualifying feature (grade C);
- Vlakte van de Raan pSCI – qualifying feature (grade C);
- NTP S-H Wattenmeer und angrenzende Küstengebiete SCI – qualifying feature (grade A);
- Doggerbank SCI – qualifying feature (grade B);
- Östliche Deutsche SCI– qualifying feature (grade A);
- Sylter Außenriff SCI – qualifying feature (grade A);
- Steingrund SCI – qualifying feature (grade C);
- Helgoland mit Helgoländer Felssockel SCI – qualifying feature (grade C);
- Hamburgisches Wattenmeer SCI – qualifying feature (grade C);
- Unterelbe SCI – qualifying feature (grade A);
- Borkum-Riffgrund SAC – qualifying feature (grade B);
- Nationalpark Niedersächsisches Wattenmeer SCI – qualifying feature (grade B);
- Gule Rev SAC – qualifying feature (grade B);
- Sydlige Nordsø SAC – qualifying feature (grade A);
- Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI – qualifying feature (population only grade A);
- Bancs des Flandres pSCI – qualifying feature (grade B);
- Recifs Gris-nez Blanc-nez pSCI – qualifying feature (grade B);
- Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI – qualifying feature (grade B);
- Baie de canche et couloir des trois estuaries pSCI – qualifying feature (grade B);
- Doggersbank pSCI – qualifying feature (grade B);
- Klaverbank pSCI – qualifying feature (grade B);
- Vlakte van de Raan SAC – qualifying feature (grade B);
- Noordzeekustzone SAC – qualifying feature (grade A); and
- Noordzeekustzone II pSCI – qualifying feature (grade B).

5.2.171 For those transboundary sites for which the harbour porpoise population is graded A or B, then this feature is considered a primary reason for designation of the site. For those sites graded as C, harbour porpoise is simply a qualifying feature. Populations in sites graded A are between 15% and 100% of the national harbour porpoise population, in those graded B between 2 and 15% and in sites graded C between 0 and 2% (EEA, 2013).

5.2.172 Harbour porpoise numbers in Dutch waters have increased significantly since the mid-1990s with a strong seasonal variation. Peak numbers occur offshore during April and May compared to January and February in nearshore waters (Camphuysen and Siemensma, 2011). The total Dutch harbour porpoise population is unknown but an estimated 60,000 individuals out of the North Sea population of 231,000 individuals occur in an area covering approximately two-thirds of the Dutch waters (Camphuysen and Siemensma, 2011).

5.2.173 Densities of harbour porpoise in German waters have been recorded as 1.0 and 1.5 animals per km^2 in 2002 and 2003, respectively, for Doggerbank SCI, and 0.4 animals per km^2 at Borkum Riffgrund SAC (Pinn, 2009).

Baseline Environment

5.2.174 Harbour porpoise are widespread throughout the temperate waters of the North Atlantic and North Pacific and are the most abundant cetacean in UK waters. The entire North Sea coast of the North Atlantic is considered to be important for this species (Reid *et al.,* 2003).

5.2.175 Results of the site specific surveys showed a high abundance of individuals distributed throughout the Project One marine mammal study area with similar results in the visual and acoustic surveys. During the two year survey period, 4,879 individuals were recorded in the entire Hornsea Zone plus 10 km buffer, and 2,714 individuals within Subzone 1 plus 4 km buffer across the two year survey period.

5.2.176 Modelled density estimates were presented for visual and acoustic data. Estimated density was shown to peak over the summer months, although the visual data showed a stronger seasonal peak compared to the acoustic data. Females with calves were regularly observed at this time of year and there was a summer peak in the number of calves.

5.2.177 In comparison to the wider southern North Sea marine mammal study area, density figures from the site specific surveys suggest that the Hornsea Zone, in particular Subzone 1, is an important area for harbour porpoise. Densities in the Hornsea Zone plus 10 km buffer were calculated using the visual data as 1.647 animals per km^2, whilst in Subzone 1 alone the densities were estimated as 2.814 animals per km^2). The acoustic data produced marginally lower density estimates with 1.263 animals per km^2 for the whole survey area (Hornsea Zone plus buffer). These values are higher than the average density of 0.598 animals per km^2 recorded for SCANS-II block U in the southern North Sea (Hammond *et al.*, 2013). A simple comparison of population size within the Hornsea Zone plus 10 km buffer using the density estimates multiplied by the area show that the population could vary considerably, with a population of 5,554 individuals estimated using the SCANS data compared with a population of 11,776 individuals using the site-specific acoustic data density estimate and 15,295 individuals using the site-specific visual density estimate. However, when comparing these figures it is important to note that the SCANS-II surveys were at a much lower resolution than the site-specific surveys. In relative terms, the SCANS data also showed that the southern North Sea is a key area for harbour porpoise in the North Sea as a whole (Hammond, 2006). As a precautionary approach, the data taken forward for the impact assessment were the modelled density estimates generated using the site-specific acoustic and visual survey data rather than the lower average density estimate based on SCANS-II.

5.2.178 Harbour porpoise feed on a wide range of fish species, but mainly small shoaling species from demersal or pelagic habitats (Santos and Pierce, 2003) such as whiting *Merlangius merlangus* during winter months, and sandeels *Ammodytidae* during summer months (Santos *et al.,* 2006). Young porpoise tend to target smaller species such as gobies *Gobiidae* and small crustaceans.

<u>Potential Impacts during Construction</u>

5.2.179 This section identifies and assesses the impacts that have been predicted to affect harbour porpoise during the construction phase for Project One as follows:

- Physical injury and/or behavioural disturbance from underwater noise as a result of foundation installation (i.e., piling), vessel noise and other construction activities (e.g., cable installation);
- Behavioural disturbance from underwater noise from vessel noise and other activities;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

5.2.180 As discussed in Section 4.3, the offshore components associated with construction of Project One will not have any direct or indirect effects on habitats within transboundary SACs/SCIs designated for harbour porpoise populations, and so there will be no effect on the conservation objectives for those habitat features.

Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities

5.2.181 The impact of underwater noise from construction activities is discussed in Section 4.6 of the Environmental Statement Volume 2, Chapter 4: Marine Mammals, and summarised below.

Magnitude

5.2.182 The modelled impact ranges for harbour porpoise suggest that for the largest hammer energy (2,300 kJ), instantaneous PTS could occur up to 600 m from the piling location. For lower hammer energies at 1,400 kJ and 800 kJ, the range at which harbour porpoise could experience instantaneous auditory injury would be out to a distance of 400 m and 250 m respectively (Table 5.8). As part of the project-design mitigation (Section 5.6), a 30 minute soft start will be employed and therefore instantaneous PTS is only likely to occur out to 200 m, which is the range for the 600 kJ soft start hammer energy. The modelled estimates of cumulative SEL show that even using the largest hammer energy, at 500 m the received noise dose would not be at a level sufficient to cause PTS in fleeing animals (Volume 4, Annex 4.3.2: Subsea Noise Technical Report). Therefore, with a soft/slow start procedure (up to 600 kJ for 30 minutes) and implementation of a MMMP with a standard 500 m mitigation zone, the risk of auditory injury is negligible.

5.2.183 It was predicted that the fleeing response in harbour porpoise (TTS) would occur out to a distances of 2.6, 3.5 and 4.6 km based on the 800 kJ, 1,400 kJ and 2,300 kJ (worst-case) hammer energies, respectively (Table 5.8). Possible avoidance (behavioural displacement) could occur over a larger area, with modelled results showing distances up to 19.4 to 28.7 km for the 800 kJ hammer energy, 24.1 to 33.2 km for the 1,400 kJ hammer energy and 28.8 to 46.6 km for the 2,300 kJ (worst-case) hammer energy. The range in effects reflects the propagation over two different substrates: sandy substrate and gravelly sand and the differences in bathymetry in different directions from the piling location.

5.2.184 The impact to harbour porpoise is predicted to be of local to regional extent (with potential for population-level effects over a wider area), and reversible in the long-term. The duration depends on whether there is single piling or concurrent piling. The magnitude of the impact magnitude is considered to be medium.

Table 5.8 Summary of harbour porpoise average impact range estimates for pile driving at a single location during construction at Project One. The model assessed the ranges for sandy substrate to the north, and gravelly sand to the south.

Impact criterion	Potential range of impact for harbour porpoise			
	600 kJ hammer energy	800 kJ hammer energy	1,400 kJ hammer energy	2,300kJ hammer energy
Instantaneous injury/PTS (pulse SEL 179 dB re 1 µPa^2·s)*	<200 m	<250 m	<400 m	<600 m
TTS/fleeing response (pulse SEL 164 dB re 1 µPa^2·s)*	<2.1 km	<2.6 km	<3.5 km	<4.6 km
Possible behavioural avoidance (pulse SEL 145 dB re 1 µPa^2·s)*	17.6 – 24.7 km	19.4 – 28.7 km	24.1 – 33.2 km	28.8 – 46.6 km

*Lucke *et al.* (2009).

Sensitivity

5.2.185 The TTS/fleeing response would affect a relatively small number of individuals compared to the estimated population, accounting for 0.12% or less of the North Sea reference population across all hammer energies and for both single and concurrent piling.

5.2.186 Table 5.9 and Table 5.10 summarise the number of harbour porpoise individuals potentially affected by piling noise based on a single and concurrent piling scenario. Assuming a single pile installation scenario, the numbers affected by TTS/feeling response ranged from 39 (acoustic dataset) or 63 (visual dataset) animals at 800 kJ with a gradual increase as hammer energy ramps up to a maximum of 142 (acoustic) or 225 (visual) animals at 2,300 kJ (Table 5.9). Thus over the range of hammer energies the number of animals estimated to be affected accounted for between 0.02 to 0.09% of the North Sea reference population.

5.2.187 For concurrent piling, the number of individuals potentially affected by TTS/fleeing gradually increases within increasing hammer energy. The minimum number affected by TTS/fleeing, at a hammer energy of 800 kJ, was calculated as 70 (acoustic) and 107 (visual) animals accounting for 0.03 and 0.04% of the reference population, respectively. At the maximum hammer energy of 2,300kJ the numbers potentially affected increased to 199 (acoustic) and 296 (visual) animals accounting for 0.08 and 0.12% of the reference population, respectively (Table 5.10).

5.2.188 The noise contours for possible avoidance extend over a distance of up to 46.6 km for the maximum hammer energy and animals within this zone are predicted to experience noise disturbance, which, as a worst case, may lead to displacement for a proportion of the population. For single piling, as hammer energy ramps up the proportion of the North Sea reference population potentially disturbed within this zone is between 0.81 and 2.42%. For concurrent piling, the proportion of the reference population potentially disturbed ranges from 0.97 to 2.77%.

5.2.189 A more realistic assessment, which considers the piling profile and the proportional displacement, suggests that considerably fewer animals are likely to be displaced during pile driving. Based on the information from the piling driveability study, it is predicted that the maximum hammer energy would only be employed for on average 32% of the piling duration and therefore over the course of the piling activity, realistically, the number of animals potentially affected by TTS/fleeing or behavioural disturbance would be less than if predicted using the worst case scenario of the maximum hammer energy for the entire piling period.

5.2.190 Baseline characterisation data suggests that the Project One marine mammal study area is an important area for harbour porpoise due to the higher densities found here compared to the wider southern North Sea. However, harbour porpoise are highly mobile and widespread throughout the North Sea and the proportion of available habitat affected by noise impacts is very small. The work currently being undertaken by SMRU Ltd and the University of Aberdeen on the Population Consequences of Disturbance (PCoD) will address some of the uncertainties associated with predicting longer term disturbance and seasonality (e.g., on fecundity) effects in the future (Lusseau *et al*., unpublished).

5.2.191 Harbour porpoise have a relative high fecundity, such that following breeding failure they are able to reproduce fairly quickly. In addition, given the wide ranging nature of harbour porpoise, their ability to exploit a wide range of prey species and the extent of available habitat elsewhere in the southern North Sea, it is likely that reduced fecundity would not occur in all individuals, even those potentially displaced from the disturbed area during the pile-driving activity.

5.2.192 Brandt *et al.* (2011) used a gradient sampling design to look at behavioural displacement in harbour porpoise at increasing distances from a single piling activity using a 900 kJ hammer energy at Horns Rev II offshore wind farm. The study found that recovery time decreased with increasing distance from the piling activity. At distances of 2.5 to 4.8 km, the abundance (measured as porpoise positive minutes) returned to baseline levels after 17 to 24 hours following cessation of piling; at distances of 10.1 to 17.8 km the abundance returned to baseline after 9 to 10 hours; and at 21.2 km there was a negligible decrease in abundance, and actually, after 70 hours the abundance exceeded baseline levels by 31%.

Another important finding in this study was that pile driving did not lead to 100% avoidance throughout the study area (Brandt *et al*., 2011). In summary, based on studies of harbour porpoise at Horns Rev offshore wind farm, this study shows that as distance from the source increases so the proportion of the population affected decreases (Brandt *et al.*, 2011).

Table 5.9 Summary of number of harbour porpoise individuals potentially affected by piling noise based on a single piling scenario at different hammer energies. Numbers affected were compared to the North Sea reference population based on the most recent SCANS-II estimates (Hammond *et al.,* 2013).

Impact criterion	800 kJ		1,400 kJ		1,600 kJ		1,900 kJ		2,300 kJ	
	Number of affected animals	% North Sea	Number of affected animals	% North Sea	Number of affected animals	% North Sea	Number of affected animals	% North Sea	Number of affected animals	% North Sea
Visual										
TTS/ fleeing 164 dB	63.4	0.03	76.9	0.03	148.2	0.06	183.0	0.07	225.5	0.09
Possible Avoidance 145 dB	2,540.6	1.03	4,227.9	1.71	4,795.3	1.94	5,464.4	2.21	6,004.3	2.42
Acoustic										
TTS/ fleeing 164 dB	39.1	0.02	77.8	0.03	92.5	0.04	115.1	0.05	142.6	0.06
Possible Avoidance 145 dB	2,008.7	0.81	3,309.2	1.34	3,745.1	1.51	4,295.0	1.73	4,783.2	1.93

Table 5.10 Summary of number of harbour porpoise individuals potentially affected by piling noise based on a concurrent piling scenario at different hammer energies. Numbers affected were compared to the North Sea reference population based on the most recent SCANS-II estimates (Hammond *et al.,* 2013).

Impact criterion	800 kJ		1,400 kJ		2,300 kJ	
	Number of affected animals	% North Sea	Number of affected animals	% North Sea	Number of affected animals	% North Sea
Visual						
TTS/fleeing 164 dB	107.3	0.04	187.0	0.08	295.7	0.12
Possible Avoidance 145 dB	3,065.2	1.24	4,827.7	1.95	6,849.2	2.77
Acoustic						
TTS/fleeing 164 dB	69.7	0.03	123.6	0.05	198.7	0.08
Possible Avoidance 145 dB	2,397.9	0.97	3,788.9	1.53	5,394.5	2.18

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.2.193 In summary, it is likely that there will be medium-term effects of disturbance of harbour porpoise within the zone of possible avoidance (out to a maximum of 46.6 km), but empirical evidence from published studies suggest that movement back into the area of impact will occur in the short term (days) and populations will return to baseline levels following cessation of the piling activity. In addition, although there is the potential for disturbance to lead to displacement, since harbour porpoise may range over large distances, it can be assumed that given the extent of similar habitat throughout the Southern North Sea region, it is unlikely that displacement would lead to any population-level effects.

5.2.194 Based on the available data presented in this assessment, harbour porpoise sensitivity to noise from construction piling is assessed as medium (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.34 *et seq.*).

Conclusion

5.2.195 Piling will result in a short to medium-term (18 to 36 months depending on whether single or concurrent piling is adopted) effect. However, due to the distance to Subzone 1 from the harbour porpoise Natura 2000 sites screened into this assessment, the local spatial extent and intermittent nature of the impact from construction piling noise, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species and their high fecundity, and empirical evidence indicating movement of animals back to the area of impact following cessation of piling, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of these Natura 2000 sites.

Behavioural disturbance from underwater noise from vessel noise

Magnitude

5.2.196 During the construction phase there is the potential for an increase in construction vessel traffic to cause negative effects on harbour porpoise. The existing level of vessel activity passing through the Project One marine mammal study area and the predicted level from Project One during the construction phase are described in paragraph 5.2.44 and 5.2.45.

5.2.197 The increased vessel activity will, for the most part, be localised to within the Project One area, and existing shipping routes to and from ports and the frequency intermittent over the construction phase. Based on this, the magnitude of effect is considered to be low.

Sensitivity

5.2.198 Harbour porpoise, as one of the most hearing sensitive species, generally avoid vessels (Miller *et al.,* 2008). In general, harbour porpoise communicate with high frequencies and therefore are likely to be most sensitive to outboard and high-speed engines that generate such frequencies. They are less likely to be affected by low frequency noise generated by slower moving vessels. Sensitivity to vessel noise is most likely related to the activity being carried out at the time (Senior *et al*., 2008). For example, resting animals are likely to avoid vessels, whereas when foraging, they will tend to ignore them (Richardson *et al*., 1995).

5.2.199 Vessel noise can affect harbour porpoise through 'masking', whereby vocal communication either between individuals of the same species or during hunting for prey may become ineffective. However, masking studies have shown that unless the received vocalisation and masking noise come from the same direction, masking is unlikely to occur at significant levels (Richardson *et al*., 1995). This is because directional hearing, coupled with the strong directional nature of echolocation pulses, is an important adaptation in echolocating marine mammals, such as harbour porpoise.

5.2.200 Against a background of high vessel activity from commercial shipping and fishing, and including many smaller vessels operating at fast speeds, it is considered unlikely that this increase in vessel activity will affect harbour porpoise in the Project One marine mammal study area due to their apparent habituation to vessel noise (see the Environmental Statement Volume 2, Chapter 8: Shipping and Navigation). This is may be due to their echolocating abilities in the marine environment and the ability of marine mammals to compensate to some extent for masking by, for example, increasing their whistle rate to maintain communication, as was seen with bottlenose dolphins in Florida (Buckstaff, 2004). The sensitivity of harbour porpoise to noise from vessel traffic is considered to be low (paragraph 4.6.158 *et seq.* of the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.2.201 Due to the localised spatial extent of increased vessel activity within the Project One area, short to medium-term effect (i.e., up to five years) over the construction phase, the low sensitivity of harbour porpoise to construction vessel noise, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 screened into this assessment.

Physical injury from increased risk of collision with vessels

Magnitude

5.2.202 During the construction phase there is the potential for physical injury from increased risk of vessel collision. Over the construction phase (i.e., up to five years, over up to three phases), there is a predicted increase in vessel traffic of 6,966 vessel transits over the five year. It is likely that some of these vessels will use ducted propellers, and approximately a quarter of vessels (22.4%) will be for crew transfers and support, which have a capacity for higher speeds of up to 25 knots.

5.2.203 The evidence for lethal injury from boat collisions to cetaceans suggests that incidents are likely to be rare (CSIP, 2011). Out of 478 *post mortem* examinations of harbour porpoise in the UK carried out between 2005 and 2010, only four (0.8%) were attributed to boat collisions. The magnitude of effect is therefore low as the increase in vessel activity is both limited in temporal and spatial extent.

Sensitivity

5.2.204 Whilst seals have been the focus of the corkscrew injury research, there is new evidence emerging that harbour porpoise may also be vulnerable to corkscrew injury (Marine Scotland Science, 2013, *pers. comm.*). The potential for mortality in harbour porpoise due to corkscrew injuries from ducted propellers is uncertain at present. However, the Developer will continue to monitor the emerging research on this and, should any evidence be published to suggest that there is a significant risk to harbour porpoises, will consider appropriate best practice the detail of which would be set out within the MMMP. The sensitivity of harbour porpoise is therefore assessed as low, (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.172 *et seq.*).

Conclusion

5.2.205 Due to the already high existing level of vessels in the vicinity of Project One supporting other industries, the localised spatial extent of increased vessel activity, the intermittent risk of collision with vessels over the entire construction phase (i.e., up to five years), and the low sensitivity of harbour porpoise to vessel collision, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment.

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.206 During the construction phase there is the potential for indirect effects on harbour porpoise due to changes in prey species distribution and/or abundance. The potential effects of these impacts on prey species are described in Volume 2, Chapter 3: Fish and Shellfish Ecology and summarised in paragraph 5.2.90. In summary, potential effects of changes in prey resources on harbour porpoise would be short to medium term (up to five years) over the construction phase and are expected to return to baseline conditions following cessation of construction activities. The magnitude of effect is therefore predicted to be low.

Sensitivity

5.2.207 Harbour porpoise feed on a wide range of fish species, but mainly small shoaling species from demersal or pelagic habitats (Santos and Pierce, 2003) such as whiting *Merlangius merlangus* during winter months, and sandeels *Ammodytidae* during summer months (Santos *et al.,* 2006) (see paragraph 5.2.178). Given the potential for a temporary loss of a small proportion of available foraging habitat during construction (Table 5.5), the sensitivity of harbour porpoise is assessed as being medium, (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.205 *et seq.*).

Conclusion

5.2.208 Due to the potential temporary loss of only a small area of available foraging habitat for harbour porpoise, their highly mobile and wide ranging nature allowing these marine mammals to exploit varied prey resources elsewhere in the southern North Sea and the short to medium term duration of effect over the construction phase (i.e., up to five years over a possible three phases), no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment.

<u>Potential Impacts during Operation and Maintenance</u>

5.2.209 The potential impacts during the operational and maintenance phase that have been screened in as posing a potential for LSEs to harbour porpoise are:

- Behavioural disturbance from vessel noise;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

Behavioural disturbance from underwater noise from vessel noise

Magnitude

5.2.210 During the operational and maintenance phase there is the potential for physical injury from increased risk of vessel collision. The magnitude of this potential impact has been discussed in paragraph 5.2.212 *et seq*. and is predicted as low.

Sensitivity

5.2.211 As with the effects of piling noise, there are uncertainties in predicting the potential effects of vessel noise on harbour porpoise, as the science is still poorly understood. Based on the precautionary approach it is therefore assumed that harbour porpoise will respond to disturbance from vessel noise through avoidance behaviour. The distance over which effects will occur will vary with the ambient noise levels, but masking may potentially occur several kilometres from the noise source. The sensitivity of harbour porpoise is therefore considered to be low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.229 *et seq.*).

Conclusion

5.2.212 Due to the localised spatial extent of increased vessel activity within the Project One area, the intermittent frequency of vessel movements during the operational and maintenance phase and the low sensitivity of harbour porpoise to construction vessel noise, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 screened into this assessment.

Physical injury from increased risk of collision with vessels

Magnitude

5.2.213 During the operation and maintenance phase there is the potential for physical injury to harbour porpoise from increased risk of vessel collision. During the operational phase there is predicted to be, on average, 2,630 vessel transits per year over the lifetime of the project (Volume 2, Chapter 8: Shipping and Navigation). This will result in an annual increase of 24% above current baseline levels within the Project One area. Vessels operating in Subzone 1 will operate at slow speeds and so the greater risk of collision will be for vessels transiting to and from Subzone 1. The magnitude of this potential impact is predicted as low.

Sensitivity

5.2.214 The sensitivity of harbour porpoise to increased vessel traffic and the risk of collision is discussed in paragraph 5.2.204 and is assessed as low.

Conclusion

5.2.215 Due to the already high existing level of vessels in the vicinity of Project One supporting other industries, the localised spatial extent of increased vessel activity, intermittent risk of collision with vessels over the lifetime of the wind farm and low sensitivity of harbour porpoise, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment. SMW will continue to monitor the emerging research on ducted propellers and risk of collision with harbour porpoise and, should any evidence be published to suggest that there is a significant risk to harbour porpoises, will consider appropriate best practice the detail of which would be set out within the MMMP.

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.216 During the construction and decommissioning phases there is the potential for indirect effects on harbour porpoise due to changes in prey species distribution and/or abundance. The magnitude of this potential impact has been discussed in paragraph 5.2.84 *et seq.* and is predicted as low.

Sensitivity

5.2.217 Harbour porpoise exploit a range of prey resources and range widely to forage. Although some key prey items may be affected during operation, such as sandeel and herring, these effects are localised and unlikely to result in a significant effect on fish and shellfish assemblages. The potential for the operational wind farm to provide benefits to fish and shellfish may also indirectly benefit harbour porpoise. Therefore, harbour porpoise sensitivity to changes in prey species availability is assessed as low (see the Environmental Statement Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.274 *et seq.*).

Conclusion

5.2.218 Due to the potential temporary loss of only a small area of available foraging habitat for harbour porpoise, their highly mobile and wide ranging nature allowing these marine mammals to exploit varied prey resources elsewhere in the southern North Sea and the potential benefits to fish and shellfish (and indirectly to harbour porpoise) due to the wind farm, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment.

Potential Impacts during Decommissioning

5.2.219 This section identifies and assesses the impacts that have been predicted to affect harbour porpoise during the decommissioning phase for Project One as follows:

- Behavioural disturbance from underwater noise as a result of removal of turbines and cables and vessel noise;
- Physical injury due to vessel collision; and
- Changes in prey (fish) species distribution and/or abundance.

5.2.220 As discussed in Section 4.3, the offshore components associated with decommissioning of Project One will not have any direct or indirect effects on habitats within UK or transboundary SACs/SCIs designated for harbour porpoise populations, and so there will be no effect on the conservation objectives for those habitat features.

Behavioural disturbance from underwater noise as a result of removal of turbines and cables and vessel noise

Magnitude

5.2.221 Decommissioning of offshore infrastructure for Project One is described in paragraph 5.2.94, and may result in temporarily elevated underwater noise levels which may have behavioural effects on harbour porpoise. Some temporary minor disturbance might be experienced in the immediate vicinity of the decommissioning activity, for example, from decommissioning vessels. Therefore, the impact of decommissioning noise will be direct but over a very localised spatial extent, temporary and intermittent over the duration of the decommissioning phase.

Sensitivity

5.2.222 The sensitivity of harbour porpoise to decommissioning noise is likely to be the same as described in paragraph 5.2.30 for sensitivity to construction vessel noise, and is therefore assessed as low.

Conclusion

5.2.223 Due to the significantly lower noise levels that would occur during decommissioning, and therefore no auditory damage expected, the local spatial extent and intermittent nature of the impact from noise during this phase and the low sensitivity of harbour porpoise to decommissioning noise, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment.

Physical injury due to vessel collision

Magnitude

5.2.224 An increase in vessel traffic during the decommissioning phase resulting in an increased disturbance or an increased potential of vessel strikes to harbour porpoise is expected to result in effects that are the same or similar to the effects of construction (see paragraphs 5.2.202 *et seq.*). Therefore, the impact of increased risk of vessel collision during decommissioning will be direct and temporary for the duration of the decommissioning phase and the magnitude is predicted to be low.

Sensitivity

5.2.225 It is expected that vessel movements will be the same as during construction and subsequent potential for physical damage to harbour porpoise would be similar to those during the construction phase. The sensitivity of harbour porpoise to vessel collision during decommissioning is likely to be the same as described in paragraph 5.2.235 for sensitivity during construction, and is therefore assessed as low.

Conclusion

5.2.226 Due to the already high existing level of vessel activity in the vicinity of Project One, the localised spatial extent of increased vessel activity offshore during decommissioning, the intermittent risk of collision with vessels over this phase, and the low sensitivity of harbour porpoise, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of Natura 2000 sites screened into this assessment. SMW will continue to monitor the emerging research on ducted propellers and risk of collision with harbour porpoise and, should any evidence be published to suggest that there is a significant risk to harbour porpoises, will consider appropriate best practice the detail of which would be set out within the MMMP.

Changes in prey (fish) species distribution and/or abundance

Magnitude

5.2.227 The effects of changes in prey (fish and shellfish) species distribution and/or abundance, resulting from decommissioning activities, on harbour porpoise is expected to be the same or similar to the effects of construction. The magnitude of this potential impact has been discussed in paragraph 5.2.84 *et seq.* and is predicted as low.

Sensitivity

5.2.228 The sensitivity of harbour porpoise to changes in prey species availability during the decommissioning phase is likely to be the same as described in paragraphs 5.2.207 *et seq.* for sensitivity during construction, and is therefore assessed as medium.

Conclusion

5.2.229 Due to harbour porpoise being highly mobile and ranging widely to forage and able to exploit similar resources elsewhere, the localised spatial impact on prey species during decommissioning, and the short to medium term duration of effect over this phase, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment.

5.3 Effect on SAC/SCI Features – In-combination Assessment

Physical injury and/or behavioural disturbance from underwater noise during construction piling

5.3.1 The main source of an increase in subsea noise is pile driving activity during construction of other offshore developments. There is no Tier 1 assessment for in-combination piling noise because, as summarised in Table 4.5, there are no offshore wind farm projects currently under construction that are anticipated to overlap with the construction phase, and therefore piling activity at Project One. For the Tier 2 assessment, there may be overlap in the construction phases of several Round 2 and Round 3 offshore wind farms that are within the southern North Sea marine mammal study area and include (in order of closest to furthest distance from Project One): Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B and East Anglia One which are all within 160 km of Project One (Table 4.5). Consequently, these projects have the most potential for an in-combination impact since noise effects may occur in adjacent areas or even overlap.

5.3.2 Construction dates may also coincide with offshore wind farm projects further afield, including Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na

Gaoithe, Firth of Forth (Project Alpha and Project Bravo), Beatrice and the Aberdeen European Offshore Wind Deployment Centre, which are over 300 km from Project One in Scottish territorial waters. Whilst the focus of the in-combination assessment on marine mammals is on projects that have the most potential for cumulative effects (i.e., those in the southern North Sea marine mammal study area), this particular assessment also considers a broader perspective by looking at projects in the North Sea as a whole.

5.3.3 There may be overlap in construction with Tier 3 projects including East Anglia Three and Four, and Dogger Bank Teesside. However, based on consideration of data confidence, these are excluded from the in-combination assessment. Tier 3 therefore includes all the projects listed above for the Tier 2 assessment plus Hornsea Project Two. The in-combination assessment has modelled a scenario of single piling within Subzone 1 (for Project One) occurring concurrently with single piling in Subzone 2 (for Project Two), as a realistic worst case scenario for cumulative effects (see the Environmental Statement Volume 4, Annex 4.3.2: Subsea Noise Technical Report). This is because it is not deemed realistic that there would be sufficient vessels available to enable piing using two vessels in each of the project sites at the same time. The in-combination noise assessment models the distances out to which noise impacts may be expected from Project One and Project Two using the same range of hammer energies described for the Project One assessment above (i.e., 800 kJ, 1,400 kJ and 2,300 kJ).

5.3.4 Installation of the Cygnus oil and gas platform (a Tier 2 project) and the Project One offshore HVAC reactive compensation substation represent single installation events of extremely short duration (i.e., hours to days) compared to the extended periods over which offshore wind farm construction would be expected to occur (i.e., years) and therefore these are not considered further in the in-combination assessment.

5.3.5 It should be noted that the in-combination noise assessment has been based on information and assessments, where available, as presented in the respective Environmental Statements. Construction timescales, as outlined in Table 4.5, are indicative and subject to change. For the purposes of this assessment the full length of the construction periods have been considered for potential cumulative effects due to a lack of data of information regarding piling timescales for these projects. However, it is unlikely that piling will occur for the entire duration of construction, and as such the assessments presented in this chapter are considered to be highly precautionary. In addition, direct comparison of the effects on marine mammals predicted by the wind farms in the wider area is difficult due to the differing approaches taken to the assessments and the differing level of detail provided. Furthermore, in the main, these assessments are based on a worst case scenario applying the Rochdale approach, and therefore all individual assessments are inherently conservative, which therefore means that a cumulative assessment of a number of projects based on information in Environmental Statements will be highly precautionary. Nevertheless, a combined quantitative assessment of the cumulative impacts posed by Project One in conjunction with other projects has been attempted.

5.3.6 The spatial worst case considers the scenario that Project One is constructed over a single offshore phase up to three and a half years, based on piling using two vessels (where actual piling represents 18 months over this construction phase) and that the temporal overlap of piling at other projects wholly coincides with this three and a half year period. Where possible, information has been obtained from offshore wind farm assessments to show the range of possible effects, whereby the spatial worst case may be due to either concurrent piling (more than one piling vessel) or piling using the largest hammer energy as required for larger diameter monopiles. Thus, consideration of the maximum number of concurrent vessels and/or the largest hammer energy would generate the maximum spatial extent of noise impact over the southern North Sea.

5.3.7 The temporal worst case considers that construction at Project One will occur in three phases over a total five year construction window, whereby piling is undertaken using a single vessel (comprising a five year phased construction), and that piling at other projects may partially overlap with the start or the end of the construction window of Project One, extending the total potential time that piling may occur over in the southern North Sea to more than the five years.

<u>Grey Seal</u>

Magnitude

Tier 1 projects

5.3.8 There are no Tier 1 projects that may cause an in-combination impact.

Tier 2 projects

5.3.9 Table 5.11 below provides a summary of the projects included in the Tier 2 in-combination underwater noise assessment for grey seal with construction timescales overlapping that of Project One (see Table 4.5). The effect ranges for behavioural disturbance of grey seal as well as the total area affected, as predicted in the respective Environmental Statements, where available, are presented for the minimum and maximum scenarios for each project. Dudgeon was not considered to be an area of importance for grey seal and as such this species was not assessed in the HRA.

5.3.10 Although piling is not predicted to occur concurrently at all Tier 2 projects, some overlap in construction phases is anticipated (Table 4.5). Therefore, the spatial worst case would be if all piling coincided with the 36 month piling phase for Project One, but given that construction periods are unlikely to overlap entirely, a temporal worst-case would be a lower level of disturbance of grey seals from areas of the southern

North Sea over a total duration of more than five years (potentially up to eight years based on indicative construction schedules (2014-2021).

5.3.11 The impact to grey seal is predicted to be of local to regional extent, intermittent (during pile-driving activity) and grey seal are expected to recover to baseline conditions upon the completion of construction, the magnitude is therefore considered to be low to medium (see paragraph 4.7.79 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Table 5.11 Effect ranges for behavioural disturbance of pinnipeds, total area affected and significance of effect as predicted in respective Environmental Statements, based on the minimum and maximum effect scenarios modelled for each project.

Project	Project design scenario range	Minimum modelled effect range (km)	Maximum modelled effect range (km)	Total area affected (km^2)	Predicted significance of effect
Project One	2.5 m pin piles to 8.5 m diameter monopiles	<1	<1.7	4.36 -8.44	Minor adverse
Tier 2 projects					
Race Bank (Centrica Energy, 2009)	4.5 to 6 m diameter monopiles	7.3	11.5	n/a	Minor to moderate
Triton Knoll (TKOWFL, 2012)	3 to 8.5 m diameter monopiles	10.5	12.1	347-465	Minor
Westernmost Rough (DONG Energy, 2009)	No information	n/a	n/a	n/a	n/a
Dudgeon (Royal Haskoning, 2009)	3 to 6.5 m diameter monopiles	n/a	n/a	n/a	n/a
East Anglia One (EAOWFL, 2012)	2 to 2.5 m pin piles	n/a	0.3	0.283	Not significant
Dogger Bank Creyke Beck A (Forewind, 2013)	3,000 kJ (8.5 m monopile)	n/a	<1.8	32	Negligible (single) to minor (concurrent)
Dogger Bank Creyke Beck B (Forewind, 2013)	3,000 kJ (8.5 m monopile)	n/a	<1.9	32	Negligible (single) to minor (concurrent)
Tier 3 projects					
Project Two	2.5 m pin piles to 8.5 m diameter monopiles	<1	<1.7	4.36 -8.44	n/a

Tier 3 Projects

5.3.12 Noise modelling at Project Two showed that the range of effects for pinnipeds was similar to those predicted for Project One. The TTS/fleeing response could occur out to a range of 1.0 to 1.7 km for hammer energies of 800 kJ to 2,300 kJ (worst case) (Table 5.12). Since noise contours for Project One and Project Two piling scenarios are unlikely to overlap, the spatial extent of in-combination effects would be approximately double that for Project One alone.

5.3.13 Construction is scheduled to occur concurrently for up to four years for Project One and Project Two. Therefore, the temporal extent of the piling will lead to in-combination increase in piling duration above that of Project One (i.e., 18 to 36 months alone).

5.3.14 The impact to grey seal is predicted to be of local to regional extent, intermittent (during pile-driving activity) and grey seal are expected to recover to baseline conditions upon the completion of construction, the magnitude is therefore considered to be low to medium (see paragraph 4.7.82 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Table 5.12 Summary of pinniped impact range estimates for pile driving during construction at Project Two.

Impact criterion	Potential range of impact for pinnipeds		
	800 kJ hammer energy	1,400 kJ hammer energy	2,300kJ hammer energy
Instantaneous injury/PTS * (M$_{pw}$ weighted 186 dB re 1 μPa^2·s)	<100 m	<100 m	<100 m
TTS/Fleeing response/ Likely avoidance (M$_{pw}$ weighted 171 dB re 1 μPa^2·s) **	<1.0 km	<1.2 km	<1.7 km

*Southall *et al*. (2007) Injury Criteria.

**Southall *et al*. (2007) Single pulse behavioural disturbance.

Sensitivity

Tier 2 projects

5.3.15 There are no figures available for the number of grey seals affected by most of the Tier 2 projects, with the exception of Triton Knoll, and therefore it has not been possible to estimate the number of individuals affected by these projects and Project One in-combination. The estimate of the effects of piling at Triton Knoll, which is scheduled to commence construction in year three of the construction period for Project One, is given as likely disturbance of up to 2.5% of the Humber Estuary SAC population, and possible disturbance of up to 7.7% of the SAC population (TKOWFL, 2012). Similar to Project One, the impact ranges predicted for East Anglia One are highly localised (Table 5.11) and the East Anglia One Environmental Statement assessed considered that, given the low level of seal use of the site, the impact to grey seals would be negligible (EAOWFL, 2012).

5.3.16 The Dogger Bank Creyke Beck A and B Environmental Statement predicted that single piling at Creyke Beck A will affect up to 0.64 grey seal (based on average densities) and that the concurrent piling scenario will affect up to 13 individuals for both Creyke Beck A and B (Forewind, 2013).

5.3.17 There were no density estimates available for grey seal at Race Bank, and therefore it was not possible to calculate the number of animals affected by this project. However, the SMRU at-sea maps (Volume 5, Annex 5.4.1: Marine Mammal Technical Report) indicate the densities of seals decrease moving south of Donna Nook and therefore Race Bank is likely to be less important for grey seals. Due to the large areas of impact predicted for Race Bank, the impact on grey seals from piling noise at Race Bank was considered to be of minor to moderate significance (Centrica Energy, 2009).

5.3.18 Grey seal may be sensitive to disturbance due to the duration of the in-combination piling works anticipated for the above mentioned projects within the southern North Sea, which is expected to last more than five years for Tier 2 projects (Table 4.5). This could lead to an overall reduction in available habitat during this period, with potential consequences on fitness of individuals and energetic costs if animals have to swim longer distances to avoid areas of disturbance. However, grey seal may be tolerant of loud noises during certain activities, such as foraging (Richardson *et al.,* 2005). In addition, the area of disturbance is small in comparison to the extent of available habitat elsewhere, for which grey seal forage widely, and it is unlikely that seals will be displaced from all Tier 2 projects at any one time, suggesting that individuals will be able to continue foraging.

5.3.19 Grey seal sensitivity is therefore assessed as medium for Tier 2 projects (paragraph 4.7.91 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.20 For Tier 3 projects, estimates of the number of grey seals affected within the threshold for TTS/fleeing for Project Two are similar to those calculated for Project One (Table 5.12). Since the noise contours are not predicted to overlap during concurrent piling, the in-combination effects are that approximately double the number of grey seals that could be affected compared with Project One alone, based on similar piling scenarios for Project Two as for Project One. The total number of individuals affected by piling at Project One and Project Two were calculated using both the site specific data and the SMRU at-sea modelled density estimates in order to give the range of potential effects. The minimum cumulative effect, estimated for the 800 kJ hammer energy overlaid on the site-specific densities, predicts that a total of 0.086 grey seals may be disturbed on average. The maximum cumulative effect at 2,300 kJ hammer energy, estimated using the SMRU modelled densities, predicts that piling could disturb up to 6.31 individuals.

5.3.21 The total duration of piling at all Tier 2 and Tier 3 offshore wind farms in the southern North Sea (Table 5.11) is estimated to be more than five years. Consequently, although concurrent piling may be localised for grey seal, the species may be sensitive as a result of on-going disturbance over a longer period. As a result, there may negative effects on ecological functions (feeding or breeding) over this period, although grey seal are expected to recover on cessation of piling.

5.3.22 Grey seal sensitivity is therefore assessed as medium for Tier 3 projects (paragraph 4.7.91 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.23 It is possible that grey seal from the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs may occur within the Project One, either en-route or actively using these sites for foraging and other activities, although tagging studies of grey seals in the Netherlands indicate that there is relatively low usage of the area compared to nearshore Dutch waters (Jak *et al*., 2009).

5.3.24 Due to the localised spatial extent of predicted impacts, intermittent nature of the impact from construction piling noise and the extent of available habitat elsewhere, no adverse effects are predicted from Project One, alone or in-combination, on grey seal populations as a feature of Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs. Furthermore, specific conservation objectives for grey seal of the Humber Estuary SAC with regard to pup production and accessibility to Donna Nook breeding site (paragraph 5.2.8) will not be adversely affected.

<u>Harbour Seal</u>

Magnitude

Tier 1 projects

5.3.25 There are no Tier 1 projects that may cause an in-combination impact.

Tier 2 projects

5.3.26 The Tier 2 projects which include harbour seal as a receptor are the same as those presented in Table 5.11 for grey seal and include Triton Knoll, East Anglia One and Race Bank. Harbour seal were not screened into the Dogger Bank Creyke Beck A and B assessment, and as such these projects were not included in the in-combination assessment. The impact ranges are estimated to be the same as those described in Table 5.11 for grey seal with behavioural effects predicted out to 0.3 km for East Anglia and 12.2 km for Triton Knoll. Although piling is not predicted to occur concurrently at all of these projects, some overlap in construction phases is anticipated (Table 4.5) and therefore although the spatial worst case would be piling over a single year, given that construction periods are unlikely to overlap entirely, a lower level of disturbance of harbour seal from areas of the southern North Sea may be expected over a total duration of more than five years.

5.3.27 The potential impact to harbour seal is predicted to be of local to regional extent, intermittent (during pile-driving activity) and harbour seal are expected to recover to baseline conditions upon the completion of construction, the magnitude is therefore considered to be low to medium (see paragraph 4.7.98 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.28 In-combination noise modelling for Project One and Project Two is the same as described for grey seal (paragraph 5.3.12 and Table 5.12). The magnitude of in-combination effects is expected to be approximately double that for Project One alone and the temporal extent of the piling will lead to an increase in piling duration.

5.3.29 The potential impact to harbour seal is predicted to be of local to regional extent, intermittent (during pile-driving activity) and harbour seal are expected to recover to baseline conditions upon the completion of construction, the magnitude is therefore considered to be low to medium (see paragraph 4.7.100 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

Tier 2 projects

5.3.30 The assessment for the majority of the Tier 2 offshore wind farms did not estimate the number of animals affected in each of the noise thresholds for harbour seal. However, the impact range for East Anglia One was highly localised and the area was not highlighted as an area with high level of seal use (EAOWFL, 2012). The estimate of the effects of piling at Triton Knoll, were given as likely disturbance of up to 2.0% of The Wash and North Norfolk Coast SAC population, and possible disturbance of up to 6.2% of The Wash and North Norfolk Coast SAC population (TKOWFL, 2012).

5.3.31 The modelled impact areas were greater for Race Bank compared with Project One (Centrica Energy, 2009). At Project One no more than one individual was predicted to be affected by disturbance for the range of hammer energies modelled (800 kJ to 2,300 kJ) based on the site-specific data. The SMRU at-sea modelled density estimates suggested that the numbers affected may be in the range 3 to 6 animals for the 1,400 and 2,300 kJ hammer energy, respectively.

5.3.32 The duration of piling for the Tier 2 projects in the southern North Sea marine mammal study area could last for more than five years and could lead to an overall reduction in available habitat during this period, with potential consequences on fitness of individuals. However, given that the construction timescales are indicative, in reality not all will overlap temporally with the piling period of Project One. It is also likely that piling will not occur for the full duration of the offshore construction periods for offshore wind farm projects and therefore.

5.3.33 Harbour seal sensitivity is therefore assessed as medium for Tier 3 projects (paragraph 4.7.102 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.34 The underwater noise modelling predicted disturbance impacts for Project Two out to similar distances as that modelled for Project One. Estimates of the number of harbour seal affected within the threshold for TTS/fleeing are similar to those for Project One the in-combination effects are that approximately double the number of harbour seal could be affected compared with Project One alone.

5.3.35 Although concurrent piling may be localised for harbour seal, the species may be sensitive as a result of on-going disturbance from all Tier 3 projects over more than five years in the southern North Sea. As a result is that there may negative effects on ecological functions (e.g., feeding or breeding) over this period, although recovery is expected following cessation of piling.

5.3.36 Harbour seal sensitivity is therefore assessed as medium for Tier 3 projects (paragraph 4.7.102 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.37 It is possible that harbour seal from The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs may occur within the Project One and Race Bank offshore wind farm areas, either on-route or actively using the sites for foraging and other activities. Due to the localised spatial extent of predicted impacts, intermittent nature of the impact from construction piling noise and the extent of available habitat elsewhere, no adverse effects are predicted from Project One, alone or in-combination, on harbour seal populations as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

<u>Harbour Porpoise</u>

Magnitude

Tier 1 projects

5.3.38 There are no Tier 1 projects that may cause an in-combination impact.

Tier 2 projects

5.3.39 Table 5.13 provides a summary of the projects included in the Tier 2 underwater noise assessment for harbour porpoise and the effect ranges for behavioural disturbance of harbour porpoise, as predicted in the respective Environmental Statements, where available, and based on the minimum and maximum modelled/assessed scenarios for each of the projects.

5.3.40 Spatially, the worst case can be considered using the upper values for the total areas affected (or maximum range of effect where area is not available), as presented in Table 5.14. Although overlap in piling activity may occur between Project One and other offshore wind farms in the wider North Sea, spatially, the worst case would be where concurrent piling occurred at the maximum hammer energy for those projects within the southern North Sea marine mammal study area. Without detailed information on the piling schedules for Tier 2 projects, the spatial worst case is considered to extend over the duration of the piling phase (assuming concurrent piling) at Project One, (i.e., 18 months).

5.3.41 Temporally, piling activity during construction of Tier 2 offshore wind farm projects in the southern North Sea marine mammal study area could extend for more than just the maximum offshore construction window for Project One alone (i.e., piling over 36 months phased over a five year construction window). Given that piling for some Tier 2 projects, with construction schedules that overlap with Project One, is predicted to commence in 2014, with most projects forecast to complete in 2021, the period over which piling activity could occur may extend for up to eight years in the southern North Sea, based on these indicative construction schedules.

5.3.42 Given uncertainties associated with the construction schedules provided and predicting total piling durations (paragraph 4.7.24 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals), for the purposes of the in-combination assessment, the worst case temporally is that piling activity would occur intermittently over a period of five years or more (up to a maximum of eight years, although Project One piling would represent only a proportion of this entire construction period piling of 18 to 36 months), and that the spatial worst case would occur where concurrent pile-driving is at a maximum at all projects, and which for Project One would be if two vessels were concurrently piling over an 18 month period.

5.3.43 For Tier 2 projects in the southern North Sea marine mammal study area where data is available, the behavioural effects predicted for harbour porpoise range from approximately 4 to 28 km and are presented for each project in Table 5.13. Displacement is assumed over the total construction phase of all Tier 2 projects of more than five years. Although not directly within the southern North Sea marine mammal study area, construction of offshore wind farms in Scotland may indirectly contribute to in-combination effects. For example, the construction schedules for Beatrice, Moray Firth and Neart na Gaoithe offshore wind farms may coincide with the schedule for Project One. This could lead to an additional reduction in available habitat over the naturally wide range for harbour porpoise in the North Sea. Although, individually these projects may not significantly affect harbour porpoise, the in-combination disturbance of animals from their habitat is likely to increase the overall magnitude of effect. The indicative construction schedules show that piling may occur at these offshore wind farms in the southern North Sea at the same time as Project One, with a potential overlap of one or more years.

5.3.44 The in-combination piling works are considered to affect harbour porpoise directly with behaviour effects over the medium term leading to possible displacement and potential negative effects on ecological processes such as breeding and feeding. The potential impact to harbour porpoise is predicted to be of local to regional extent, intermittent (during pile-driving activity) and recover to baseline conditions upon the completion of construction is expected, the magnitude is therefore considered to be medium (see paragraph 4.7.20 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Table 5.13 Effect ranges for behavioural displacement of harbour porpoise based on the minimum and maximum scenarios modelled for each project.

Project	Project design modelled scenario range	Minimum modelled effect range (km)	Maximum modelled effect range (km)	Total area affected (km^2)	Predicted significance of effect
Project One	2.5 m pin piles to 8.5 m diameter monopiles	19.4 - 28.7	28.8 - 46.6	2,544 – 3,555	Minor to moderate adverse (short to medium term) and minor adverse in long term
Tier 2 projects					
Race Bank (Centrica Energy, 2009)	4.5 to 6 m diameter monopiles	4 - 8.5	8 – 12	(453)	Minor to moderate
Westernmost Rough (DONG Energy, 2009)	n/a	n/a	10 km (not modelled)	n/a	Negligible
Triton Knoll (TKOWFL, 2012)	3 to 8.5 m diameter monopiles	13.8	16.6	599-863	Minor
Dudgeon (Royal Haskoning, 2009)	3 to 6.5 m diameter monopiles	6.2	14.0	(616)	Minor adverse
East Anglia One (EAOWFL, 2012)	2 to 2.5 m pin piles	13.0	19.0	531-1,400	Not significant
Dogger Bank Creyke Beck A and (Forewind, 2013)	3,000 kJ hammer energy (8 m monopile)		19.5-28.5	1,968 (single) and 4,770 (multiple)	Negligible
Dogger Bank Creyke Beck B (Forewind,2013)	3,000 kJ hammer energy (8 m monopile)		24-43	3,480 (single) and 6,719 (multiple)	Minor adverse
Galloper (GWFL, 2011)	3 to 7 m diameter monopiles	37	49	n/a	Minor adverse
London Array II (RPS, 2005)	n/a	n/a	7.7	n/a	Minor to moderate adverse
Kentish Flats Extension (Vattenfall, 2011a)	6.5 m monopile (not modelled)	n/a	4	n/a	Minor adverse
Beatrice (BOWL, 2012)	Single pin pile to two simultaneous pin piles	n/a	61.25	7,380-8,053	Minor adverse
Moray Firth (MORL, 2012)	2.5 m diameter pin piles	n/a	n/a	n/a	Minor adverse
Neart na Gaoithe (Mainstream Renewable Power, 2012)	2.5 to 3.5 m diameter piles	n/a	n/a	4,329-4,668	Minor adverse
Aberdeen European Offshore Wind Deployment Centre (Vattenfall, 2011b)	3 m pile	n/a	22 km	n/a	Minor adverse

Project	Project design modelled scenario range	Minimum modelled effect range (km)	Maximum modelled effect range (km)	Total area affected (km^2)	Predicted significance of effect
Tier 3 projects					
Project Two (SMart Wind, 2012d)	2.5 m pin piles to 8.5 m diameter monopoles	20.5 - 31.0	28.5 - 47.0	1,654 – 3,648	Scoping only. Not yet assessed.

(Source: Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.45 Table 5.14 provides a summary of the projects included in the Tier 3 cumulative underwater noise assessment for harbour porpoise and the effect ranges for behavioural disturbance of harbour porpoise, The in-combination noise contours for piling at Project One and Project Two are considered for the hammer energy range considered in the Project One assessment alone (800 kJ, 1,400 kJ and 2,300 kJ). The underwater noise modelling assessment is presented in 4.7.29 *et seq.* (Environmental Statement Volume 2, Chapter 4: Marine Mammals) and impact ranges in Table 5.15 below. In summary, there is overlap in the areas of possible avoidance at both 1,400 kJ and 2,300 kJ, but no overlap at the 800 kJ hammer energy. The effect range for Project Two is similar to that for Project One.

5.3.46 The offshore construction schedules for Project One and Project Two are expected to overlap by up to four years and, therefore, during this time the in-combination effect has the potential to be up to twice that for Project One alone. Since Project One is planned as a phased development (i.e., 3.5 years of piling over a five year period), there will be times within this four year overlap where construction activities only take place at Project Two. Temporally, the offshore construction works for Project One and Project Two may occur over a maximum of seven years (i.e., one year of Project One and six years of Project Two construction). During this time disturbance would be limited to either Project One or Project Two, except for the periods where construction activities overlap. This construction period falls within the construction phase for the Tier 2 projects.

5.3.47 In total the construction phase for all Tier 3 projects may last more than five years (potentially up to eight years based on current information on indicative construction schedules presented in Table 4.5) and over this time there would be direct effects on harbour porpoise behaviour, with possible effects on ecological processes such as breeding or feeding. The magnitude is therefore considered to be medium (see paragraph 4.7.29 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Table 5.14 Summary of harbour porpoise impact range estimates for pile driving during construction at Project Two.

Impact criterion	Potential range of impact for harbour porpoise		
	800 kJ hammer energy	1,400 kJ hammer energy	2,300kJ hammer energy
Instantaneous injury/PTS (pulse SEL 179 dB re 1 μPa^2·s)*	<250 m	<350 m	<600 m
TTS/fleeing response (pulse SEL 164 dB re 1 μPa^2·s)*	<2.6 km	3.1 – 3.4 km	<4.6 km
Possible behavioural avoidance (pulse SEL 145 dB re 1 μPa^2·s)*	20.5 – 31.0 km	24.1 – 37.4 km	28.5 – 47.0 km

* Lucke *et al*. (2009).

Sensitivity

Tier 2 projects

5.3.48 Harbour porpoise is listed as a feature of 26 Natura 2000 sites within the southern North Sea marine mammal study area. It is likely that harbour porpoise will regularly move between other Tier 2 offshore wind farms sites considered in the in-combination assessment in the southern North Sea and these SACs/SCIs.

5.3.49 Predicted numbers of displaced individuals from projects considered in the in-combination assessment are presented in Table 5.15. In summary, Triton Knoll Environmental Statement predicts that between 817 and 948 individuals will experience behavioural disturbance as a result of piling noise during construction (TKOWFL, 2012). However, for most of the Tier 2 Round 2 offshore wind farm projects (including Race Bank, Dudgeon, Westernmost Rough, London Array II and Kentish Flats Extension) no estimates of the number of harbour porpoise potentially displaced were made. Therefore, an approximation of the number of individuals affected for these Tier 2 Round 2 projects has been calculated using the density estimate for SCANS Block U of 0.598 animals per km^2. Based on this assessment, there may be possible avoidance in up to an additional 7,100 harbour porpoise for Tier 2 projects in the southern North Sea marine mammal study area. In the wider North Sea, construction of offshore wind farms in Scotland may result in greater numbers of individuals potentially disturbed (paragraph 4.7.33 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.3.50 Spatially, the worst case scenario would be if piling was to occur over the same period at all wind farms (i.e., over the piling phase for Project One). The worst case temporally, will be intermittent disturbance over a period of more than five years, and potentially up to eight years based on the current construction schedules.

5.3.51 Harbour porpoise sensitivity is therefore assessed as medium (paragraph 4.7.36 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals). Recent studies by Brandt *et al.* (2011) suggest that it is unlikely that all individuals within the area of behavioural disturbance will be displaced and that the proportion affected decreases moving further away from the source.

Table 5.15 Minimum and maximum modelled effect scenarios for the tiered in-combination assessment with respect to the number of harbour porpoise displaced by piling noise and the percentage of the North Sea population (247,631 individuals) affected. The scenarios for each offshore wind farm are based on propagation over the greatest distance.

Project	Minimum modelled effect scenario		Maximum modelled effect scenario	
	Number of affected individuals	% North Sea	Number of affected individuals	% North Sea
Project One	2,540.6 (single) and 3,065.2 (concurrent)[1]	1.03	6,004.3 (single) and 6849.2 (concurrent)[1]	2.42
Tier 2				
Triton Knoll (TKOWLF, 2012)	817	0.33	948	0.38
Race Bank (Centrica, 2009)	*(135.8)*	*(0.05)*	*(270.6)*	*(0.11)*
Dudgeon (Royal Haskoning, 2009)	*(72.2)*	*(0.03)*	*(368.3)*	*(0.15)*
Westernmost Rough	-	-	*(186.0)*	*(0.08)*
London Array II	-	-	*(110.3)*	*(0.04)*
Kentish Flats Extension	-	-	*(29.8)*	*(0.01)*
East Anglia One (EAOWFL, 2012)	-	-	1,433.0	0.58
Dogger Bank Creyke A (Forewind, 2013)	-	-	1,470 (single) and 3,562 (concurrent)[2]	0.59 (single) and 1.4 (concurrent)
Dogger Bank Creyke B (Forewind, 2013)	-	-	2,599 (single) and 5,017 (concurrent)[2]	1.05 (single) and 2.03 (concurrent)
Galloper (GWFL, 2011)	1,187	0.48	1,780	0.72
Beatrice (BOWL, 2012)	-	-	4,350	1.76
Moray Firth (MORL, 2012)	4,098	1.65	4,537	1.83
Neart na Gaoithe (Mainstream Renewable Power, 2012)	385	0.16	887	0.36
Firth of Forth (Project Alpha) (Seagreen Wind Energy, 2012)	-	-	1,501 (single) 2,542 (based on both Firth of Forth projects piling)	0.61 1.03
Firth of Forth (Project Bravo) (Seagreen Wind Energy, 2012)	-	-	1,683 (single) 2,542 (based on both Firth of Forth projects piling)	0.68 1.03
Aberdeen European Offshore Wind Deployment Centre (Vattenfall, 2011b)	-	-	*(910.8)*	*(0.37)*
Tier 3				
Project One and Two[3]	4,798.7	1.92	10,686.8	4.28

( ) indicates that number of individuals affected has been estimated using the SCANS Block U density estimate of 0.592 animals per km^2.

[1] Based on visual density estimates as the higher numbers (worst case) compared with acoustic density estimates.

[2] Based on combined harbour porpoise and potential harbour porpoise sightings data and assuming no temporal overlap between the two projects.

[3] Results for Project One and Two presented together since the noise contours overlap.

Tier 3 projects

5.3.52 The numbers of harbour porpoise potentially affected by behavioural disturbed from Project Two have been estimated based on the modelled site-specific density estimates generated for Project One (paragraph 4.7.39 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

5.3.53 For the lowest 800 kJ hammer energy modelled the noise contours do not overlap, and therefore, with a similar area of effect the cumulative number of harbour porpoises is approximately double that of Project One alone. For the maximum scenario presented in Table 5.16 (i.e., 2,300 kJ hammer energy), although there is overlap in the noise contours there is also a large increase in animals affected from 6,004 for Project One alone to 10,687 for Projects One and Two in-combination. The maximum scenario for Project One and Project Two has the potential to affect 4.28% of the North Sea population for the two year duration of concurrent piling should animals be present in both locations at the same time at levels recorded during Project One baseline surveys.

5.3.54 Taking into account the Tier 2 projects, the potential spatial extent of disturbance is greater with many more individuals potentially displaced than for Project One in isolation (Table 5.15). Harbour porpoise sensitivity is therefore assessed as medium to high (paragraph 4.7.39 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals), due to the spatial and temporal extent of the potential effects and uncertainties in the population-level effect of disturbance.

Conclusion

5.3.55 Piling has the potential to result in a medium-term (more than five years), cumulative, negative effect on harbour porpoise. Given the population range of harbour porpoise (the reference population being that of the whole of the North Sea), potential for recovery to baseline population levels in the long-term and wide extent of available habitat elsewhere, and the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species and their high fecundity, there is the potential for animals from SACs/SCIs to avoid the disturbed areas during in-combination piling activity utilising habitat elsewhere in non-disturbed areas. Therefore, there are no adverse effects are predicted from Project One, alone or in-combination, on the harbour porpoise at the southern North Sea population level or as a feature of Natura 2000 sites in the southern North Sea (paragraph 5.2.192) for which it is a qualifying feature.

Behavioural disturbance from underwater noise from vessels and other activities

5.3.56 The projects considered within this in-combination assessment for Annex II marine mammal species are as follows:

- Tier 1: Consented projects currently under construction/were under construction at the time of the Project One marine mammal surveys: offshore wind farm projects (i.e., Lincs, Sheringham Shoal and Humber Gateway) and other offshore developments within a 50 km buffer of Project One including oil and gas activities and aggregate dredging (see Table 4.5);
- Tier 2: All Tier 1 projects plus all application aggregate extraction areas and consented offshore wind farm projects (i.e., Westernmost Rough, Race Bank, Dudgeon and Triton Knoll) within a 50 km buffer of Project One (see Table 4.5); and
- Tier 3: All Tier 2 projects plus Hornsea Project Two.

<u>Grey Seal</u>

Magnitude

Tier 1 Projects

5.3.57 Vessels used for construction/operation/decommissioning of Tier 1 projects are predicted to be similar to those described for Project One (paragraphs 5.2.43 *et seq.*) and include barges, jack-up rigs and tugs. Numbers of vessels are not available for most of the Tier 1 projects with the exception of the Humber Gateway (currently under construction), which estimates a total of 489 vessels movements per year over the construction phase. During operation there is predicted to be approximately 186 scheduled maintenance trips per year and 730 unscheduled trips per year (E.ON, 2008).

5.3.58 There are 14 licenced aggregate extraction areas within the representative 50 km buffer of Project One, with a single dredger assumed to be working within the area at any one time. Similarly, there is considerable oil and gas activity in the southern North Sea marine mammal study area (i.e., exploration and drilling activities), though it is not possible to accurately quantify the total number of vessel movements associated with these activities. In context with the high existing levels of vessel activity in region, the in-combination magnitude of effect is assessed as low (paragraph 4.7.116 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 Projects

5.3.59 Vessels used for construction/operation/decommissioning of these projects are predicted to be similar to those described for Project One (paragraphs 5.2.43 *et seq.*).

For Tier 2 projects, there are 11 applications for aggregate extraction areas within the representative 50 km buffer of Project One (total of 25 licenced areas for Tier 1 and Tier 2 projects). Information on the numbers of vessels predicted to be required for the construction and operation of the Tier 2 projects is limited and is summarised in Table 5.17. Due to the increase in vessel activity above baseline, the in-combination magnitude of effect is assessed as medium (paragraph 4.7.121 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 Projects

5.3.60 Based on the current levels of vessel activity of 28 to 30 vessels per day passing within a 10 NM radius of Subzone 1, there is predicted to be an uplift of 33.4% (i.e., double that for Project One alone) above baseline during the period of overlap in construction of Project One and Project Two. During the operational phase there is predicted to be an increase of 48% above current baseline levels. Due to the increase in vessel activity above baseline and the long-term duration of disturbance, the in-combination magnitude of effect is assessed as medium (paragraph 4.7.124 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals)

Sensitivity

5.3.61 Auditory injury from vessel traffic is considered unlikely given the current background levels of noise in the region and therefore the effect is most likely to be disturbance in relation to the noise generated from crew-transport vessels. Disturbance from vessel noise is predicted to occur as a series of short term events (e.g., during the crew transfer times) over the construction and operation phases of all tiered projects, which is likely to result in avoidance behaviour for grey seal.

5.3.62 Therefore, the sensitivity of grey seal to vessel disturbance is considered to be low as described in paragraphs 5.2.47 *et seq.* (construction), paragraph 5.2.75 (operation and maintenance) and paragraph 5.2.95 (decommissioning) for Project One alone. Grey seal sensitivity and is the same for all tiers of the in-combination assessment since vessel noise is considered over the long-term from construction through to decommissioning (paragraph 4.7.126 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.63 Due to the already high existing level of vessels in the vicinity of Project One, the intermittent vessel activity over the construction/operational/decommissioning phases for all projects considered, no adverse effects are predicted from Project One, alone or in-combination, on grey seal at a population level or on this species' conservation objectives as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs. Furthermore, specific conservation objectives for grey seal of the Humber Estuary SAC with regard to pup production and accessibility to Donna Nook breeding site (paragraph 5.2.8) will not be adversely affected.

Harbour Seal

Magnitude

Tier 1 Projects

5.3.64 Vessels used for construction/operation/decommissioning of Tier 1 projects are predicted to be similar to those described for Project One (paragraphs 5.2.43 *et seq.*) and described in paragraphs 5.3.57 *et seq.* for grey seal. The in-combination magnitude of effect is assessed the same as for grey seal, and is therefore as low (paragraph 4.7.116 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 and Tier 3 Projects

5.3.65 Vessels used for construction/operation/decommissioning of Tier 2 and Tier 3 projects are predicted to be similar to those described for Project One (paragraphs 5.2.43 *et seq.*) and described in paragraphs 5.3.59 and 5.3.60 for grey seal. The in-combination magnitude of effect is assessed the same as for grey seal, and is therefore assessed as medium (paragraph 5.3.59 and 5.3.60; and paragraph 4.7.121 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.66 The sensitivity of harbour seal to vessel disturbance is assessed as low and is described in paragraph 5.2.134 (construction), paragraph 5.2.146 (operation and maintenance) and paragraph 5.2.158 (decommissioning), and is the same for all tiers of the in-combination assessment since vessel noise is considered over the long-term from construction through to decommissioning (paragraph 4.7.126 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.67 Due to the already high existing level of vessels in the vicinity of Project One, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the likely avoidance behaviour and potential habituation to the increased noise, no adverse effects are predicted from Project One, alone or in-combination, on harbour seal at a population level or on this species' conservation objectives as a feature of The Wash and North Norfolk Coast Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

Harbour Porpoise

Magnitude

Tier 1 Projects

5.3.68 Vessels used for construction/operation/decommissioning of Tier 1 projects are predicted to be similar to those described for Project One (paragraphs 5.2.43 *et seq.*) and described in paragraphs 5.3.57 *et seq.* for grey seal. The in-combination magnitude of effect is assessed as low (paragraph 4.7.116 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 and Tier 3 Projects

5.3.69 Vessels used for construction/operation/decommissioning of Tier 2 and Tier 3 projects are predicted to be similar to those described for Project One (paragraphs 5.2.43 *et seq.*) and described in paragraphs 5.3.59 and 5.3.60 for grey seal. The in-combination magnitude of effect is assessed as medium (paragraph 5.3.59 and 5.3.60; and paragraph 4.7.121 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.70 Disturbance from vessel noise would most likely result in avoidance behaviour. Masking may potentially occur several kilometres from the noise source, depending on ambient noise levels. The sensitivity of harbour porpoise to vessel disturbance is assessed as low and is as described in paragraphs 5.2.198 *et seq.* (construction), paragraph 5.2.211 (operation and maintenance) and paragraph 5.2.222 (decommissioning) for Project One alone, and is the same for all tiers of the in-combination assessment since vessel noise is considered over the long-term from construction through to decommissioning (paragraph 4.7.126 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.71 Due to the already high existing level of vessels in the vicinity of Project One, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the likely habituation to the increased vessel activity, no adverse effects are predicted from Project One, alone or in-combination, on harbour porpoise at the southern North Sea population level or on this species' conservation objectives as a feature of the Natura 2000 sites screened into the in-combination assessment.

Physical injury from increased risk of vessel collision

5.3.72 The projects considered within this in-combination assessment for Annex II marine mammal species are as follows:

- Tier 1: Consented projects currently under construction/were under construction at the time of the Project One marine mammal surveys: offshore wind farm projects (i.e., Lincs, Sheringham Shoal and Humber Gateway) and other offshore developments within a 50 km buffer of Project One including oil and gas activities and aggregate dredging (see Table 4.5);
- Tier 2: All Tier 1 projects plus all application aggregate extraction areas and consented offshore wind farm projects (i.e., Westernmost Rough, Race Bank, Dudgeon and Triton Knoll) and oil and gas activities within a 50 km buffer of Project One (see Table 4.5); and
- Tier 3: All Tier 2 projects plus Hornsea Project Two.

Grey Seal

Magnitude

Tier 1 Projects

5.3.73 The vessels used for construction, operation and maintenance and decommissioning are as described in paragraphs 5.2.52 *et seq.* (construction and decommissioning) and paragraphs 5.2.78 *et seq.* (operation and maintenance). Numbers of vessels for Tier 1 projects are as described in paragraph 5.3.57 and 5.3.58.

5.3.74 Grey seal appear to have habituated to the existing high levels of vessel traffic and the increase resulting from Tier 1 projects is relatively small in the context of the already high existing traffic. In addition, it is likely that the noise generated by the vessels will deter grey seal from the immediate vicinity and therefore collision with vessels in the proximity of turbine locations within Subzone 1 is unlikely. Furthermore grey seal densities recorded in Subzone 1 (plus 4 km buffer) were low (0.038 animals per km^2) using Project One survey data, and 0.4 to 2 animals per km^2 using SMRU (2011) aerial and tagging data. The in-combination magnitude of impact associated with Tier 1 projects represents only a minor change to baseline vessel traffic and is therefore low (paragraph 4.7.132 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 Projects

5.3.75 The numbers of vessels involved in construction and operation of Tier 2 projects are presented in Table 5.16, and show that over the duration of the projects there will be a considerable uplift in vessel numbers over baseline levels within region. However, collision risk from vessel movement is intermittent and vessels movements are likely to be confined to existing shipping routes and localised within project areas.

5.3.76 The in-combination increase in vessel traffic represents a long-term increase in collision risk for grey seal, however due to the already high existing levels of vessel activity in the southern North Sea, to which grey seal appear to have habituated, the magnitude of impact is medium (paragraph 4.7.133 to 4.7.134 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 Projects

5.3.77 Project Two is predicted to double the level of vessel activity within the Hornsea Zone, which together with the increase in traffic associated with the Tier 1 and Tier 2 projects over baseline levels represents a long-term increase in collision risk. The magnitude of the impact is therefore medium (paragraph 4.7.135 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Table 5.16 Estimates of vessel movements per year for Tier 2 offshore wind farm projects.

Offshore wind farm	Vessel movements during construction	Vessel movements during operation
Triton Knoll (TKOWFL, 2012)	7,700 per annum	18,440 per annum
Race Bank (E.ON, 2008)	2,730 per annum	88 - 176 per annum scheduled (1-2 per turbine) 176 - 528 per annum unscheduled (2-6 per turbine
Dogger Bank Creyke Beck A and B	2,610 construction vessel movements over 3 years 850 vessel movements for material transport	683 round trips to port per year 28 vessels on site
Dudgeon (Royal Haskoning, 2009)	Not provided	Not provided

Sensitivity

5.3.78 The sensitivity of grey seal to increased collision risk is as described previously for construction-related collision risk for Project One alone (paragraphs 5.2.55 *et seq.*).

5.3.79 Distances from each of the offshore wind farms to the Humber Estuary SAC and Ramsar site are shown in Table 5.17. Based on the JNCC guidance (summarised in Table 5.4), the risk of corkscrew injury to grey seals from all offshore wind farms is considered to be low (Table 5.17). It is noted that Project One risk of injury from ducted propellers is considered low to medium (paragraphs 5.2.56 and 5.2.57). Based on the Project One alone risk and in-combination risk from other projects, grey seal sensitivity is assessed as low to medium.

Table 5.17 Distances from the closest boundary of other offshore wind farms in the southern North Sea marine mammal study area to the boundaries of the SACs designated for seals. Distances calculated as nautical miles (NM) are applied to the risk assessment using the JNCC published guidelines on corkscrew injuries (JNCC, 2012).

Offshore wind farm	Distance to the Wash and North Norfolk Coast SAC Km (NM)	JNCC Risk Assessment: harbour seal	Distance to The Humber Estuary SAC Km (nm)	JNCC Risk Assessment: grey seal
Project One	94.5 (51.0)	Low	102.2 (55.1)	Low
Tier 1				
Lincs	5.6 (3.0)	High	24.8 (13.4)	Low
Lynn and Inner Dowsing	3.7 (2.0)	High	26.4 (14.2)	Low
Sheringham Shoal	7.5 (4.1)	Medium	62.9 (33.9)	Low
Humber Gateway	52.3 (28.2)	Medium	8.1 (4.4)	Low
Westernmost Rough	73.5 (39.7)	Low	14.7 (7.9)	Low
Tier 2				
East Anglia One	189.3 (102.2)	Low	110.5 (59.6)	Low
Dogger Bank Creyke Beck A and B	188.1 (101.5)	Low	162.1 (87.5)	Low
Race Bank	18.8 (10.1)	Medium	35.9 (19.4)	Low
Dudgeon	27.1 (14.6)	Medium	75.0 (40.5)	Low
Triton Knoll	39.8 (21.5)	Medium	30.9 (16.7)	Low
Tier 3				
Project Two	90.5 (48.8)	Low	89.4 (48.3)	Low

Conclusion

5.3.80 Due to the already high existing level of vessels in the vicinity of Project One, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the likely avoidance behaviour and potential habituation to the increased vessel traffic, no adverse effects are predicted from Project One, alone or in-combination, on grey seal at a population level or on this species' conservation objectives as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and

Klaverbank pSCIs. Furthermore, specific conservation objectives for grey seal of the Humber Estuary SAC with regard to pup production and accessibility to Donna Nook breeding site (paragraph 5.2.8) will not be adversely affected. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (Section 5.6).

Harbour Seal

Magnitude

Tier 1 Projects

5.3.81 Vessels used for construction/operation/decommissioning are similar to those described for Project One in paragraphs 5.2.137 (construction and decommissioning) and paragraph 5.2.148 (operation and maintenance). Numbers of vessels for Tier 1 projects are the same as for grey seal and described in paragraph 5.3.57 and 5.3.58. The in-combination magnitude of effect is assessed the same as for grey seal, and is therefore low (paragraph 4.7.132 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 and Tier 3 Projects

5.3.82 Vessels used for construction/operation/decommissioning for Tier 2 and Tier 3 projects are predicted to be similar to those described for Project One (paragraphs 5.2.137 and 5.2.148). The numbers of vessels for Tier 2 and Tier 3 projects are the same as for grey seal and are presented in Table 5.16 and discussed in paragraphs 5.3.75 to 5.3.77. The in-combination magnitude of effect is assessed the same as for grey seal, and is therefore medium (paragraph 4.7.133 to 4.7.135 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.83 Distances from each of the offshore wind farms to The Wash and North Norfolk Coast SAC (designated for harbour seal) are presented in Table 5.16. Based on the JNCC guidance (summarised in Table 5.4), the risk of corkscrew injury to harbour seals, there is considered to be a high risk of corkscrew injury from the Lincs and Lynn and Inner Dowsing offshore wind farms, a medium risk from Sheringham Shoal Race Bank, Humber Gateway, Dudgeon and Triton Knoll offshore wind farms and a low risk from Project One, East Anglia Project One, Dogger Bank Creyke Beck A and B, Westernmost Rough and Project Two. Cumulatively, vessel movement for all tiers of assessment would present a high risk to harbour seals (Table 5.17).

5.3.84 The JNCC advice on mitigation for projects representing a high or medium risk is to consider alternatives to ducted propellers and/or to avoid the breeding season if possible. Based on the Project One alone risk and in-combination risk from other projects, harbour seal sensitivity is assessed as medium to high (paragraph 4.7.136 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals). However, it is noted that the Project One is considered a low risk (for the offshore wind farm) and medium (for cable laying in the Humber Estuary SAC), (paragraphs 5.2.138 and 5.2.139).

Conclusion

5.3.85 Due to the already high existing level of vessels in the vicinity of Project One, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the likely avoidance behaviour and potential habituation to the increased vessel traffic, no adverse effects are predicted from Project One, alone or in-combination, on harbour seal at a population level nor on this species' conservation objectives as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

5.3.86 Although no adverse effect on conservation objectives has been identified, it is assumed that mitigation measures recommended by JNCC will be adopted by other offshore wind farms where the magnitude is high or medium (i.e., not Project One where the magnitude is low). As noted above Project One is considered a low to medium risk component of this in-combination concern, but nevertheless, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (Section 5.6).

Harbour Porpoise

Magnitude

Tier 1 Projects

5.3.87 Vessels used for construction/operation/decommissioning of Tier 1 projects are predicted to be similar to those described for Project One in paragraph 5.2.202 *et seq.* (construction and decommissioning) and paragraph 5.2.213 (operation and maintenance). Numbers of vessels for Tier 1 projects are the same as described for grey seal in paragraph 5.3.57 and 5.3.58. The in-combination magnitude of effect is assessed as low (paragraph 4.7.132 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 and Tier 3 Projects

5.3.88 Vessels used for construction/operation/decommissioning for Tier 2 and Tier 3 projects are predicted to be similar to those described for Project One (paragraphs 5.2.202 *et seq.* and 5.2.213). The numbers of vessels for Tier 2 and Tier 3 projects are presented in Table 5.16 and are the same as described for grey seal in paragraphs 5.3.75 to 5.3.77. The in-combination magnitude of effect is assessed medium (paragraph 4.7.133 to 4.7.135 in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.89 The region is an area that already experiences high levels of vessel traffic and so further increases are likely to cause avoidance behaviour in harbour porpoise. As discussed in paragraph 5.2.204, seals have been the primary focus of corkscrew injury research from collision with ducted propellers on vessels. However, harbour porpoise may also be vulnerable to such injury (Marine Scotland Science, 2013, *pers. comm.*), and further research is being conducted in this area. The sensitivity of harbour porpoise to increased collision risk from Project One and in-combination with other projects is assessed as low (for Project One) to medium (in-combination) and is the same for all tiers of the in-combination assessment (paragraph 4.7.136 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.90 Due to the already high existing level of vessels in the vicinity of Project One, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the likely avoidance behaviour and potential habituation to the increased vessel traffic, no adverse effects are predicted from Project One, alone or in-combination, on harbour porpoise at the southern North Sea population level nor on this species' conservation objectives as a feature of the Natura 2000 sites screened into the in-combination assessment.

5.3.91 The Developer will continue to monitor the emerging research on harbour porpoise sensitivity to collision risk with ducted propellers and, should any evidence be published to suggest that there is a significant risk to harbour porpoises, will consider appropriate best practice the detail of which would be set out within the MMMP.

Changes to prey species distribution/abundance

5.3.92 The projects considered within this in-combination assessment for Annex II marine mammal species are as follows:

- Tier 1: Consented projects currently under construction/were under construction at the time of the Project One marine mammal surveys (i.e., Lincs, Sheringham Shoal and Humber Gateway) and oil and gas activities within a 50 km of the Project One boundary (see Table 4.5);
- Tier 2: All Tier 1 projects plus consented offshore wind farm projects (i.e., Westernmost Rough, Race Bank, Dudgeon and Triton Knoll) and oil and gas activities within a 50 km buffer of Project One (see Table 4.5); and
- Tier 3: All Tier 2 projects plus Hornsea Project Two and Tetney Sea-line replacement.

Grey Seal

Magnitude

Tier 1 projects

5.3.93 The indirect effects on grey seal arising from in-combination impacts on prey species are described in detail in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. In-combination effects on fish and shellfish have been identified as follows:

- Temporary habitat loss from offshore wind farm construction, aggregate extraction activity, and commercial fishing activities (see paragraph 3.7.7 *et seq.* of Volume 2, Chapter 3: Fish and Shellfish Ecology);
- Increases in suspended sediment concentration and sediment deposition from offshore wind farm construction and aggregate extraction activity (see paragraph 3.7.18 *et seq.* of Volume 2, Chapter 3: Fish and Shellfish Ecology);
- Disturbance due to noise from piling activity during construction of offshore wind farms (see paragraph 3.7.30 *et seq.* of Volume 2, Chapter 3: Fish and Shellfish Ecology);
- Long-term loss of habitat from offshore wind farm foundations and related infrastructure (see paragraph 3.7.48 *et seq.* of Volume 2, Chapter 3: Fish and Shellfish Ecology);
- Long-term introduction of hard substrates leading to creation of new habitat from offshore wind farm foundations and related infrastructure (see paragraph 3.7.58 *et seq.* of Volume 2, Chapter 3: Fish and Shellfish Ecology); and
- EMF arising from subsea cables from offshore wind farms (see paragraph 3.7.67 *et seq.* of Volume 2, Chapter 3: Fish and Shellfish Ecology).

5.3.94 These potential impacts were assessed as of only minor adverse significance in Volume 2, Chapter 3: Fish and Shellfish Ecology, as much of the effects are temporary and localised with the potential for recovery following cessation of the disturbance activity. Although the sensitivity of sandeels, a key prey item for grey seal, was assessed as typically higher than other species (i.e., medium) the assessment showed that habitat loss would only occur in areas of low intensity sandeel spawning, with no areas of high intensity affected.

5.3.95 In-combination increases in suspended sediment concentration and sediment deposition were assessed as being of limited spatial extent and short-term duration, with only slight elevations in concentrations or deposition above baseline levels. Similarly, in-combination effects from underwater noise and EMF were predicted to affect only a small proportion of spawning habitats. The magnitude of these effects on demersal spawning species (including sandeel) was therefore described as low.

5.3.96 Conversely, potential in-combination benefits to fish and shellfish resources were identified resulting from the long-term introduction of new habitat, which under the Tier 1 scenario equates to approximately 6.9 km^2 of new habitat creating reef effects.

5.3.97 The in-combination impacts to fish and shellfish resources were predicted as highly localised and consequently, the magnitude of effects on grey seal as a result of impacts to key prey species will also be of local spatial extent is therefore assessed as low (paragraph 4.7.156 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 projects

5.3.98 As with the Tier 1 assessment, the Tier 2 in-combination effects on the prey resources of grey seal, as predicted in Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, were assessed as no greater than minor adverse significance.

5.3.99 Temporary and long-term habitat loss has been estimated to equate to an area of approximately 110.8 km^2 and 4.9 km^2, respectively, which will be highly localised within individual project areas. Temporary habitat loss is likely to be a considerable over-estimation as only a proportion of the active aggregate dredging licence areas included in the assessment are dredged at any one time, allowing for recovery between dredging events.

5.3.100 Increased suspended sediment concentrations and deposition from Tier 2 projects are likely to be similar in magnitude to that described above in paragraph 5.3.95. Effects of EMF on fish and shellfish are predicted to be of low magnitude due to the very localised nature of the electric and magnetic field induced either side of the cable.

5.3.101 In-combination effects of piling noise for Tier 2 projects on fish predicted behavioural effects in the range of approximately 3 km and 40 km depending on the hearing sensitivities of different fish species. However, the maximum proportion of the sandeel spawning and nursery habitat potentially affected is approximately 1.1% to 2.8% and 1.3% to 3.3%, respectively.

5.3.102 Potential in-combination benefits to fish and shellfish resources were identified resulting from the long-term introduction of new habitat, which under the Tier 2 scenario equates to approximately 13.14 km^2.

5.3.103 Although under the Tier 2 in-combination assessment predicts impacts to grey seal prey species across a number of offshore developments, the impacts within each of these areas/sites are predicted to be highly localised. Therefore, the magnitude of effects of Tier 2 projects on grey seal is predicted to be low (paragraph 4.7.161 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.104 The Tier 3 assessment includes Project Two and the Tetney sea-line replacement, which predicts results in potential effects on marine mammal prey species from the temporary loss of approximately 140 km^2 of subtidal habitat, the long-term loss of approximately 11 km^2 of subtidal habitat and EMF from a total of 3,663 km subsea cables within a 50 km buffer of Project One. In-combination behavioural avoidance effects from Tier 3 projects from piling noise were predicted for key prey species as follows (see Table 5.5):

- 1.2 to 3.5% of the sandeel spawning habitat and 1.4 to 4.1% of the sandeel nursery habitat;
- 0% of herring spawning and nursery habitats (based on International Herring Larvae Survey (IHLS) data from 2001 to 2012) or 1.2 to 2.5% of spawning habitat and 1.9 to 4.7% of nursery habitat (based on Coull *et al.,* 1998); and
- 1.6 to 3.8% of whiting spawning habitat and 1.2 to 3.4% of whiting nursery habitat.

5.3.105 The above in-combination effects, together with a predicted increase in suspended sediments and deposition which are predicted to be rapidly dispersed have been assessed as of minor adverse significance to fish and shellfish species (Volume 2, Chapter 3: Fish and Shellfish Ecology).

5.3.106 Potential in-combination benefits to fish and shellfish resources were also identified resulting from the long-term introduction of new habitat, which for Tier 3 projects equates to approximately 18 km^2.

5.3.107 The in-combination impacts to fish and shellfish resources were predicted as highly localised and consequently, the magnitude of effects on grey seal as a result of impacts to key prey species will also be of local spatial extent and is therefore assessed as low (paragraph 4.7.165 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.108 As described previously in paragraphs 5.2.68 *et seq.*, grey seal exploit a range of prey resources and range widely to forage. Although some key prey items, such as sandeel and herring, may be affected during construction, operation and decommissioning of offshore developments within the 50 km buffer, these effects are localised and unlikely to result in a significant effect on fish and shellfish assemblages. There is also potential for the operational wind farms in the area to provide benefits to fish and shellfish due to the reef effect created by introduced hard substrates, and this in turn may indirectly benefit grey seal through local increases in prey abundance.

5.3.109 Therefore, the sensitivity of grey seal to changes in prey species availability from Project One and in-combination with other projects is assessed as low and is the same for all tiers of the in-combination assessment (paragraph 4.7.167 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.110 Due to the temporary and highly localised effect on prey species with the potential for recovery following cessation of the disturbance activity, the potential temporary loss of only small areas of available foraging habitat for grey seal and the large foraging range of this species and ability to exploit similar resources elsewhere, no adverse effects are predicted from Project One, alone or in-combination, on the grey seal at a population level or as a feature of the Humber Estuary SAC and Ramsar, Berwickshire and North Northumberland SAC and Dutch Dogger Bank and Klaverbank pSCIs.

<u>Harbour Seal</u>

Magnitude

Tier 1 projects

5.3.111 The in-combination impacts to fish and shellfish resources are summarised in paragraphs 5.3.93 *et seq.* and in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. Effects are predicted to be temporary and highly localised, and consequently, the magnitude of effects on harbour seal as a result of impacts to key prey species will also be of local spatial extent and is assessed as low (paragraph 4.7.156 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 projects

5.3.112 The in-combination impacts to fish and shellfish resources are summarised in paragraphs 5.3.98 *et seq.* and in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. Effects are predicted to be temporary and highly localised, and consequently, the magnitude of effects on harbour seal as a result of impacts to key prey species will also be of local spatial extent and is assessed as low (paragraph 4.7.161 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.113 The in-combination impacts to fish and shellfish resources are summarised in paragraphs 5.3.104 *et seq.* and in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. Effects are predicted to be temporary and highly localised, and consequently, the magnitude of effects on harbour seal as a result of impacts to key prey species will also be of local spatial extent and is assessed as low (paragraph 4.7.165 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.114 As described previously in paragraphs 5.2.142, harbour seal exploit a range of prey resources. Although some key prey items, such as sandeel and herring, may be affected during construction, operation and decommissioning of offshore developments within the 50 km buffer, these effects are localised and unlikely to result in a significant effect on fish and shellfish assemblages. Benefits to fish and shellfish and indirectly to harbour seal are also predicted due to the reef effect created by introduced hard substrates.

5.3.115 Therefore, the sensitivity of harbour seal to changes in prey species availability from Project One and in-combination with other projects is assessed as low and is the same for all tiers of the in-combination assessment (paragraph 4.7.167 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.116 Due to the temporary and highly localised effect on prey species with the potential for recovery following cessation of the disturbance activity, the potential temporary loss of only a small area of available foraging habitat for harbour seal, their ability to exploit similar resources elsewhere, no adverse effects are predicted on the harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC and Dutch Dogger Bank and Klaverbank pSCIs.

<u>Harbour Porpoise</u>

Magnitude

Tier 1 projects

5.3.117 The in-combination impacts to fish and shellfish resources are summarised in paragraphs 5.3.93 *et seq.* and in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. Effects are predicted to be temporary and highly localised, and consequently, the magnitude of effects on harbour porpoise as a result of impacts to key prey species will also be of local spatial extent and is assessed as low (paragraph 4.7.156 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 2 projects

5.3.118 The in-combination impacts to fish and shellfish resources are summarised in paragraphs 5.3.98 *et seq.* and in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. Effects are predicted to be temporary and highly localised, and consequently, the magnitude of effects on harbour porpoise as a result of impacts to key prey species will also be of local spatial extent and is assessed as low (paragraph 4.7.161 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Tier 3 projects

5.3.119 The in-combination impacts to fish and shellfish resources are summarised in paragraphs 5.3.104 *et seq.* and in the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology. Effects are predicted to be temporary and highly localised, and consequently, the magnitude of effects on harbour porpoise as a result of impacts to key prey species will also be of local spatial extent and is assessed as low (paragraph 4.7.165 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Sensitivity

5.3.120 As described previously in paragraph 5.2.207, harbour porpoise feed on a wide range of fish species, particularly sandeel and whiting. Although some key prey items may be affected during construction, operation and decommissioning of offshore developments within the 50 km buffer, these effects are localised and unlikely to result in a significant effect on fish and shellfish assemblages. Benefits to fish and shellfish and indirectly to harbour porpoise are also predicted.

5.3.121 Therefore, the sensitivity of harbour porpoise to changes in prey species availability from Project One and in-combination with other projects is assessed as low and is the same for all tiers of the in-combination assessment (paragraph 4.7.167 *et seq.* in the Environmental Statement Volume 2, Chapter 4: Marine Mammals).

Conclusion

5.3.122 Due to the potential temporary loss of only a small area of available foraging habitat for harbour porpoise, their highly mobile and wide ranging nature allowing these marine mammals to exploit varied prey resources elsewhere in the southern North Sea and the potential for recovery of prey resources following cessation of the disturbance activity, no adverse effects are predicted on the harbour porpoise at a population level or as a feature of the Natura 2000 sites screened into this assessment.

5.4 Effect on SPA/Ramsar Features – Project One Alone

5.4.1 This section of the HRA presents the information gathered to determine whether there may be any significant adverse effects predicted on the conservation objectives of SPA and or Ramsar qualifying interests due to the impacts of collision mortality or operational displacement caused by Project One. The scope of SPA and or Ramsar sites was determined at the screening stage (see Section 4.3 and Annexes A and B), and two sites were screened in for a potential LSE: Flamborough Head and Bempton Cliffs SPA and Firth of Forth Islands SPA (see Table 4.4).

Flamborough Head and Bempton Cliffs SPA

Site Conservation Objectives

5.4.2 With regard to the individual species and/or assemblage of species for which the site has been classified (‘the Qualifying Features’ listed below):

‘Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive;

Subject to natural change, to maintain or restore:

- *The extent and distribution of the habitats of the qualifying features;*
- *The structure and function of the habitats of the qualifying features;*
- *The supporting processes on which the habitats of the qualifying features rely;*
- *The populations of the qualifying features; and*
- *The distribution of the qualifying features within the site.*

Qualifying Features:

- *Black-legged kittiwake Rissa tridactyla (breeding);*
- *Seabird assemblage. During the breeding season, the area regularly supports 305,784 individual seabirds including:*
  - *Puffin Fratercula arctica;*
  - *Razorbill Alca torda;*
  - *Guillemot Uria aalge;*
  - *Fulmar Fulmaris glacialis;*
  - *Herring Gull Larus argentatus;*
  - *Gannet Morus bassanus; and*
  - *Black-legged kittiwake*.’

5.4.3 Flamborough Head and Bempton Cliffs SPA is the closest SPA to the proposed Project One development. It comprises chalk sea cliffs rising 135 m from the sea with cliff-top vegetation comprising maritime and chalk grassland. The site lies 116 km from the proposed development and holds national and international seabird populations. Details of the species communities present are provided in Annex A, and the cited and current populations of each qualifying interest considered here are presented in Table 5.18.

5.4.4 The results from the screening exercise (Annex A) have identified the following qualifying species at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE:

- Fulmar (displacement during operation);
- Gannet (collision risk and displacement during operation);
- Black-legged kittiwake (Kittiwake) (collision risk during operation);
- Herring gull (collision during operation);
- Guillemot (displacement during operation);
- Razorbill (displacement during operation); and
- Puffin (displacement during operation).

5.4.5 No LSEs were predicted for any impact occurring during the construction or decommissioning phases.

Table 5.18 Qualifying species for the Bempton Cliffs and Flamborough Head SPA and their populations at the time of designation and those based on latest counts (SNH 2012).

Qualifying Feature	Cited total at designation 'pairs'[2]	Latest counts [1] 'pairs'
Fulmar	Not available	1,447
Gannet	1,631[3]	9,947 (2011); 11,061 (2012)
Kittiwake	83,370	44,520
Herring gull	1,110	711
Guillemot	16,150	41,607
Razorbill	5,133	10,570
Puffin	3,473	490

[1] Latest counts from JNCC & NE (2013).

[2] Counts at time of designation in 1993 were based on population levels from 1987.

[3] Note gannet was not listed as a qualifying species at time of designation.

Fulmar

Displacement Mortality

5.4.6 The Project One HRA Screening Assessment, detailed in Annex A, has identified fulmars at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from displacement impacts during the period of operation.

5.4.7 Fulmar has an extensive foraging range, with reported maximum trip distance of 580 km and a mean maximum trip of around 400 km (Thaxter *et al*., 2012). Subzone 1 lies within the fulmar's mean maximum foraging range from Flamborough Head and Bempton Cliffs SPA.

5.4.8 The UK breeding population is 499,000 pairs (BTO 2013) with the majority of birds nesting in northern Britain, particularly around Scotland. During the non-breeding period between 1.1 million and 3.3 million fulmars winter in the North Sea (Camphuysen and Garthe, 1997).

5.4.9 Results from site specific monitoring indicate that fulmars are widespread across the Hornsea Zone throughout the year, with peak densities occurring during May and June with a seasonal peak mean in Subzone 1 plus 1 km buffer of 948 birds and a density of 2 birds per km^2.

5.4.10 Of those recorded in flight very few sightings of flying birds were of birds flying at a height greater than 22.5 m above sea surface. Collision risk modelling predicts less than one collision per year (Volume 2, Annex 5.5.1: Ornithology Technical Report, Appendix C). Consequently, fulmars are at very low risk of collision with the proposed development.

5.4.11 Fulmars forage at sea, with offal and fish discards from trawlers now a major part of their diet (Forrester *et al*., 2007). Outwith the breeding season fulmars forage widely and are highly pelagic occurring throughout the waters of the North Sea and the North Atlantic (Stone *et al.,* 1995; Camphuysen and Garthe, 1997).

5.4.12 There are few studies from offshore wind farms where fulmars regularly occur. Results from Egmond aan Zee offshore wind farm in the Netherlands recorded no clear influence of the wind farm on the distribution of fulmars (Krijgsveld *et al*., 2011). Elsewhere, declines in the number of fulmars present have been reported from Arklow Bank offshore wind farm in Ireland but there was no evidence that these declines were associated with the proximity of the turbines (Barton *et al*. 2009). Fulmars have been assessed as being at low vulnerability to displacement (Langston, 2010; Furness and Wade, 2012).

5.4.13 There is recognised to be uncertainty over what the consequences of displacement may be on an individual and a range of possible levels of mortality are presented. During discussions with JNCC and Natural England, and based on Natural England and JNCC (2012) interim guidance it was agreed that in order to assess the displacement effect the mean peak number of birds recorded within Subzone 1 (plus an appropriate buffer) during each season will be used in the first instance. The mean peak number (i.e., the mean of the highest population estimates within a particular season, which do not necessarily occur within the same month each year) is considered sufficiently precautionary for the realistic worst-case.

5.4.14 Natural England and JNCC (2012) interim guidance recommends that for the species of highest sensitivity (divers and sea ducks) a site plus 4 km buffer should be used, whereas a generic site plus 2 km buffer should be used for all other species.

5.4.15 Evidence presented in Environmental Statement Volume 2, Chapter 5: Ornithology however suggests that a 2 km buffer is likely to be an overestimate of risk for fulmar, and the other species considered here (more sensitive divers and sea ducks were scoped out of the impact assessment), and that it should be used to inform species-specific buffers, rather than the use of generic values. Buffers therefore taken forward to impact assessment are species-specific and for low sensitivity species such as fulmar, displacement was from Subzone 1 only (no buffer). For medium sensitivity species displacement was from the Subzone 1 plus a 1 km buffer.

5.4.16 Based on the evidence available SMart Wind has adopted what it considers to be the appropriate displacement buffer for each of the species considered in the assessment for operational displacement. These assumptions are set out for each species in the following paragraphs, but in summary the approach adopted is to apply no buffer for gulls, fulmar and gannet, and a 1 km buffer for auk species. It is recognised that there is a degree of uncertainty with regard to the extent out to which displacement effects may be experienced (if at all) for seabird species and therefore, Appendix A of Volume 5, Annex 5.5.1: Ornithology Technical Report presents the outputs of the displacement matrices based on a highly precautionary assumption that all birds may experience displacement out to 2 km.

5.4.17 For the purposes of this assessment the proportion of fulmars displaced within Subzone 1 was set at 30%, based on the reported studies and published reviews, which are presented in detail in Section 5.6 of Environmental Statement, Volume 2, Chapter 5: Ornithology.

5.4.18 The assessment is based on possible levels of mortality of 2% during the breeding period and 1% during the non-breeding period. The levels of impact are considered to be suitably precautionary based on fulmar being a far ranging pelagic seabird.

5.4.19 During the breeding period (March to July) a peak mean of 948 fulmars within Subzone 1 occurred within Subzone 1. Assuming a displacement of 30% of the fulmars and a subsequent 2% mortality rate, a total of six fulmars may be lost as a result of displacement (Table 5.19).

5.4.20 During the non-breeding period (August to February) a peak mean of 235 fulmars occurred within Subzone. Assuming a displacement of 30% of the fulmars and a subsequent 1% mortality rate, a total of one fulmar may be lost as a result of displacement (Table 5.20).

Table 5.19 Estimated peak fulmar mortality as a result of displacement from Subzone 1 during the breeding season.

Fulmar (breeding: Mar-Jul)	Mortality (%)												
Displaced (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	1	2	5	9	19	28	38	47	57	66	76	85	95
20	2	4	9	19	38	57	76	95	114	133	152	171	190
25	2	5	12	24	47	71	95	119	142	166	190	213	237
30	3	6	14	28	57	85	114	142	171	199	228	256	284
40	4	8	19	38	76	114	152	190	228	265	303	341	379
50	5	9	24	47	95	142	190	237	284	332	379	427	474
60	6	11	28	57	114	171	228	284	341	398	455	512	569
70	7	13	33	66	133	199	265	332	398	465	531	597	664
75	7	14	36	71	142	213	284	356	427	498	569	640	711
80	8	15	38	76	152	228	303	379	455	531	607	683	758
90	9	17	43	85	171	256	341	427	512	597	683	768	853
100	9	19	47	95	190	284	379	474	569	664	758	853	948
Mean peak number = 948													
Low sensitivity = Subzone 1 only													

5.4.21 Not all fulmars estimated to be lost due to displacement impacts will be adults but it is not possible to accurately age fulmars by plumage features from offshore surveys. Studies undertaken on fulmars indicate that the proportion of non-breeding birds present at a colony varies across the season and across years. Peak periods for non-breeders occur in the spring, which is the period when peak numbers were also recorded in Subzone 1. Between 30 and 35% of birds present during this period may be non-breeding birds (Hatch 1989).

5.4.22 Assuming that a similar proportion of birds impacted are non-breeding birds then of the six fulmars estimated to be lost during the breeding period, four may be breeding adults.

Table 5.20 Estimated peak fulmar mortality as a result of displacement from Subzone 1 during the non-breeding season.

Fulmar (non-breeding: Aug-Feb)	Mortality (%)												
Displaced (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	5	7	9	12	14	16	19	21	24
20	0	1	2	5	9	14	19	24	28	33	38	42	47
25	1	1	3	6	12	18	24	29	35	41	47	53	59
30	1	1	4	7	14	21	28	35	42	49	56	63	71
40	1	2	5	9	19	28	38	47	56	66	75	85	94
50	1	2	6	12	24	35	47	59	71	82	94	106	118
60	1	3	7	14	28	42	56	71	85	99	113	127	141
70	2	3	8	16	33	49	66	82	99	115	132	148	165
75	2	4	9	18	35	53	71	88	106	123	141	159	176
80	2	4	9	19	38	56	75	94	113	132	150	169	188
90	2	4	11	21	42	63	85	106	127	148	169	190	212
100	2	5	12	24	47	71	94	118	141	165	188	212	235
Mean peak number = 235													
Low sensitivity = Subzone 1 only													

5.4.23 During the non-breeding period not all fulmars recorded will be adults and an estimated 30% of the population may be non-breeding birds. Consequently, less than one fulmar lost due to displacement effects during each non-breeding period may be an adult from Flamborough Head and Bempton Cliffs SPA.

5.4.24 Not all adult fulmars at risk of being displaced during the non-breeding period will be from the Flamborough Head and Bempton Cliffs SPA. Assuming the proportion of birds impacted during the non-breeding period is related to the size of the breeding population from each of the breeding colonies that are SPAs then no fulmars from the Flamborough Head and Bempton Cliffs SPA are predicted to be lost during the non-breeding period due to displacement effects (See Annex B).

5.4.25 The total breeding population of fulmar at Flamborough Head and Bempton Cliffs SPA is 1,447 pairs (2008 - 2011 count (Natural England and JNCC, 2012; Phase 4 Consultation)). The potential loss of four adult fulmars per year is 0.1% of the breeding population. The level of impact predicted will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA.

Gannet

5.4.26 The Project One HRA Screening Assessment, detailed in Annex A, has identified gannets at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from collision risk and displacement impacts during the period of operation.

5.4.27 Results from site specific monitoring indicate that gannets are widespread across the Hornsea Zone throughout the year, with peak densities occurring from September through to November.

5.4.28 Tagging studies undertaken at Flamborough Head and Bempton Cliffs SPA indicate that when feeding chicks, gannets from the SPA may forage up to 306 km from the breeding colony; although the mean foraging range from the two years of studies for which published data are available was between 47 and 54 km indicating that the majority of flights during the chick rearing period do not overlap with the proposed development area. However, results from the tagging studies confirm that gannets from the SPA occur within the proposed development area (Figure 10.1) (Langston and Teuten, 2012; Langston and Teuten *in prep*.).

5.4.29 Studies undertaken at the nearest other gannet colony on the Bass Rock, located within the Forth Islands SPA, indicate that breeding gannets from this colony will not regularly occur within the Hornsea Zone. The maximum distance gannets from this colony have been recorded to the south of the colony during the breeding period is 260 km and the Hornsea Zone lies 363 km away (Hamer *et al.,* 2011).

5.4.30 Further support to the hypothesis that gannet maintain vast exclusive fishing ranges despite doing nothing to defend their territories from rival colonies was published in June 2013 (Wakefield *et al.*, 2013)

5.4.31 Evidence from existing offshore wind farms indicates that gannets avoid flying through wind farms and are largely displaced (Leopold *et al*., 2011; PMSS, 2006). Those that do enter a wind farm reduce flight height to be below 10 m and cut across the edge of the wind farm and are at very low risk of collision (Leopold *et al*., 2011). The results from post-construction monitoring indicate that gannets may have an avoidance behaviour of 99% or more (Cook *et al*., 2012; Krijgsveld *et al*., 2011).

5.4.32 Much of the data have been collected on gannets outwith the breeding period and therefore birds may, in theory, behave differently than those during the breeding period; although there is no evidence to support this. Based on published empirical data it is predicted that avoidance rates for gannet significantly greater than 98% will occur and therefore an avoidance rate of 99% has been used for the basis of the assessment here.

5.4.33 As a consequence of the far field avoidance behaviour and that gannets avoid entering wind farms, there is the potential for a relatively high level of displacement. Studies undertaken using radar and visual observations have indicated that 68% of gannets may avoid entering into wind farms (Krijgsveld *et al*., 2011).

Collision mortality

5.4.34 The results from the collision risk modelling (see Environmental Statement Volume 2, Chapter 5: Ornithology) indicate that based on the worst-case scenario of 332 3.6 MW turbines and a 99% avoidance rate, a total of 27 gannets will, on average, collide with the proposed Project One turbines over the course of a single year. The total number of gannets predicted to collide per year based on a 98% avoidance behaviour is 54 birds. During the breeding period (April to September) seven collisions are predicted each year (at 99% avoidance rate).

5.4.35 The cited SPA population comprises only adult breeding birds. The proportion of adults predicted to be impacted has been calculated using site specific data on gannets for which their age was recorded. Of those that were aged, 61.8% of all gannets were adults during the breeding period and 91.5% were aged as adults during the non-breeding period. During the breeding period fewer adult gannets were recorded than during the non-breeding period. This may be due to a larger proportion of adults attending colonies and foraging closer to the colony, particularly during the egg incubation period.

5.4.36 During the breeding season it is predicted that all collisions are likely to be of birds from the Flamborough Head and Bempton Cliffs SPA as evidence indicates adults from other breeding colonies do not regularly occur in the area during this time. Results from the collision risk modelling indicate that on average, a total of seven gannets are predicted to collide with the proposed development each breeding season of which, based on the proportion of adults recorded during the breeding period, four may be adults (Table 5.21).

5.4.37 During the non-breeding period (October to March) gannets at risk of collision may be from other colonies, including other SPAs. A proportion of those at risk of collision will be from Flamborough Head and Bempton Cliffs SPA and assuming the proportion of birds at risk is directly in proportion to the colony size, then of the 18 adult gannets predicted to collide during the non-breeding period, a total of two adult gannets will be from the SPA (See Annex B, Table B.1).

5.4.38 The total number of adult gannets predicted to collide with Project One per year is six adult birds; four during the breeding period and two during the non-breeding period.

5.4.39 As discussed during consultation (Table 1.1), for this application, PBR modelling was calculated for the Flamborough Head and Bempton Cliffs SPA gannet population, using the most recent available data (Annex J). PBR is a tool to estimate the increase in mortality a population can sustain. It shows that the gannet population may sustain a mortality of 452 birds (recovery factor of 0.5) without the carrying capacity of the population being affected. The combined annual mortality rate of six adults therefore falls well below this threshold.

5.4.40 The gannet PVA commissioned by the Strategic Ornithological Support Services (SOSS) group indicates that a population decline at the Flamborough Head and Bempton Cliffs gannet colony is predicted should there be an increase in mortality of more than 150 birds per year (WWT, 2011). It is understood from consultation with JNCC that the SOSS PVA for gannets is considered precautionary for the Flamborough Head and Bempton Cliffs colony due to a higher growth rate at Flamborough Head compared to the Bass Rock colony growth rate used as an average for gannets across the UK within the SOSS PVA study, as well as older population data being used (Sophy Allen, JNCC, 13 October 2012, *pers. comm.*). A reanalysis carried out for the Triton Knoll application (Statement of Common Ground) predicted that based on the updated 2009 colony data, up to 303 gannets could be harvested with a 50% chance of the SPA population no longer growing (i.e., negative growth, or decline, of the colony), which is considered more realistic. Nevertheless, both variants of the model predict threshold values that greatly exceed the numbers of losses predicted here.

Table 5.21 Predicted mean number of adult Flamborough Head and Bempton Cliffs SPA gannet collisions per year with Project One.

Number of adult gannets predicted to collide			
	Breeding [1]	**Non-breeding [2]**	**Total annual adults**
98% avoidance	9	4	13
99% avoidance	**4**	**2**	**6**

[1] = 61.8% of all observations during breeding period April to September were of adults
[2] = 91.5% of all observations during non-breeding period October to March were of adults

5.4.41 The population of gannet at the Flamborough Head and Bempton Cliffs SPA is increasing and the potential increase in mortality arising from collision impacts from Project One alone is below that predicted to cause a decline in the gannet breeding population. Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA.

Displacement mortality

5.4.42 There is recognised to be uncertainty over what the consequences of displacement may be on an individual bird and a range of possible levels of mortality are presented.

5.4.43 For the purposes of this assessment a precautionary displacement value of 70% has been used based on the observed macro-avoidance rates recorded from studies undertaken at a wind farm in the southern North Sea that reported 64% macro-avoidance behaviour and is the best available data on the level of displacement from a wind farm for gannets (Krijgsveld *et al*., 2011).

5.4.44 The assessment is based on possible levels of mortality of 2% during the breeding period and 1% during the non-breeding period. The levels of impact are considered to be suitably precautionary based on gannet being a far ranging piscivorous seabird with mobile and often widespread prey. Although birds may be displaced from the immediate vicinity around turbines, it is unlikely that the loss of a relatively small area of habitat in comparison with overall foraging range will greatly increase mortality rates at a population level.

5.4.45 During the breeding period (April to September) a peak mean of 341 gannets occurred within Subzone 1. Assuming a precautionary displacement value of 70% of the gannets and a subsequent 2% mortality rate, a total of five gannets may be lost as a result of displacement (Table 5.22).

Table 5.22 Predicted peak gannet mortality as a result of displacement from Project One during the breeding season

Gannet (breeding: Apr-Sep)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	0	1	2	3	7	10	14	17	20	24	27	31	34
20	1	1	3	7	14	20	27	34	41	48	55	61	68
25	1	2	4	9	17	26	34	43	51	60	68	77	85
30	1	2	5	10	20	31	41	51	61	72	82	92	102
40	1	3	7	14	27	41	55	68	82	95	109	123	136
50	2	3	9	17	34	51	68	85	102	119	136	153	171
60	2	4	10	20	41	61	82	102	123	143	164	184	205
70	2	5	12	24	48	72	95	119	143	167	191	215	239
75	3	5	13	26	51	77	102	128	153	179	205	230	256
80	3	5	14	27	55	82	109	136	164	191	218	246	273
90	3	6	15	31	61	92	123	153	184	215	246	276	307
100	3	7	17	34	68	102	136	171	205	239	273	307	341
Mean peak number = 341													
Medium sensitivity = Subzone 1 only													

5.4.46 Site specific surveys recorded 61.8% of gannets during the breeding period as being adults and therefore potential part of the SPA population. Consequently, of the possible five gannets that might be lost due to displacement three may be adults from the Flamborough Head and Bempton Cliffs SPA.

5.4.47 During the non-breeding period (October to March), the peak population estimate was 338 birds. At a mortality rate of 1%, this would result in the loss of two birds per year (Table 5.23).

5.4.48 Although evidence presented in the Environmental Statement, Volume 2, Chapter 5: Ornithology shows otherwise (e.g. Krijgsveld *et al.,* 2011).

Table 5.23 Predicted peak gannet mortality as a result of displacement from Subzone 1 during the non-breeding season.

Gannet (non-breeding: Oct-Mar)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	0	1	2	3	7	10	14	17	20	24	27	30	34
20	1	1	3	7	14	20	27	34	41	47	54	61	68
25	1	2	4	8	17	25	34	42	51	59	68	76	85
30	1	2	5	10	20	30	41	51	61	71	81	91	101
40	1	3	7	14	27	41	54	68	81	95	108	122	135
50	2	3	8	17	34	51	68	85	101	118	135	152	169
60	2	4	10	20	41	61	81	101	122	142	162	183	203
70	2	5	12	24	47	71	95	118	142	166	189	213	237
75	3	5	13	25	51	76	101	127	152	177	203	228	254
80	3	5	14	27	54	81	108	135	162	189	216	243	270
90	3	6	15	30	61	91	122	152	183	213	243	274	304
100	3	7	17	34	68	101	135	169	203	237	270	304	338
Mean peak number = 338													
Medium sensitivity = Subzone 1 only													

5.4.49 During the non-breeding period, 91.5% of gannets recorded from site specific surveys were adults and therefore two adult gannets per non-breeding period may be lost.

5.4.50 Not all gannets at risk of being displaced during the non-breeding period will be from the Flamborough Head and Bempton Cliffs SPA. Assuming the proportion of birds impacted during the non-breeding period is related to the size of the breeding population from each of the breeding colonies that are SPAs then no gannets from the Flamborough Head and Bempton Cliffs SPA are predicted to be lost during the non-breeding period due to displacement effects (See Annex B).

5.4.51 Based on the results of the PBR for gannets at Flamborough Head and Bempton Cliffs SPA (Annex J), an annual mortality rate of up to three adults (five birds in total) falls well below the threshold for which the gannet population may be sustained, (a mortality rate of up to 452 birds with a recovery factor of 0.5) without the carrying capacity of the population being affected. This is also true for the PVA carried out by WWT (2011) and the revised version for the Triton Knoll application.

5.4.52 Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA.

Collision and displacement mortality combined

5.4.53 It is acknowledged that for gannet, collision and displacement effects may both result in mortality for the Flamborough Head and Bempton Cliffs SPA population. The interaction of these two impacts is however not straightforward. In the assessment, conservative values for proportion of birds displaced (displacement) and avoidance rates (collision risk) have been used, and these are incompatible with each other – one cannot have a worst-case displacement and a worst-case collision rate simultaneously. Therefore although some birds may be affected by displacement and others by collision risk, total impact cannot be determined by adding together these two variables.

5.4.54 Given the above and the lack of guidance or precedent it is not considered appropriate to combine these effects in a quantified manner. Furthermore, there is considerable debate as to whether displacement functions as an annual event (in the same way that collision does), and whilst assessments have adopted a worst case assumption that it is, this adds to the justification for not combining the two in a quantified manner.

<u>Black-legged Kittiwake</u>

5.4.55 The Project One Screening Assessment, detailed in Annex A, has identified (black-legged) kittiwakes at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from collision risk and displacement during operation.

5.4.56 Results from site specific monitoring indicate that kittiwakes are widespread across the Hornsea Zone throughout the year, with peak densities from July to September, corresponding with post-breeding movements from colonies.

5.4.57 The maximum reported foraging range for kittiwake is 120 km, although the mean maximum is 60 km and the mean foraging range 25 km (Thaxter *et al*., 2012). Therefore, kittiwakes recorded within Project One/Subzone 1 are at the maximum reported foraging range for this species. However, observations of flying birds recorded a significant majority of birds flying in an east-west direction across the Hornsea Zone during the breeding period, indicating that at least some kittiwakes recorded during the breeding period will be birds from the Flamborough Head and Bempton Cliffs SPA (see Environmental Statement Volume 2, Chapter 5: Ornithology).

Collision mortality

5.4.58 The results from the collision risk modelling (see Environmental Statement Volume 2, Chapter 5: Ornithology) indicate that based on the worst-case scenario and a 98% avoidance rate, on average, a total of 31 kittiwakes may collide with the proposed Project One development over the course of a year. This estimate has been based on the use of Option 4 of the extended Band (2012) model, using site-specific flight height information (see Environmental Statement Volume 5, Annex 5.5.1, Ornithology and paragraph 5.5.3).

5.4.59 During the breeding season (March to July) a total of 14 kittiwakes from the SPA are predicted to collide on average each year of which, based on the proportion of adults recorded during site specific surveys, 13 collisions per breeding season will be of adult birds (Table 5.24).

5.4.60 The total breeding population of kittiwakes on the latest counts from between 2008 and 2011 at Flamborough Head and Bempton Cliffs SPA is 44,520 pairs, having decreased from 83,370 pairs in 1987 at the time of designation; a decline of at least 1,618 pairs per year. The loss of any breeding adult kittiwake may facilitate the decline. The cause of the decline in kittiwake populations, not just at Flamborough Head and Bempton Cliffs, but also across many colonies along the east coast of the UK is not clear, but may be linked to large-scale changes in the environment and effects on prey availability (Wanless *et al.,* 2005; Wanless *et al*., 2007).

5.4.61 The predicted impact of 13 adult kittiwakes from the Project One development represents an increase in baseline mortality (taken to be 0.19 by Furness and Wade, 2012) by 0.07% on the breeding population each breeding season at the Flamborough Head and Bempton Cliffs SPA.

5.4.62 Since the site has been designated the breeding population of kittiwakes at Flamborough Head and Bempton Cliffs SPA has decreased on average by at least 3,236 individuals per year. The additional loss of 13 adult kittiwakes during the breeding period will however not significantly increase the recent rate of decline.

5.4.63 Outwith the breeding season, kittiwakes within the proposed development area will be from other colonies including SPAs and non-SPAs. A total of 22% of the GB population of kittiwakes are not qualifying features for any SPA, i.e., they do not breed in an SPA (JNCC, 2012b), and this corresponds closely with the estimated 21% of non-SPA birds along the east coast, using the SMP database. Therefore, of the 12 adult kittiwakes predicted to be impacted during the non-breeding period an estimated nine will be part of an SPA breeding population.

5.4.64 Assuming the proportion of birds present from each colony for which kittiwake is a qualifying species correlates with the size of the colony then of the nine predicted collisions of adult kittiwakes to occur during the non-breeding period, two will be of adult kittiwakes from Flamborough Head and Bempton Cliffs (see Annex B, Table B.2). This is approximately 0.002% of the Flamborough Head and Bempton Cliffs SPA population, and results in an increase in baseline mortality by 0.01%.

5.4.65 The potential loss of 15 adult kittiwakes predicted to collide each year (13 during breeding period; 2 during non-breeding period) is 0.02% of the Flamborough Head and Bempton Cliffs SPA breeding population, and an increase in baseline mortality by 0.09%.

5.4.66 PBR modelling carried out for this application using the most recent available data for the Flamborough Head and Bempton Cliffs SPA population predicted that 1,023 adult kittiwakes can be removed annually from the population without an effect on the carrying capacity of the population, using a recovery factor of 0.2 to reflect the declining population (Annex J). The predicted annual mortality attributable to Project One is well below this threshold, suggesting there is no risk to the population from collisions attributable to Project One.

5.4.67 As further supporting information to understand the effect of the predicted additional mortality from Project One on the Flamborough Head and Bempton Cliffs SPA kittiwake population, a PVA was commissioned (Annex K). The scope of the PVA was designed in consultation with JNCC and Natural England (Table 1.1). The PVA assumed a closed population (i.e., without immigration or emigration) and in the absence of any additional mortality, the average population growth rate predicted for this population varied between 1.6% growth and 1.6% decline, using productivity estimates averaged over distinct 'early' productivity years (1986-1999) or 'late' productivity years (2000-2011) of Flamborough Head and Bempton Cliffs SPA, respectively.

Table 5.24 Predicted mean number of adult Flamborough Head and Bempton Cliffs SPA kittiwake collisions per year with Project One.

Number of adult kittiwakes predicted to collide			
	Breeding [-1]	Non-breeding [-2]	Total annual adults
98% avoidance	13	2	15
1 = 90.1% adults during breeding period 2 = 71% adults during non-breeding period			

5.4.68 It is recognised that the breeding population of kittiwakes at Flamborough Head and Bempton Cliffs SPA is in decline, but based on the predicted additional mortality of 15 kittiwakes per year, none of the modelled outputs indicated that there was a likelihood of a significant increase in rate of decline in the SPA population at these levels of additional mortality.

5.4.69 Although the conservation objectives of the SPA are currently not being met, based on the relatively small numbers of kittiwakes predicted to be impacted (0.02% of the population), and the small contribution the predicted impacts will make on the overall decline, it is predicted that the potential annual impact on kittiwakes from Project One alone will not affect the integrity of the site.

Displacement mortality

Breeding Season

5.4.70 The peak mean kittiwake population estimate within Subzone 1 during the main breeding season (March to July) was 1,897 birds, including a proportion of unidentified small gulls.

5.4.71 Construction period records from the Lincs offshore wind farm show that at least 769 birds (198 observations), including large gulls, kittiwake, and terns used turbine bases and monopiles to rest on. On several occasions gulls were clearly associated with the jack-up barge, the guard vessels and with the *Resolution* construction vessel while piling was in progress (RPS, *in prep*). Displacement rates for kittiwake are therefore likely to be low.

5.4.72 The kittiwake's foraging range is relatively large compared to many other seabirds (up to Thaxter's 2012 maximum of at least 120 km is likely) and with prey items being mobile throughout the year, a mortality rate of 2% is considered appropriate for during the breeding season. Based on this, nine individuals may be lost as a result of displacement from the area in question (Table 5.25).

5.4.73 From the most recent regional breeding population estimate of 44,520 pairs and a baseline mortality rate of 0.19 (Furness and Wade, 2012), an additional nine deaths would be an increase in baseline mortality of 0.05% within the current Flamborough Head and Bempton Cliffs SPA breeding population. To reach the 1% additional mortality level for the SPA, a mortality rate of between 30-40% would be required. Therefore, even when recognising the uncertainty around the precise level of mortality, a significant increase in magnitude would not likely occur.

Non-breeding Season

5.4.74 Over the non-breeding months (August to February), the peak mean kittiwake population estimate was 20,272 birds for Subzone 1, including a proportion of unidentified small gulls. Highest counts coincided with a likely post-breeding dispersal from August to October.

5.4.75 Based on a 1% mortality rate during this period, it is predicted that 51 birds will die as a result of displacement (Table 5.26). If regular intermixing of populations occurs across the east coast during winter months, 20.3% of losses would be attributable to

Flamborough Head and Bempton Cliffs SPA, based on relative population size. As such, it is predicted that 10 of these 51 birds would be from the SPA.

Annual mortality on the Flamborough Head and Bempton Cliffs SPA population

5.4.76 For Project One alone, the mortality rate for kittiwake was nine birds during the breeding season and 10 during the non-breeding season. This results in an annual mortality rate of 19 birds, with 15 being adults, based on the fact that 90.1% of identified kittiwakes during baseline surveys within the breeding seasons were adults, with 71% in the non-breeding season.

5.4.77 Although the conservation objectives of the SPA are currently not being met, based on the relatively small numbers of kittiwakes predicted to be impacted (0.02% of the population, and an increase in baseline mortality of 0.09%), and the small contribution the predicted impacts will make on the overall decline, it is predicted that the potential annual impact on kittiwakes from Project One alone will not affect the integrity of the site.

Collision and displacement mortality combined

5.4.78 As stated for gannet in this section, given the complex interactions and the lack of guidance or precedent it is not considered appropriate to combine the effects of collision and displacement mortality in a quantified manner.

Table 5.25 Predicted peak kittiwake mortality rate as a result of displacement from Subzone 1 only during the breeding season.

Kittiwake (breeding: Mar-Jul)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	2	4	9	19	38	57	76	95	114	133	152	171	190
20	4	8	19	38	76	114	152	190	228	266	304	341	379
25	5	9	24	47	95	142	190	237	285	332	379	427	474
30	6	11	28	57	114	171	228	285	341	398	455	512	569
40	8	15	38	76	152	228	304	379	455	531	607	683	759
50	9	19	47	95	190	285	379	474	569	664	759	854	949
60	11	23	57	114	228	341	455	569	683	797	911	1,024	1,138
70	13	27	66	133	266	398	531	664	797	930	1,062	1,195	1,328
75	14	28	71	142	285	427	569	711	854	996	1,138	1,280	1,423
80	15	30	76	152	304	455	607	759	911	1,062	1,214	1,366	1,518
90	17	34	85	171	341	512	683	854	1,024	1,195	1,366	1,537	1,707
100	19	38	95	190	379	569	759	949	1,138	1,328	1,518	1,707	1,897
Mean peak number = **1,897** Low sensitivity = Subzone 1 only													

Table 5.26 Predicted peak kittiwake mortality rate as a result of displacement from Subzone 1 only during the non-breeding season.

Kittiwake (non-breeding: Aug-Feb)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	20	41	101	203	405	608	811	1,014	1,216	1,419	1,622	1,824	2,027
20	41	81	203	405	811	1,216	1,622	2,027	2,433	2,838	3,244	3,649	4,054
25	51	101	253	507	1,014	1,520	2,027	2,534	3,041	3,548	4,054	4,561	5,068
30	61	122	304	608	1,216	1,824	2,433	3,041	3,649	4,257	4,865	5,473	6,082
40	81	162	405	811	1,622	2,433	3,244	4,054	4,865	5,676	6,487	7,298	8,109
50	101	203	507	1,014	2,027	3,041	4,054	5,068	6,082	7,095	8,109	9,122	10,136
60	122	243	608	1,216	2,433	3,649	4,865	6,082	7,298	8,514	9,731	10,947	12,163
70	142	284	710	1,419	2,838	4,257	5,676	7,095	8,514	9,933	11,352	12,771	14,190
75	152	304	760	1,520	3,041	4,561	6,082	7,602	9,122	10,643	12,163	13,684	15,204
80	162	324	811	1,622	3,244	4,865	6,487	8,109	9,731	11,352	12,974	14,596	16,218
90	182	365	912	1,824	3,649	5,473	7,298	9,122	10,947	12,771	14,596	16,420	18,245
100	203	405	1,014	2,027	4,054	6,082	8,109	10,136	12,163	14,190	16,218	18,245	20,272
Mean peak number = **20,272** Low sensitivity = Subzone 1 only													

Herring gull

Collision mortality

5.4.79 The Project One HRA Screening Assessment, detailed in Annex A, has identified herring gull at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from collision risk during operation.

5.4.80 Results from site specific monitoring indicate that herring gulls are widespread across the Hornsea Zone, with peak densities from November to May, particularly during December and January. Few herring gulls were recorded between June and October.

5.4.81 The maximum reported foraging range for herring gull is 92 km, although the mean maximum is 61.1 km and the mean foraging range 10.5 km (Thaxter *et al*., 2012). Therefore, herring gulls recorded within Subzone 1 are beyond the maximum reported foraging range for this species. Observations of flying birds recorded during the breeding period recorded a significant majority of birds flying in a north-south direction across the Hornsea Zone, indicating that herring gulls recorded during the this period will not be birds from the Flamborough Head and Bempton Cliffs SPA (see Environmental Statement Volume 2, Chapter 5: Ornithology).

5.4.82 The results from the collision risk modelling (see Environmental Statement Volume 2, Chapter 5: Ornithology) indicate that based on the worst-case scenario, Option 1 of the Band (2012) model, and a 98% avoidance rate, on average, a total of 64 herring gulls may collide with Project One over the course of a year.

5.4.83 During the breeding season (April to August) a total of 6 herring gulls are predicted to collide on average each year of which, based on the proportion of adults recorded during site specific surveys, two collisions per breeding season will be of adult birds (Table 5.27).

5.4.84 Project One is beyond the maximum recorded foraging range for herring gull and therefore it is unlikely that either of the adult herring gulls predicted to be impacted during the breeding period will be from the Flamborough Head and Bempton Cliffs SPA, and are more likely to be non-breeding birds able to forage further offshore. Nevertheless, even if both adults were from the SPA, an increase in baseline mortality of only 2% is predicted.

5.4.85 During the non-breeding season (August to March) a total of 58 herring gulls are predicted to collide on average each year of which, based on the proportion of adults recorded during site specific surveys, 23 collisions will be of adult birds.

5.4.86 Outwith the breeding season, herring gulls within the proposed development area will be from other colonies including SPAs and non-SPAs. A total 32% of the GB population of herring gulls breed on SPAs (JNCC, 2012a), which is very similar to the 31% estimated using east coast colony data in the SMP database. Therefore, of the 23 adult herring gulls predicted to be impacted during the non-breeding period an estimated seven may be part of an SPA breeding population.

5.4.87 Assuming the proportion of birds present from each SPA for which herring gull is a qualifying species correlates with the size of the colony compared to the east coast population (1.7% of 42,209 pairs) then of the seven predicted collisions of adult herring gulls to occur during the non-breeding period, none are predicted to be adult herring gulls from Flamborough Head and Bempton Cliffs (see Annex B, Table B.4).

5.4.88 Collision risk modelling predicts a total of 64 herring gull collisions per year with Project One, based on a 98% avoidance rate. The Flamborough Head and Bempton Cliffs SPA is beyond the maximum foraging range of this species during the breeding period and therefore the likelihood is that neither of the estimated two collisions of breeding adults per year will be from this SPA (Table 5.27). During the non-breeding period an estimated seven adult herring gulls possibly from SPAs may be impacted. Based on the relative sizes of the SPA breeding populations, no herring gulls from the Flamborough Head and Bempton Cliffs SPA are predicted to collide with Project One. Consequently, no adult herring gulls from the Flamborough Head and Bempton Cliffs SPA are predicted to be impacted by Project One.

Table 5.27 Predicted mean number of adult Flamborough Head and Bempton Cliffs herring gull collisions per year with Project One.

Number of adult herring gull predicted to collide			
	Breeding	Non-breeding	Total annual adults
98% avoidance	2	0	2
39.8% of all aged herring gulls were of adults			

5.4.89 It is predicted that the potential annual impact on herring gulls from Project One alone will not affect the integrity of the site.

Guillemot

Displacement mortality

5.4.90 The screening assessment (Section 4.3) has identified guillemot at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from displacement during operation.

5.4.91 Results from site specific monitoring indicate that peak numbers of guillemots occurred during the September and October. Peak numbers in excess of 19,000 guillemots were estimated in the Project One area. During the breeding period lower numbers were recorded with a peak mean of 3,458 individuals (see Environmental Statement, Volume 2, Chapter 5: Ornithology).

5.4.92 The maximum reported foraging range for guillemot during the breeding period is 135 km, although the mean maximum is 84 km and the mean foraging range 37.8 km

(Thaxter *et al*., 2012). Therefore, guillemots recorded within the Project One area during the breeding season are within the maximum reported foraging range for this species but beyond the reported mean maximum and mean foraging ranges. Flight directions across the Hornsea Zone during the breeding period were predominantly east-west, indicating that at least some birds occurring within the Project One area during the breeding period were from the Flamborough Head and Bempton Cliffs SPA.

5.4.93 During the breeding season not all guillemots attending colonies and adjacent waters are breeding adults. Guillemots do not usually breed until they are five years old (BWP*i*) and unlike gannets and gulls it is not easy to separate adults from immature birds from site specific observations offshore. However, data from studies undertaken on guillemots estimate that during the early part of the season, when guillemots first return to the colony and egg laying commences, few birds present in the colonies are immature. However, during the breeding period 30% of all guillemots present may be immature birds and therefore not part of the SPA breeding population (Wanless *et al.,* 1998).

5.4.94 For guillemot there is evidence from existing offshore wind farms to support a species specific level of displacement. Early publications (e.g., Zucco *et al.*, 2006) indicated a level of displacement on common guillemots from offshore wind farms that would warrant a 'medium' sensitivity to displacement to be attributed to them. However, a number of more recent studies undertaken at other offshore wind farms have not shown a similar level of effect. Arklow Bank offshore wind farm did not find any significant difference in the number of common guillemots present pre- and post-construction (Barton *et al.,* 2009) and post construction monitoring at North Hoyle offshore wind farm indicated an increase of up to 55% in the number of common guillemots present compared to before the wind farm was constructed (Gill *et al.*, 2008). Studies undertaken at Dutch wind farms have reported displacement effects of less than 50% (Leopold *et al.,* 2011).

5.4.95 At Robin Rigg (Walls *et al.,* 2013), there was an increase in guillemot numbers in the first year of operation compared to the construction phase, and although there was some preliminary evidence that guillemots may be showing some level of avoidance of the wind farm area, when statistically analysing all auks combined, a displacement rate of 30% was predicted.

5.4.96 Consequently, based on the results above, the use of species-specific displacement level of 30% has been considered for the purposes of this assessment, although a displacement rate of 10-100% has been presented.

5.4.97 There is little evidence on what the consequences of displacement on guillemots may be. Recent studies being developed using time/energy budgets of breeding guillemots and the impacts of a proposed offshore wind farm indicate an increase in energy expenditure may occur should a wind farm impact on breeding guillemots by either displacing birds to other areas or increasing their flight demands (McDonald *et al.,* 2012).

5.4.98 If displacement does occur, there may be an increase in intra-specific competition or an increase in energetic expenditure but displacement will not necessarily cause an increase in adult mortality. It is possible that the effects of displacement will cause reduced breeding success for those individuals affected, which could have an overall effect on the breeding population (McDonald *et al.,* 2012).

5.4.99 There is recognised to be uncertainty over what the consequences of displacement may be on an individual and a range of possible levels of mortality are presented. During the breeding period the foraging range of guillemots is restricted in their requirement to return to their breeding colonies to attend nests and chicks and their almost exclusive requirement for sandeels (Wright and Begg, 1997). Following breeding, adults and young disperse into adjacent waters and a wider variety of prey may become available to them with increasing amounts of sprat and young herring present (Blake *et al.,* 1985). During the winter, guillemots are widely dispersed across the North Sea (Stone *et al*., 1995) and therefore, they have a wide possible foraging area. Consequently, there is predicted to be a higher risk of an impact from displacement on guillemots during the breeding period compared to either the post-breeding or winter periods.

5.4.100 The assessment is based on possible levels of mortality of 10% during the breeding period (May to June). 2% during post-breeding period (July to September) and 1% during the non-breeding period (October to April). The levels of impact are considered to be suitably precautionary based on guillemot being a far ranging piscivorous seabird with mobile and often widespread prey and of medium vulnerability to displacement (see Environmental Statement Volume 2, Chapter 5: Ornithology).

Breeding Season

5.4.101 During the breeding period (May to June) a peak mean of 3,458 guillemots occurred within the wind farm area and 1 km buffer. Based on a displacement of 30% of guillemots and a subsequent 10% mortality rate, a total of 104 guillemots may be lost as a result of displacement (Table 5.29).

5.4.102 Studies undertaken of breeding guillemots suggest that 30% of the guillemots present during the breeding period may be non-breeding immature birds (Wanless *et al.,* 1998) and therefore not part of the cited SPA population. Consequently, of the possible 104 guillemots that might be lost due to displacement 74 may be adults from the Flamborough Head and Bempton Cliffs SPA.

5.4.103 The breeding guillemot population at the Flamborough Head and Bempton Cliffs SPA is 83,214 adults. The loss of an estimated 74 adults is 0.08% of the breeding population, and would be an increase in baseline mortality by 0.8% (using a mortality rate of 0.115, as per Furness and Wade, 2012).

Post-breeding Season

5.4.104 During the post-breeding period (July to September), the peak mean population estimate was 12,872 birds within Subzone 1 and a 1 km buffer using data from September of both years. In comparison, 24,380 large auks were estimated, and assuming a 78% proportion of guillemots in this period, results in a peak mean population of 19,016 guillemots. Using a 2% mortality rate, this would result in the death of 114 birds as a result of displacement (Table 5.30).

5.4.105 During the post-breeding period there will be an unknown but higher proportion of immature and juvenile birds within the population impacted. However, based on studies undertaken during the breeding period when an estimated 30% of the guillemots present may be non-breeding immature birds and therefore not part of the SPA population it is estimated that of the 114 guillemots that might be lost due to displacement, 80 may be adults.

5.4.106 Following breeding, guillemots disperse offshore. During this period birds from other colonies may occur in the area and so not all those predicted to be impacted would be from the Flamborough Head and Bempton Cliffs SPA. Birds from the colonies to the north of the Subzone 1 may also occur in the area and be displaced. Although it is recognised that birds may travel from any of the SPAs, only those from the closest adjacent colonies of the Farne Islands (48,126 individuals. 58% of post-breeding population) have been considered to occur in the area during the post-breeding period. If the proportion of birds impacted is in direct proportion to the colony size, then it is predicted that of the 80 adult guillemots estimated to be impacted, 50 will be from Flamborough Head and Bempton Cliffs SPA (Annex B). This is equivalent to 0.06% of the breeding population, and an increase in baseline mortality by 0.5% on the Flamborough Head and Bempton Cliffs SPA population.

Non-breeding Season

5.4.107 Over the winter months (October to March) the mean peak guillemot population estimate was 15,364 birds for Subzone 1 and 1 km buffer, using data from October of both years.

5.4.108 Based on a 1% mortality rate during this period, it is predicted that 46 birds will be lost as a result of displacement (Table 5.31). Based on 30% of the birds impacted being non-breeding immature or juvenile birds, then of the 46 birds predicted to be lost an estimated 32 will be adults.

5.4.109 Guillemots displaced from the proposed development area will be from other colonies, particularly from northern Britain (Wernham *et al.,* 2002). Assuming the proportion of birds present from each colony for which guillemot is a qualifying species correlates with the population from the SPA breeding colony (approximately 9.7% in the case of Flamborough Head and Bempton Cliffs SPA), then it is predicted that three adult guillemots from Flamborough Head and Bempton Cliffs SPA may be impacted in the non-breeding season (Annex B).

5.4.110 The potential mortality of three guillemots from the Flamborough Head and Bempton Cliffs SPA during the non-breeding period is equivalent to 0.002% of the breeding population, and an increase in baseline mortality by 0.02%.

Annual mortality on the Flamborough Head and Bempton Cliffs SPA population

5.4.111 If the mortality rates from the breeding, post-breeding and non-breeding seasons are added together, up to 127 adult guillemots from the Flamborough Head and Bempton Cliffs SPA may be impacted as a result of mortality from displacement from Subzone 1 plus a 1 km buffer each year (Table 5.28). It is not clear however that the relationship between mortality rates in different seasons is a simple additive total, and so the combined total of the three seasons should therefore be viewed as very precautionary figure.

Table 5.28 Predicted number of adult Flamborough Head and Bempton Cliffs SPA guillemot losses caused by operational displacement from with Project One.

Number of adult guillemots predicted to be lost due to displacement			
Breeding	**Post-breeding**	**Non-breeding**	**Total annual adults**
74	50	3	127
70% of all observations were predicted to be adults			

5.4.112 The potential increase in mortality arising from displacement effects from Project One alone on guillemots from Flamborough Head and Bempton Cliffs SPA is 0.15% of the total breeding population, and an increase in baseline mortality by 1.3%.

5.4.113 A PBR model has been created to estimate the level of removal each year of adult guillemots from the Flamborough Head and Bempton Cliffs SPA population before it becomes unsustainable (Annex J). Using the most recent population data available, and a recovery factor of 0.4 (considered precautionary since the population appears to be stable at least), then a loss of 1,293 birds would be required before this happens. The predicted mortality rate of 127 adult guillemots due to displacement from Project One would therefore fall well below this threshold, and so it is clear that there is no risk to the population as a result of displacement from Project One.

5.4.114 As such, the level of impact predicted will not affect the conservation status of the species, or the conservation objectives of the site, and therefore there will be no adverse effect on the integrity of the SPA.

Table 5.29 Estimated peak guillemot mortality as a result of displacement from Subzone 1 plus 1 km buffer during the breeding season.

Guillemot (breeding: May-Jun)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	3	7	17	35	69	104	138	173	207	242	277	311	346
20	7	14	35	69	138	207	277	346	415	484	553	622	692
25	9	17	43	86	173	259	346	432	519	605	692	778	865
30	10	21	52	104	207	311	415	519	622	726	830	934	1,037
40	14	28	69	138	277	415	553	692	830	968	1,107	1,245	1,383
50	17	35	86	173	346	519	692	865	1,037	1,210	1,383	1,556	1,729
60	21	41	104	207	415	622	830	1,037	1,245	1,452	1,660	1,867	2,075
70	24	48	121	242	484	726	968	1,210	1,452	1,694	1,936	2,179	2,421
75	26	52	130	259	519	778	1,037	1,297	1,556	1,815	2,075	2,334	2,594
80	28	55	138	277	553	830	1,107	1,383	1,660	1,936	2,213	2,490	2,766
90	31	62	156	311	622	934	1,245	1,556	1,867	2,179	2,490	2,801	3,112
100	35	69	173	346	692	1,037	1,383	1,729	2,075	2,421	2,766	3,112	3,458
Mean peak number = 3,458 Medium sensitivity = Subzone 1 plus 1 km buffer													

Table 5.30 Estimated peak guillemot mortality as a result of displacement from Subzone 1 plus 1 km buffer during the post-breeding season.

Guillemot (post-breeding July to Sept)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	19	38	95	190	380	570	761	951	1,141	1,331	1,521	1,711	1,902
20	38	76	190	380	761	1,141	1,521	1,902	2,282	2,662	3,043	3,423	3,803
25	48	95	238	475	951	1,426	1,902	2,377	2,852	3,328	3,803	4,279	4,754
30	57	114	285	570	1,141	1,711	2,282	2,852	3,423	3,993	4,564	5,134	5,705
40	76	152	380	761	1,521	2,282	3,043	3,803	4,564	5,324	6,085	6,846	7,606
50	95	190	475	951	1,902	2,852	3,803	4,754	5,705	6,656	7,606	8,557	9,508
60	114	228	570	1,141	2,282	3,423	4,564	5,705	6,846	7,987	9,128	10,269	11,410
70	133	266	666	1,331	2,662	3,993	5,324	6,656	7,987	9,318	10,649	11,980	13,311
75	143	285	713	1,426	2,852	4,279	5,705	7,131	8,557	9,983	11,410	12,836	14,262
80	152	304	761	1,521	3,043	4,564	6,085	7,606	9,128	10,649	12,170	13,692	15,213
90	171	342	856	1,711	3,423	5,134	6,846	8,557	10,269	11,980	13,692	15,403	17,114
100	190	380	951	1,902	3,803	5,705	7,606	9,508	11,410	13,311	15,213	17,114	19,016
Mean peak number = 19,016 Medium sensitivity = Subzone 1 plus 1 km buffer													

Table 5.31 Estimated peak guillemot mortality as a result of displacement from Subzone 1 plus 1 km buffer during the winter non-breeding period.

Guillemot (non-breeding: Oct-Apr)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	15	31	77	154	307	461	615	768	922	1,075	1,229	1,383	1,536
20	31	61	154	307	615	922	1,229	1,536	1,844	2,151	2,458	2,766	3,073
25	38	77	192	384	768	1,152	1,536	1,921	2,305	2,689	3,073	3,457	3,841
30	46	92	230	461	922	1,383	1,844	2,305	2,766	3,226	3,687	4,148	4,609
40	61	123	307	615	1,229	1,844	2,458	3,073	3,687	4,302	4,916	5,531	6,146
50	77	154	384	768	1,536	2,305	3,073	3,841	4,609	5,377	6,146	6,914	7,682
60	92	184	461	922	1,844	2,766	3,687	4,609	5,531	6,453	7,375	8,297	9,218
70	108	215	538	1,075	2,151	3,226	4,302	5,377	6,453	7,528	8,604	9,679	10,755
75	115	230	576	1,152	2,305	3,457	4,609	5,762	6,914	8,066	9,218	10,371	11,523
80	123	246	615	1,229	2,458	3,687	4,916	6,146	7,375	8,604	9,833	11,062	12,291
90	138	277	691	1,383	2,766	4,148	5,531	6,914	8,297	9,679	11,062	12,445	13,828
100	154	307	768	1,536	3,073	4,609	6,146	7,682	9,218	10,755	12,291	13,828	15,364

Mean peak number = 15,364

Medium sensitivity = Subzone 1 plus 1 km buffer

Razorbill

Displacement mortality

5.4.115 The Project One HRA Screening Assessment, detailed in Annex A, has identified razorbill at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from displacement during operation.

5.4.116 Results from site specific monitoring indicate that peak numbers of razorbill occurred during the September and October. Peak mean numbers in excess of 7,000 razorbills were estimated in the Project One area and 1 km buffer in October. During the breeding period lower numbers were recorded with a peak mean of 915 individuals within Project One and a 1 km buffer (see Environmental Statement, Volume 2, Chapter 5: Ornithology).

5.4.117 The maximum reported foraging range for razorbill during the breeding period is 95 km, although the mean maximum is 48.5 km and the mean foraging range 23.7 km (Thaxter *et al.,* 2012). Therefore, razorbills recorded within Project One during the breeding season are beyond the maximum reported foraging range for this species from this SPA. Flight directions across the Hornsea Zone during the breeding period were predominantly east-west, indicating that at least some birds occurring were from the Flamborough Head and Bempton Cliffs SPA.

5.4.118 There is less evidence to predict the potential displacement effects of offshore wind farms on razorbills. Reported studies from developments provide little information on the potential displacement effects on razorbills. Results from those studies have indicated that razorbills have similar behavioural responses to those of guillemots. Studies undertaken in the Netherlands at the Egmond ann Zee offshore wind farm report less than a 50% displacement. No statistically significant change in numbers between pre and post construction were found at North Hoyle (Lindeboom *et al*., 2011; RWE, 2008). Therefore, it is likely that the number of razorbills displaced, if any, will be lower than the precautionary 50% displacement and a 40% displacement has been used in this assessment (see Environmental Statement, Volume 2, Chapter 5: Ornithology). This is a higher level of estimated displacement than has been used for guillemot due to the lower level of evidence available on the scale of potential displacement to razorbills.

5.4.119 During the breeding season not all razorbills attending colonies and adjacent waters are breeding adults. Razorbills do not usually breed until they are four years old (BWP*i*) and unlike gannets and gulls it is not possible to separate adults from immature birds from site specific observations offshore. However, data from other studies indicate that during the breeding period between 18% and 30% of all razorbills present may be immature birds and therefore not part of the SPA breeding population (Lloyd and Perrins, 1977; Wanless *et al.,* 1998). For the purposes of this assessment an estimated 20% of razorbills present offshore are considered to be non-breeding immature birds.

5.4.120 During the post-breeding and non-breeding periods there will be an unknown but higher proportion of immature and juvenile birds within the population impacted compared to the breeding period, as the population will contain both juvenile and immature razorbills. However, the proportion of the non-adult population is unknown so a precautionary, 20% of the population (based on breeding season proportions) being non-adults is used to assess impacts across the year

5.4.121 There is little evidence of what the consequences of displacement on razorbills may be. Recent studies being developed using time/energy budgets of breeding guillemots and the impacts of a proposed offshore wind farm indicate an increase in energy expenditure will occur should a wind farm impact on breeding guillemots by either displacing birds to other areas or increasing their flight demands (McDonald *et al.,* 2012). It is expected that similar effects on razorbills might occur.

5.4.122 If displacement does occur, there may be an increase in intra-specific competition or an increase in energetic expenditure but displacement will not necessarily cause an increase in adult mortality. It is possible that the effects of displacement will cause reduced breeding success for those individuals affected, which could have an overall effect on the breeding population (McDonald *et al.,* 2012).

5.4.123 As with guillemots, there is recognised to be uncertainty over what the consequences of displacement may be on an individual and a range of possible levels of mortality are presented. Similarly, the foraging range of razorbills is restricted during the breeding period in their requirement to return to their breeding colonies to attend nests and chicks. Following breeding, adults and young disperse into adjacent waters and a wider variety of prey may become available to them. During the winter, razorbills are widely dispersed across the North Sea (Stone *et al*., 1995) and therefore, they have a wide possible foraging area. Consequently, there is predicted to be a higher risk of an impact from displacement on guillemots during the breeding period compared to either the post-breeding or winter periods.

5.4.124 The assessment is based on possible levels of mortality of 10% during the breeding period (May to June). 2% during post-breeding period (July to September) and 1% during the non-breeding period (October to April). The levels of impact are considered to be suitably precautionary based on razorbill being a far ranging piscivorous seabird with mobile and often widespread prey and of medium vulnerability to displacement (see Environmental Statement Volume 2, Chapter 5: Ornithology).

Breeding Season

5.4.125 The precautionary assumption for the purposes of this assessment is that all razorbills recorded during the breeding season, from between May and June, are from the nearest SPA colony (i.e., Flamborough Head and Bempton Cliffs SPA).

5.4.126 The peak mean razorbill population estimate within Subzone 1 plus 1 km buffer during the breeding season was 367 birds. In comparison, the total ‘All Auk’ population peak mean estimate was 4,572 birds, and assuming 20% are razorbills, the peak mean estimate during the breeding period is 915 birds.

5.4.127 Based on a mortality rate of 10% during the breeding season, 37 razorbills may be lost as a result of displacement from Subzone 1 plus 1 km buffer (Table 5.32).

Table 5.32 Estimated peak razorbill mortality as a result of displacement from Subzone 1 plus 1 km buffer during the breeding season.

Razorbill (breeding: May-Jun)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	1	2	5	9	18	27	37	46	55	64	73	82	92
20	2	4	9	18	37	55	73	92	110	128	146	165	183
25	2	5	11	23	46	69	92	114	137	160	183	206	229
30	3	5	14	27	55	82	110	137	165	192	220	247	275
40	4	7	18	37	73	110	146	183	220	256	293	329	366
50	5	9	23	46	92	137	183	229	275	320	366	412	458
60	5	11	27	55	110	165	220	275	329	384	439	494	549
70	6	13	32	64	128	192	256	320	384	448	512	576	641
75	7	14	34	69	137	206	275	343	412	480	549	618	686
80	7	15	37	73	146	220	293	366	439	512	586	659	732
90	8	16	41	82	165	247	329	412	494	576	659	741	824
100	9	18	46	92	183	275	366	458	549	641	732	824	915
Mean peak number = 915													
Medium sensitivity = Subzone 1 plus 1 km buffer													

5.4.128 Studies undertaken of breeding razorbills suggest that 20% of the razorbills present during the breeding period may be non-breeding immature birds (Lloyd and Perrins, 1977; Wanless *et al.,* 1998) and therefore not part of the cited SPA population. Consequently, of the possible 37 razorbills that might be lost due to displacement 30 may be adults from the Flamborough Head and Bempton Cliffs SPA.

5.4.129 The breeding razorbill population at the Flamborough Head and Bempton Cliffs SPA is 21,140 breeding adults. The loss of an estimated 30 adults is 0.14% of the breeding population.

Post-breeding Season

5.4.130 During the post-breeding period (July to September), the peak mean population estimate was 6,321 birds within Subzone 1 plus 1 km buffer. In comparison, 24,380 large Auks were estimated and assuming a 30% proportion of razorbills in this period, results in a peak mean population of 7,314 razorbills.

5.4.131 Using a 40% level of displacement and a 2% mortality rate, there an estimated loss 59 birds as a result of displacement (Table 5.33).

5.4.132 Based on 20% of the population comprising non-breeding immature birds, of the 59 razorbills estimated to be impacted 47 might be adults.

5.4.133 Following breeding, razorbills disperse offshore. During this period birds from other colonies may occur in the area and so not all those predicted to be impacted would be from the Flamborough Head and Bempton Cliffs SPA. Birds from the SPAs to the north of the Subzone 1 may also occur in the area and be displaced. Although it is recognised that birds may travel from any of the SPAs only those from the closest colonies at St Abb's Head to Fast Castle SPA are considered to occur in the area during the post-breeding period. If the proportion of birds impacted is in direct proportion to the colony size, then it is estimated that of the 47 adult razorbills estimated to be impacted, 44 will be from Flamborough Head and Bempton Cliffs SPA (Annex B). This is equivalent to 0.22% of the breeding population. This is a small increase in mortality compared to the overall razorbill population.

Non-breeding Season

5.4.134 Over the winter months (October to April) the mean peak razorbill population estimate was 5,421 birds for Subzone 1 plus 1 km buffer. In comparison, the large auk estimate was 21,899 and so assuming 30% are razorbill in this period, this produces a higher estimate of 6,570 razorbills.

5.4.135 Based on 1% mortality during this period, it is predicted that 26 birds will die as a result of displacement (Table 5.34).

Table 5.33 Estimated peak razorbill mortality rate as a result of displacement from Subzone 1 plus 1 km buffer during the post-breeding season.

Razorbill (post-breeding: Jul-Sep)	Mortality (%)												
Displaced (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	7	15	37	73	146	219	293	366	439	512	585	658	731
20	15	29	73	146	293	439	585	731	878	1,024	1,170	1,317	1,463
25	18	37	91	183	366	549	731	914	1,097	1,280	1,463	1,646	1,829
30	22	44	110	219	439	658	878	1,097	1,317	1,536	1,755	1,975	2,194
40	29	59	146	293	585	878	1,170	1,463	1,755	2,048	2,340	2,633	2,926
50	37	73	183	366	731	1,097	1,463	1,829	2,194	2,560	2,926	3,291	3,657
60	44	88	219	439	878	1,317	1,755	2,194	2,633	3,072	3,511	3,950	4,388
70	51	102	256	512	1,024	1,536	2,048	2,560	3,072	3,584	4,096	4,608	5,120
75	55	110	274	549	1,097	1,646	2,194	2,743	3,291	3,840	4,388	4,937	5,486
80	59	117	293	585	1,170	1,755	2,340	2,926	3,511	4,096	4,681	5,266	5,851
90	66	132	329	658	1,317	1,975	2,633	3,291	3,950	4,608	5,266	5,924	6,583
100	73	146	366	731	1,463	2,194	2,926	3,657	4,388	5,120	5,851	6,583	7,314
Mean peak number = 7,314 Medium sensitivity = Subzone 1 plus 1 km buffer													

Table 5.34 Estimated peak razorbill mortality as a result of displacement from Subzone 1 plus 1 km buffer during the non-breeding period.

Razorbill (non-breeding: Oct-Apr)	Mortality (%)												
Displaced (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	7	13	33	66	131	197	263	329	394	460	526	591	657
20	13	26	66	131	263	394	526	657	788	920	1,051	1,183	1,314
25	16	33	82	164	329	493	657	821	986	1,150	1,314	1,478	1,643
30	20	39	99	197	394	591	788	986	1,183	1,380	1,577	1,774	1,971
40	26	53	131	263	526	788	1,051	1,314	1,577	1,840	2,102	2,365	2,628
50	33	66	164	329	657	986	1,314	1,643	1,971	2,300	2,628	2,957	3,285
60	39	79	197	394	788	1,183	1,577	1,971	2,365	2,759	3,154	3,548	3,942
70	46	92	230	460	920	1,380	1,840	2,300	2,759	3,219	3,679	4,139	4,599
75	49	99	246	493	986	1,478	1,971	2,464	2,957	3,449	3,942	4,435	4,928
80	53	105	263	526	1,051	1,577	2,102	2,628	3,154	3,679	4,205	4,730	5,256
90	59	118	296	591	1,183	1,774	2,365	2,957	3,548	4,139	4,730	5,322	5,913
100	66	131	329	657	1,314	1,971	2,628	3,285	3,942	4,599	5,256	5,913	6,570
Mean peak number = 6,570 Medium sensitivity = Subzone 1 plus 1 km buffer													

5.4.136 Assuming that 20% of the razorbill population will be non-breeding immature birds then of the 26 estimated to be lost from the population 21 will be adults.

5.4.137 Razorbills displaced from the proposed development area will be from other SPA colonies, particularly from northern Britain (Wernham *et al.,* 2002). Assuming the proportion of birds present from each SPA for which razorbill is a qualifying species correlates with the population from the SPA breeding colony (27.3% of the east coast population), then it is predicted that of the 21 adult razorbills estimated to be impacted, five may be from Flamborough Head and Bempton Cliffs SPA.

5.4.138 The potential mortality of five adult razorbills from the Flamborough Head and Bempton Cliffs SPA during the non-breeding season is equivalent to 0.02% of the breeding population, and an increase in baseline mortality by 0.2% (based on an annual mortality rate of 0.095, Furness and Wade, 2012).

Annual mortality on the Flamborough Head and Bempton Cliffs SPA population

5.4.139 From the information presented above, over a year, 79 adult razorbills may be impacted as a result of mortality from displacement from the Flamborough Head and Bempton Cliffs SPA (Table 5.35). This is seen as a very precautionary total by summing the peak mortality rates from the three seasons. The potential increase in mortality arising from displacement effects from Subzone 1 alone on razorbills from Flamborough Head and Bempton Cliffs SPA is 0.4% of the total breeding population, and an increase in baseline mortality (taken as 0.095 in Furness and Wade, 2012) by 3.9%.

Table 5.35 Predicted number of adult Flamborough Head and Bempton Cliffs SPA razorbill losses caused by operational displacement from with Project One.

Number of adult razorbills predicted to be lost due to displacement			
Breeding	**Post-breeding**	**Non-breeding**	**Total annual adults**
30	44	5	79
80% of all observations were predicted to be adults			

5.4.140 A PBR model has been created to estimate the level of removal each year of adult razorbills from the Flamborough Head and Bempton Cliffs SPA population before it becomes unsustainable (Annex J). Using the most recent population data available, and a recovery factor of 0.5 (considered precautionary since the population appears to be stable at least), then a loss of 607 birds would be required before this happens. The predicted mortality rate of 79 adult razorbills due to displacement from Project One would therefore fall well below this threshold, and so it is clear that there is no risk to the population as a result of displacement from Project One.

5.4.141 As such, the level of impact predicted will not affect the conservation status of the species, or the conservation objectives of the site, and therefore there will be no adverse effect on the integrity of the SPA.

Puffin

Displacement mortality

5.4.142 The Project One HRA Screening Assessment, detailed in Annex A, has identified puffin at Flamborough Head and Bempton Cliffs SPA as being at risk of a LSE from displacement during the operational period of the wind farm.

5.4.143 Results from site specific monitoring indicate that the highest peak numbers of puffins generally occurred during the non-breeding period particularly August and November, but an unusually high peak of 1,686 birds was estimated in Subzone 1 plus 1 km buffer in June of Year 1.

5.4.144 The maximum reported foraging range for puffin during the breeding period is 200 km, the mean maximum is 105 km and the mean foraging range 4 km (Thaxter *et al.,* 2012). Therefore, puffins in the Subzone 1 development area during the breeding season may be from the Flamborough Head and Bempton Cliffs SPA. Flight directions across the Hornsea Zone during the breeding period were predominantly east-west, indicating that at least some birds occurring were from the Flamborough Head and Bempton Cliffs SPA.

5.4.145 There is very little evidence from existing offshore wind farms to predict the potential displacement impacts that offshore wind farms may have on puffins. However, it is likely that their behaviour will be similar to that of other auk species, which show at least some, relatively low level, displacement effects. The little data there are indicates that puffins may not be significantly displaced with birds recorded within the area of the constructed Arklow Bank development in the East Irish Sea. However, both the number of turbines and the number of puffins observed at this site were very small (Barton *et al.,* 2010).

5.4.146 For the purposes of this assessment it is estimated that there will be up to 40% displacement from the Project One and 1 km buffer. This is a higher level of displacement than used for guillemot as it allows for an increased level of precaution to account for lack of species specific data (see Environmental Statement, Volume 2, Chapter 5: Ornithology).

5.4.147 During the breeding season not all puffins attending colonies and adjacent waters are breeding adults. Puffins do not usually breed until they are five years old (BWP*i*) and unlike gannets and gulls it is not easy to separate adults from immature birds from site specific observations offshore. However, data from other studies indicate that during the breeding period 35% of all puffins present may be non-breeding or immature birds (Harris and Wanless, 2011) and therefore not part of the SPA breeding population. For the purposes of this assessment an estimated 35% of puffins present offshore are considered to be non-breeding or immature birds.

Breeding Season

5.4.148 The peak mean puffin population estimate within Subzone 1 plus 1 km buffer during the main breeding season (April to July) was 1,070 birds. Based on a mortality rate of 10% during the breeding season, 43 puffins may be lost as a result of displacement (Table 5.37).

5.4.149 Based on a conservative 30% of the puffins present during the breeding period being non-breeding immature birds (Harris and Wanless, 2011 predicted up to 35%) of the possible 43 puffins that might be lost due to displacement, 30 may be adults.

5.4.150 The site-specific data collected within the Hornsea Zone and a 10 km buffer across the breeding period (April to July) resulted in the peak mean population estimate of 2,987 puffins. If 35% of the birds present are non-breeding immature birds (Harris and Wanless 2011) then 1,941 of the puffins recorded will be breeding adults. The total breeding population at Flamborough Head and Bempton Cliffs SPA is 980 breeding adults (JNCC and NE 2013) and therefore the number of potentially breeding adult puffins recorded across the surveyed areas is significantly higher than the total nearest SPA breeding colony. Consequently, this indicates that a proportion of birds present within the Hornsea Zone will be either breeding birds from other colonies, or non-breeding adults.

5.4.151 The nearest other puffin colonies are Coquet Island and the Farnes Islands. Coquet Island lies 258 km to the north of the Subzone 1 and has a breeding population of 15,812 individuals. The Farne Islands lie 287 km to the north of the Subzone 1 and has a breeding population of 36,835 individuals.

5.4.152 Both colonies lie beyond the maximum reported foraging range for puffins of 200 km. However, the figure for the maximum reported foraging range is based on indirect measurements and is reported to be of low confidence (Thaxter *et al*., 2012). The numbers of puffins recorded from site surveys was over twice as high as the total Flamborough Head and Bempton Cliffs SPA breeding population and therefore puffins from other colonies (Farne Islands and Coquet Island) will likely be present in Subzone 1 even though the two breeding colonies are beyond the reported maximum foraging range.

5.4.153 The number of puffins impacted from each of the three breeding colonies from which puffins are predicted to originate during the breeding period are apportioned between the colonies based on breeding population size, the distance each colony is from Subzone 1 and the proportion of the total area within the species' foraging range that is sea. From which the proportion of the colony population at risk is calculated.

5.4.154 The results indicate that of the 30 adult puffins estimated to be impacted from displacement effects from Subzone 1, a total of three may be from the Flamborough Head and Bempton Cliffs SPA (Table 5.36).

Table 5.36 Estimated number of puffins impacted from each of the SPAs from which puffins are qualifying species and are predicted to occur in Subzone 1 during the breeding period.

SPA	Distance from Subzone 1	Breeding Population (individuals)	Proportion of colony population at risk	Number of birds at risk
Flamborough Head and Bempton Cliffs SPA	117	980	0.0027	3
Coquet Island SPA	258	15,812	0.0005	9
Farne Islands SPA	287	36,835	0.0004	18

5.4.155 The breeding puffin population at the Flamborough Head and Bempton Cliffs SPA is 980 breeding adults (Natural England and JNCC, 2012). The potential loss of an estimated three adults is 0.3% of the breeding population, which equates to an increase in baseline mortality (taken to be 0.05 in Furness and Wade, 2012) by 6.1%.

Non-breeding season

5.4.156 During the non-breeding period (August to March), the peak mean population estimate was 1,257 birds within Subzone 1 and a 1 km buffer and an estimated 5 birds might be lost due to displacement effects (Table 5.38).

5.4.157 Based on 30% of the population comprising non-breeding immature or juvenile birds then of the five estimated fatalities due to displacement, three will be adults.

5.4.158 Puffins displaced from the proposed development area during the non-breeding period will be from other colonies, particularly from northern Britain (Wernham *et al.,* 2002). Assuming the proportion of birds present from each SPA for which puffin is a qualifying species correlates with the population from the breeding colony (Flamborough Head and Bempton Cliffs SPA is only 0.2% of the east coast population), then it is predicted that of the three adult puffins estimated to be impacted during the non-breeding period none will be from the Flamborough Head and Bempton Cliffs SPA (Annex B).

Annual mortality on the Flamborough Head and Bempton Cliffs SPA population

5.4.159 Over a year an estimated three adult puffins may be impacted as a result of mortality from displacement from the Flamborough Head and Bempton Cliffs SPA. The potential increase in mortality arising from displacement effects from Project One alone on puffins from Flamborough Head and Bempton Cliffs SPA is 0.3% of the total breeding SPA population, and an increase in baseline mortality by 6.1%.

5.4.160 PBR modelling undertaken on puffins from Flamborough Head and Bempton Cliffs SPA indicates that the loss of more than 7.6 puffins per year would be unsustainable (Annex J). This is based on a precautionary recovery factor of 0.2, reserved for populations of high concern. The estimated loss of three puffins per year from the SPA is below the level at which an unsustainable population loss is predicted to occur.

5.4.161 The level of impact predicted on puffins from the SPA due to displacement effects will therefore not affect the conservation status of the species, or the conservation objectives of the site and therefore there will not be an adverse effect on the integrity of the SPA.

Conclusion

5.4.162 Based on the assessment above for each SPA species, it is concluded that there will be no adverse effects on the integrity of the Flamborough Head and Bempton Cliffs SPA as a result of Project One alone.

Table 5.37 Estimated peak puffin mortality as a result of displacement from Subzone 1 during the breeding season.

Puffin (breeding: Apr-Jul)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	1	2	5	11	21	32	43	54	64	75	86	96	107
20	2	4	11	21	43	64	86	107	128	150	171	193	214
25	3	5	13	27	54	80	107	134	161	187	214	241	268
30	3	6	16	32	64	96	128	161	193	225	257	289	321
40	4	9	21	43	86	128	171	214	257	300	342	385	428
50	5	11	27	54	107	161	214	268	321	375	428	482	535
60	6	13	32	64	128	193	257	321	385	449	514	578	642
70	7	15	37	75	150	225	300	375	449	524	599	674	749
75	8	16	40	80	161	241	321	401	482	562	642	722	803
80	9	17	43	86	171	257	342	428	514	599	685	770	856
90	10	19	48	96	193	289	385	482	578	674	770	867	963
100	11	21	54	107	214	321	428	535	642	749	856	963	1,070
Mean peak number = 1,070 Medium sensitivity = Subzone 1 plus 1 km buffer													

Table 5.38 Estimated peak puffin mortality as a result of displacement from Subzone 1 during the non-breeding season.

Puffin (non-breeding: Aug-Mar)	Mortality (%)												
Displaced (%)	**1**	**2**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
10	1	3	6	13	25	38	50	63	75	88	101	113	126
20	3	5	13	25	50	75	101	126	151	176	201	226	251
25	3	6	16	31	63	94	126	157	189	220	251	283	314
30	4	8	19	38	75	113	151	189	226	264	302	339	377
40	5	10	25	50	101	151	201	251	302	352	402	453	503
50	6	13	31	63	126	189	251	314	377	440	503	566	629
60	8	15	38	75	151	226	302	377	453	528	603	679	754
70	9	18	44	88	176	264	352	440	528	616	704	792	880
75	9	19	47	94	189	283	377	471	566	660	754	848	943
80	10	20	50	101	201	302	402	503	603	704	804	905	1,006
90	11	23	57	113	226	339	453	566	679	792	905	1,018	1,131
100	13	25	63	126	251	377	503	629	754	880	1,006	1,131	1,257
Mean peak number = 1,257 Medium sensitivity = Subzone 1 plus 1 km buffer													

Forth Islands SPA

Site's Conservation Objectives

- *'To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and*
- *To ensure for the qualifying species that the following are maintained in the long term:*
  - *Population of the species as a viable component of the site;*
  - *Distribution of the species within site;*
  - *Distribution and extent of habitats supporting the species;*
  - *Structure, function and supporting processes of habitats supporting the species; and*
  - *No significant disturbance of the species.*
- *Qualifying Species (*indicates assemblage qualifier only):*
  - *Arctic tern (Sterna paradisaea);*
  - *Common tern (Sterna hirundo);*
  - *Cormorant (Phalacrocorax carbo)*;*
  - *Fulmar (Fulmarus glacialis)*;*
  - *Gannet (Morus bassanus);*
  - *Guillemot (Uria aalge)*;*
  - *Herring gull (Larus argentatus)*;*
  - *Kittiwake (Rissa tridactyla)*;*
  - *Lesser black-backed gull (Larus fuscus);*
  - *Puffin (Fratercula arctica);*
  - *Razorbill (Alca torda)*;*
  - *Roseate tern (Sterna dougallii);*
  - *Sandwich tern (Sterna sandvicensis);*
  - *Shag (Phalacrocorax aristotelis); and*
  - *Seabird assemblage.'*

5.4.163 The Forth Islands SPA lies approximately 363 km to the north of the proposed development. The site comprises a series of islands supporting the main seabird colonies in the Firth of Forth including the Isle of May, Bass Rock, Craigleith, Inchmickery, Fidre and The Lamb.

5.4.164 The results from the screening exercise identified the following qualifying species at the Forth Islands SPA as being at risk of a LSE outwith the breeding season alone and in-combination with other plans or projects:

- Gannet (collision risk and displacement during operation).

5.4.165 The potential impacts on gannet (Table 5.39) from the Forth Islands SPA during construction and decommissioning phases were based on the evidence presented in the Environmental Statement (Volume 2, Chapter 5: Ornithology) and the Screening Assessment. Impacts on qualifying species during construction and decommissioning were identified as being smaller in extent and duration than those similar impacts (i.e., displacement) arising during the operational period. Impacts on gannets were predicted to occur less than 500 m from the site. Therefore any impacts from construction will be very localised and relatively short-term for the duration of the construction period, and therefore, not considered significant. Impacts associated with construction and decommissioning have not been considered further in the information to inform the Appropriate Assessment.

Table 5.39 Gannet population at the Forth Islands SPA.

Qualifying Feature	1990 Site total at designation 'pairs'	Latest count 'pairs' [1]	Condition[2]
Gannet	34,400	55,482	Favourable Maintained.

[1] - Source – Lewis *et al*. 2012;

[2] - Source – SNH 2012.

Gannet

Collision mortality

5.4.166 The maximum recorded foraging range for gannet is 590 km and therefore the Forth Islands SPA is within the maximum recorded foraging range of this species. However, the mean maximum foraging distance is 229 km and therefore below the 359 km distance that the SPA is from the proposed Project One development. Tagging studies undertaken on breeding gannets at the Forth Islands SPA indicate that few, if any, gannets for the SPA will occur within the proposed Project One during the breeding period. Data from three years of studies recorded a maximum foraging distance of 261 km to the south of the colony and therefore not overlapping with Project One (Hamer *et al.,* 2011).

5.4.167 A recent review of tagging data from various colonies across Britain has shown that foraging ranges seldom overlap (Wakefield *et al.,* 2013), which reinforces the likelihood that connectivity of the Bass Rock colony with Project One during the breeding season is negligible.

5.4.168 Breeding birds from the Forth Islands SPA are thus unlikely to occur frequently in the proposed Project One during the breeding season. Therefore none of the impacts on adult gannets from Project One predicted to occur during the breeding period will be on birds from the Forth Islands SPA and no further assessment on breeding season impacts has been undertaken.

5.4.169 Outwith the breeding season gannets range widely across the North Sea and birds from the SPA may occur in the area and be at risk of potential collision.

5.4.170 The results from the collision risk modelling indicate that based on the worst-case scenario and 98% avoidance behaviour, a total of 19 adult gannets per year from the Forth Islands SPA may collide with the proposed Project One during the non-breeding season (Annex B). If, as predicted, the avoidance behaviour is 99% then a total of 10 gannets per year from the Forth Islands SPA will be impacted and all during the non-breeding period.

5.4.171 The potential loss of 10 gannets per year from a breeding population of 110,974 individuals is 0.009% of the population, and an increase in baseline mortality by 0.1%.

5.4.172 Population Viability Analysis undertaken on gannets indicates that the breeding population within the Forth Islands SPA may be able to sustain an increase in annual mortality of up to 2,000 birds per year without a high risk of a population decline (WWT, 2011).

5.4.173 The population is in favourable conservation status (SNH, 2012) and therefore the predicted small increase in adult mortality is not expected to cause an adverse effect on the integrity of the site population or affect the conservation objectives of the site.

Displacement mortality

5.4.174 Gannets from the Forth Islands SPA are not predicted to regularly occur within Subzone 1 during the breeding period, and displacement impacts are therefore limited to the non-breeding season.

5.4.175 As discussed above there is recognised to be uncertainty over what the consequences of displacement may be on an individual. For the purposes of the assessment of displacement impacts on gannets a level of 70% has been used and for impacts during the non-breeding period a level of 1% mortality has been assessed. The levels of impact are considered to be suitably precautionary based on gannet being a far ranging piscivorous seabird with mobile and often widespread prey.

5.4.176 A peak of 338 gannets is estimated to be present during the non-breeding period by Project One/Subzone 1 alone. Based on an estimated 70% displacement level and 1% mortality rate, a total of two gannets per non-breeding period are estimated to be lost due to displacement impacts (Table 5.23). Apportioning the estimated impacts during the non-breeding period across the North Sea breeding SPA population, an estimated one adult gannet per year from the Forth Islands SPA might be impacted from displacement effects (Annex B).

5.4.177 The estimated loss of one adult gannet per year from displacement effects is less than 0.001% of the SPA breeding population.

5.4.178 The level of impact estimated will not affect the conservation status of the species and/or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA.

Collision and displacement mortality combined

5.4.179 As stated for gannets from Flamborough Head and Bempton Cliffs SPA, given the complex interactions and the lack of guidance or precedent it is not considered appropriate to combine the effects of collision and displacement mortality in a quantified manner.

Conclusion

5.4.180 Based on the assessment above it is concluded that there will be no adverse effects on the integrity of the Forth Islands SPA as a result of the Project One development alone or in-combination with other plans and projects.

5.5 Effect on SPA/Ramsar Features – In-combination Assessment

5.5.1 This section of the HRA presents the information gathered to determine whether there may be any significant adverse effects predicted on the conservation objectives of SPA and or Ramsar qualifying interests due to the impacts of collision mortality or operational displacement caused by Project One, in-combination with other identified projects (Table 4.6). The scope of SPA and or Ramsar sites was determined at the screening stage (see Section 4.3and Annexes A and B), and two sites were screened in for a potential likely significant in-combination effect: Flamborough Head and Bempton Cliffs SPA and Firth of Forth Islands SPA (see Table 4.4).

5.5.2 Before a detailed in-combination assessment can be undertaken it is important to highlight the complexity of bring discrete datasets together to inform an in-combination assessment. The following paragraphs and tables therefore present details of the relevant projects and how their information has been approached for this project, with reference to where uncertainty lies and how data limitation has influenced the in-combination assessment.

In-combination collision risk – data confidence

5.5.3 The earliest collision risk assessments of offshore wind farms for Round 1 and 2 projects were generally undertaken by adapting the Band (2000) collision risk model (updated in Band *et al.,* 2007), developed on behalf of Scottish Natural Heritage to quantify mortality rates for birds at offshore wind farms. As flight data are collected in a fundamentally different way in the onshore and offshore environments, the boat survey data collected at these offshore sites required significant reinterpretation to become compatible with the model. This is a potential source of variability in interpretation and results between projects, particularly as a standard method of interpretation was not available at that time.

5.5.4 For these projects' models it was also assumed that for birds transiting through turbines at risk height, collision risk was distributed evenly within the rotor swept area (as per Option 1 or 2 of the Band (2012) model), which in the majority of cases overestimates the risk for most species which predominantly fly at lower altitudes (including some within the lower rotor swept area). As the probability of colliding with a rotor blade is lower at these lower altitudes, using the mean value instead will invariably overestimate risk, and therefore resultant mortality rates.

5.5.5 The most recent projects have run collision risk analyses using the Band model, updated for the offshore environment (Band, 2012, and sometimes the draft version, Band, 2011). The updated Band (2012) model differs from the originals developed for onshore wind farms (Band, 2000; Band *et al*., 2007) in two key ways. Firstly, bird numbers are input as densities rather than raw counts, better reflecting the way in which data are collected in the offshore environment. Secondly, the updated Band model is capable of incorporating four options for considering flight heights:

- Option 1 - using the basic model, i.e. assuming that a uniform distribution of flight heights between lowest and highest levels of the rotors; and using the proportion of birds at risk height as derived from site survey;
- Option 2 - again using the basic model, but using the proportion of birds at risk height as derived from the generic flight height information;
- Option 3 - using the extended model, using the generic flight height information to estimate collision risk; and
- Option 4 - using the extended mode, but if site survey information is sufficient to generate a flight height distribution, this should be used.

5.5.6 Therefore Options 1 and 2 reflect the choices available from using the Band (2000) and Band *et al.,* (2007) models. Options 3 and 4 which use modelled flight height distributions allows comparison of the impact of varying the height of wind turbines, and to account for the fact that collision risk is not distributed evenly within the rotor swept area.

5.5.7 This means that projects that have used the Band (2012) or Band (2011) models are likely to produce more realistic mortality rates than earlier projects that had to interpret the onshore Band models. This is particularly the case for those that undertook modelling using the extended Option 3 or 4 variants. For this assessment, the data confidence for each project should be considered (see Table 5.40). The level of confidence is based on ratings as follows:

- Low data confidence = no quantitative modelling has taken place for that species, or results are known to be subject to refinement and review;
- Medium data confidence = use of Band (2000) or Band *et al*., (2007) model variant with site-specific data;
- High confidence = use of Band (2012) or Band (2011) model, particularly those that have considered the extended Options 3 or 4.

5.5.8 In addition to the different models used to estimate collision mortality, different avoidance rates have been selected for impact assessment in different projects. This is the most sensitive parameter in the model, and so leads to a great deal of uncertainty in results. No attempt has however been made to convert mortality estimates from other projects to a standard mortality rate (e.g. 98%) for this assessment. This is because it is not certain whether conservatism has been applied at other stages of the collision model used by other projects, and so for example, adding further conservatism by reducing avoidance rate may overestimate 'true' estimates. The value prescribed by each project is therefore the value considered in this in-combination assessment.

5.5.9 As well as different models being used for different projects, as some applications are still within the planning process at the time of writing, then the figures provided have not been finalised. This is known to be the case for Dogger Bank Creyke Beck A and B, East Anglia One, Seagreen Alpha and Bravo, and Neart na Gaoithe. The levels of mortality predicted are therefore subject to change, and so the confidence level in their results is low. This is also the case for Project Two, where results are preliminary. Therefore, whilst the approach may lead to an assumption of high confidence, in reality given that the numbers used in this assessment are known to be subject to refinement (which we understand in the majority of cases will lead to a significant reduction in predicted mortality numbers) the confidence in these data is low.

Table 5.40 In-combination collision risk values (all individuals) and assessment of significance from Tier 1-3 projects.

Tier	Offshore Wind Farm	Model Used and data confidence	Gannet	Great skua	Arctic skua	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Little gull	Common tern	Arctic tern
	Hornsea Project One	Band (2012) Options 1 and 4 Site data **HIGH**	27 annual collisions with 7 during the breeding season (99%)	1 annual collision (98%)	9 annual collisions (98%)	127 annual collisions (98%)	22 annual collisions with 18 during the breeding season (98%)	64 annual collisions with 6 during breeding season (98%)	31 annual collisions with 14 during the breeding season (98%)	10 annual collisions (98%)	8 annual collisions (98%)	47 annual collisions (98%)
1	**Lynn and Inner Dowsing**	Band (2000) Site data **MEDIUM**	No estimates Negligible	-	-	-	-	-	-	-	-	-
1	**Thanet**	Band (2000) Site data **MEDIUM**	1 annual collision (99%) Minor	-	-	1 annual collision (99%) Minor	32 annual collisions (99%) Moderate	49 annual collisions (99%) Moderate	1 annual collision (99%) Minor	-	0 annual collisions Minor	-
1	**Gunfleet sands I, II and III**	None **LOW**	No estimates Negligible	-	-	No estimates Negligible	No estimates Negligible	No estimates Negligible	No estimates Negligible	No estimates Negligible	-	-
1	**Kentish Flats**	None **LOW**	-	-	-	-	-	-	-	-	No estimates Negligible	-
1	**Egmond aan Zee**	Band *et al.* (2007) Site data (visual and radar) **MEDIUM**	1.6 annual collisions (99.1%)	-	-	-	-	-	-	-	-	-
1	**Greater Gabbard**	Band (2000) Site data **MEDIUM**	No estimates Negligible	29 annual collisions (99.82%) Negligible	-	No estimates Negligible	10.8 for breeding and non-breeding periods (99.82%) Minor	No estimates Negligible	No estimates Negligible	No estimates Negligible	-	-

Tier	Offshore Wind Farm	Model Used and data confidence	Gannet	Great skua	Arctic skua	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Little gull	Common tern	Arctic tern
	Lincs	Band (2000) Site data **MEDIUM**	21 annual collisions (95%) Negligible	-	-	-	9 annual collisions (95%) Minor	-	-	0 annual collisions (95%) Negligible	1 annual collision (95%) Minor	-
	London Array Phase I	Band (2000) Site data **MEDIUM**	No estimates Moderate	No estimates Minor/ Negligible	No estimates Minor/ Negligible	No estimates Moderate	No estimates Moderate	No estimates Moderate	No estimates Minor/Negligible	No estimates Minor/ Negligible	No estimates Minor	No estimates Minor/ Negligible
	Sheringham Shoal	Band (2000) Site data **MEDIUM**	31 annual collisions (98%) Negligible	-	-	-	33 annual collisions (98%) Negligible	-	-	8 annual collisions (98%) Negligible	3 annual collisions (98%) Minor	-
	Teesside	Band (2000) Site Data **MEDIUM**	2.3 annual collisions (99.62%) Negligible	-	0.5 annual collisions (99.62%) Minor	33 annual collisions (99.62%) Minor	-	33 annual collisions (99.62%) Minor	28 annual collisions (99.62%) Negligible	-	0.8 annual collisions (99.62%) Negligible	-
	Humber Gateway	Not available **LOW**	8 in total with 3 per annum from FHBC SPA (98%)	Not available	Not available	Not available	Not available	Not available	14 per annum, all from FHBC SPA (98%)	Not available	Not available	Not available
2	**Race Bank**	Band (2000) Site data **MEDIUM**	494 annual collisions (95%) Minor	-	-	-	715 annual collisions (95%) Moderate	-	241 annual collisions (95%) Minor	130 annual collisions (95%) Minor	1 annual collision (95%) Minor	-
	Moray Firth Project One (MORL)	Band (2011) Option 1 **HIGH**	31 in breeding and 26 in non-breeding season (99.5%)	-	-	139 annual mortality (98%)	-	47 - non-breeding season (99.5%)	10 - non-breeding season (99.5%)	-	-	-

Tier	Offshore Wind Farm	Model Used and data confidence	Gannet	Great skua	Arctic skua	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Little gull	Common tern	Arctic tern
	Dogger Creyke Beck - Projects A and B	Band (2012) Option 3 Generic flight heights **LOW (preliminary)**	58.8 to 186.5 deaths per year in total, with 21.6-58.2 deaths during breeding season. 8.31-24.27 deaths to FHBC SPA, which Includes 5.37 and 14.31 breeders respectively (98%)	<1 per year Minor	<1 per year Minor	102.66-109.36 (14.2-19.7 during breeding and 88.46-89.66 during non-breeding season) (98%)	31.87-66.97 (16.5-54.4 during breeding and 12.6-15.4 during non-breeding season) (98%)	-	427.6-784.6 annual collisions, with 163.5 to 470.2 during breeding season. 166.67-380.94 deaths to SPA which Includes 101.16 and 291.01 breeders respectively (98%)	-	-	-
	East Anglia One	Band (2012) Option 1 Site data plus aerial flight survey data, or Cook *et al.* (2011) for less common species **LOW (preliminary)**	850 annual deaths. Regional = 16 during breeding season and 23 during winter (east coast). HRA assumes all breeding season mortality to FHBC SPA as worst case (16 birds at 98% avoidance). Non-breeding season FHBC SPA mortality taken to be 29 birds. (98%)	-	-	496 annually. Regional = 9 during breeding season and 16 during winter. (98%)	394 annually. Regional = 58 during breeding season and 162 during winter. (98%)	230 annually. Regional = 8 during breeding season and 84 during winter (98%)	1,056 deaths annually. Regional = 6 during breeding season and 344 during winter. HRA assumes all breeding season mortality to SPA as worst case (6 birds at 98% avoidance). Winter SPA mortality taken to be 9 birds. (98%)	-	-	-
	Dudgeon	Band (2000) Site data **MEDIUM**	597 annual deaths (97%) Minor-Moderate	-	-	-	153 (99%) Moderate	-	-	-	-	-

Tier	Offshore Wind Farm	Model Used and data confidence	Gannet	Great skua	Arctic skua	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Little gull	Common tern	Arctic tern
	Triton Knoll	Band (2000) Site data **MEDIUM**	Based on SOS decision letter regarding acceptance of 99% avoidance rate: 127 annual collisions with 75 from FHBC SPA, of which 52 are adults. Mitigated layout is 64 collisions on SPA, with 45 of these adults. (99%)	-	5 annual collisions (98%) Negligible	487 annual collisions (288 turbines) (98%) Moderate	Total annual mortality of 148 birds with 98 from region (85 in revised layout), 50 (43) of which are adults. (98%)	-	From HRA: 440 annual with 182 from FHBC SPA, of which 121 are adults. Mitigated layout is 158 collisions on SPA, with 104 of these adults. (98%)	75 annually, with 26 from Hornsea Mere, 24 of which adults (98%)	4 annually, with 2 from North Norfolk Coast SPA	-
	Kentish Flats Extension	Band *et al.* (2007) Site data **MEDIUM**	0.4 annual collisions (98%) Negligible	-	-	1.2 annual collisions (98%) Negligible	6.4 annual collisions (98%) Negligible	8.7 annual collisions (98%) Negligible	5 annual collisions (98%) Negligible	-	0.75 annual collisions (98%) Negligible	-
	Beatrice	Band *et al.* (2007) and Band (2011) Option 1 Site data **HIGH**	54 in breeding season and 78 in winter (99%)	13 collisions all in breeding season. (99%)	6 collisions all in breeding season. (99%)	62 in breeding season and 240 in winter (99%)	-	29 in breeding season and 465 in winter (99%)	62 in breeding season and 70 in winter (99%)	-	-	8 collisions all in breeding season. (99%)
	Galloper	Band *et al.* (2007) Site data **MEDIUM**	112 (peak annual) (98%) Minor	27 (peak annual) (98%) Negligible	3.6 (peak annual) (98%) Negligible	52 annual collisions (99%) Minor	330 (peak annual) (99%) Moderate	54 (peak annual) (99% Negligible	74 (peak annual) (99%) Minor	-	-	-
	London Array Phase II	Band (2000) Site data **MEDIUM**	As per Phase I	As per Phase I	As per Phase I	As per Phase I	As per Phase I	As per Phase I	As per Phase I	As per Phase I	As per Phase I	As per Phase I

Tier	Offshore Wind Farm	Model Used and data confidence	Gannet	Great skua	Arctic skua	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Little gull	Common tern	Arctic tern
	Westernmost Rough	Band *et al.* (2007) Site data **MEDIUM**	1 collision every 9 months (95%) Minor	-	-	1 bird every 7 months (95%) Minor	1 bird every 4 months (95%) Minor	1 bird every 16 months (95%) Negligible	1 bird every 5-6 months (95%) Minor	-	1 bird every 9 months (95%) Minor	-
	Aberdeen European Offshore Wind Deployment Centre	Band (2011) Option 1&2 Site data and Cook *et al.* (2012) for flight heights **HIGH**	9 during the breeding season and 8 during winter (98%)	No estimates Negligible	No estimates Negligible.	2 during the breeding season and 10 during winter (98%)	No estimates Negligible	11 during the breeding season and 8 during winter (98%)	27 during the breeding season and 7 during winter (98%)	-	No estimates Minor	No estimates Negligible
	Seagreen Alpha	Band (2011) Option 2 (Cook *et al.* 2011) and site data **LOW (preliminary)**	1,004 per annum with 904 in breeding season. (98%)	-	-	146 per annum with 5 in breeding season. (98%)	13 per annum with 7 in breeding season. (98%)	76 per annum with 25 in breeding season. (98%)	675 per annum with 201 in breeding season. (98%)	-	-	-
	Seagreen Bravo	Band (2011) Option 2 (Cook *et al.* 2011) and site data **LOW (preliminary)**	661 per annum with 552 in breeding season. (98%)	-	-	121 per annum with 17 in breeding season. (98%)	29 per annum with 27 in breeding season. (98%)	48 per annum with 16 in breeding season. (98%)	624 per annum with 263 in breeding season. (98%)	-	-	-

Tier	Offshore Wind Farm	Model Used and data confidence	Gannet	Great skua	Arctic skua	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Little gull	Common tern	Arctic tern
	Neart na Gaoithe	Band (2011) Option 1 Site data **LOW (preliminary)**	100 per year, with 95 from regional breeding population. 90 in breeding season and 5 for non-breeding season. (99.8%)	-	-	1.3 deaths on the regional breeding population in summer, and 1.5 deaths on regional breeding population in winter (assuming 10% of deaths are to this population). (98%)	4 annual collisions (98%)	55 deaths on the regional breeding population in summer, and 43 deaths on regional breeding population in winter (assuming 25% of deaths are to this population). (98%)	14 deaths on the regional breeding population in summer, and 8 deaths on regional breeding population in winter (assuming 50% of deaths are to this population). 99.5% avoidance rate (99.5%)	17 per year, with 4 from regional population. (98%)	-	0.9 annual collisions (98%)
3	**Hornsea Project Two**	Band (2012) Options 1 and 4 Site data **LOW (preliminary)**	14 collisions during the breeding season and 24 during non-breeding season (99%)	3 collisions per year (98%)	-	12 collisions during the breeding season and 102 during non-breeding season (98%)	20 collisions during the breeding season and 8 during non-breeding season (98%)	21 collisions during the breeding season and 121 during non-breeding season (98%)	21 collisions during the breeding season and 20 during non-breeding season (98%)	45 collisions per year (98%)	-	-

Notes:

Shaded cells represent project estimates which can be included as part of a quantitative in-combination assessment, i.e. they have data that are compatible with Project One.

FHBC SPA = Flamborough Head and Bempton Cliffs SPA.

Where species were not taken forward to impact assessment, or where no levels of significance were predicted, this is represented by a dash ‘-‘.

Levels of significance in each project’s Environmental Statement have been standardised to correlate with those presented for Project One. For example, ’Medium’ = Moderate, ‘Low’ = Minor and ‘Very Low’ = Negligible. Where a value of ‘Not significant’ was provided, this is assumed to be Negligible or lower. Although not stated, all significances are assumed to be adverse.

In-combination operational displacement – data confidence

5.5.10 Similar to the in-combination assessment of collision mortality above, only the results presented in each project's submitted documents that are directly applicable to Project One and require no further interpretation, are included within the quantitative part of the assessment. In the large majority of cases, projects have made no attempt to quantify either the amount of birds displaced by the wind farm, or the resultant mortality levels. Instead a qualitative assessment is usually conducted (Table 4.12), and as such these projects cannot be included as part of a quantitative assessment.

5.5.11 In some other projects, 100% displacement has been assumed, but the resultant mortality rate is not considered and in some (e.g., Beatrice), the impact on productivity rather than mortality is considered the more appropriate metric. These projects are also excluded from quantitative assessment.

5.5.12 A qualitative assessment is therefore only available for other projects, with the exception of Dogger Creyke Beck A and B, as well as Project Two (which is based on preliminary population estimates using Hornsea Zone data).

5.5.13 For assessment, the regional populations are based on the mean maximum, or maximum foraging range from Project One, with the range for each species used based on site-specific available evidence (e.g., distance to closest breeding colony).

5.5.14 Where relevant, it is split into the breeding, non-breeding and in some cases, post-breeding seasons, based on the different ranging capabilities and intermixing of populations at different times of the year. Post-breeding seasons were restricted to guillemot and razorbill, based on the agreement during consultation with JNCC on 22 November 2012.

5.5.15 The methodology used to determine displacement impacts at each project is summarised in Table 4.8, and the level of significance, or where applicable, the results of displacement assessment, are shown in Table 5.41 below.

Table 5.41 Levels of predicted mortality or significance from Tier 1-3 projects considered in the assessment of in-combination displacement with Project One.

Tier	Offshore Wind Farm	Fulmar	Gannet	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Guillemot	Razorbill	Puffin
1	**Project One**	6 during the breeding season and 1 during the non-breeding season	5 during the breeding season and 2 during the non-breeding season	<1 during the breeding season and 1 during the non-breeding season	1 during the breeding season and <1 during the non-breeding season	<1 during the breeding season and <1 during the non-breeding season	9 during the breeding season and 51 during the non-breeding season	104 during the breeding season, 114 during post-breeding and 46 during the non-breeding season	37 during the breeding season, 59 during post-breeding and 26 during the non-breeding season	43 during the breeding season and 5 during the non-breeding season
	Lynn and Inner Dowsing	-	Minor	-	-	-	-	-	-	-
	Thanet	No impact	Negligible	No impact	No impact	No impact	No impact	Minor	Minor	-
	Gunfleet sands I, II and III	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	-
	Kentish Flats	-	-	-	-	-	-	Minor	-	-
	Egmond aan Zee	-	-	-	-	-	-	-	-	-
	Greater Gabbard	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor	-
	Lincs	Negligible	Negligible to minor	-	Negligible to minor	-	-	Negligible to minor	Negligible to minor	-
	London Array Phase I	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Negligible

Tier	Offshore Wind Farm	Fulmar	Gannet	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Guillemot	Razorbill	Puffin
	Sheringham Shoal	-	Negligible	-	Negligible	-	-	Minor	Minor	-
	Teesside	Negligible	Negligible	Minor	Negligible	Minor	Minor	Negligible	Minor	Negligible
	Humber Gateway	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
2	**Race Bank**	Minor	Minor	-	Minor to negligible	-	Minor	Minor to negligible	Minor to negligible	-
	Moray Firth Project One (MORL)	Minor	Minor	Minor	-	Minor	Minor	Minor	Minor	Minor
	Dogger Creyke Beck - Projects A and B	Minor	Minor	Minor	Minor	-	248-323 deaths in total. 98.19-136.35 attributable to FHBC SPA, and includes 60.76 and 91.24 breeders	2814-3058 deaths in total. 571.87-937.56 attributable to FHBC SPA population, of which Includes 164.66 and 595.57 breeders	567-885 deaths in total. 176.55-133.31 attributable to FHBC SPA, and of which Includes 9.83 and 31.168 breeders	59-70 deaths in total. 1.29-2.25 attributable to FHBC SPA and Includes 0.78 and 1.87 breeders
	East Anglia One	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	**-**
	Dudgeon	Minor	Negligible	-	Minor	-	-	-	-	-
	Triton Knoll	Minor	Negligible	Negligible	Negligible	-	Minor	Negligible	Negligible	Negligible
	Kentish Flats Extension	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	-	-
	Beatrice	Minor	-	-	-	-	Negligible	Negligible	Minor	-
	Galloper	Minor	Minor	Minor	Minor	Negligible	Minor	Moderate	Moderate	-
	London Array Phase II	As London Array I	As London Array I	As London Array I	As London Array I	As London Array I	As London Array I	As London Array I	As London Array I	As London Array I
	Westernmost Rough	-	Minor	Negligible	Negligible	Negligible	Negligible	Minor	Minor	Minor
	Aberdeen European Offshore Wind Deployment Centre	Negligible	Negligible	Negligible	Minor	Negligible	Negligible	38-386 per annum Minor	13-129 per annum Minor	6-62 per annum Negligible.
	Seagreen Alpha	-	-	-	-	-	4 per annum Minor	18 per annum Minor	2 per annum Minor	7 per annum Minor

Tier	Offshore Wind Farm	Fulmar	Gannet	Great black-backed gull	Lesser black-backed gull	Herring gull	Kittiwake	Guillemot	Razorbill	Puffin
	Seagreen Bravo	-	-	-	-	-	4-5 per annum Minor	18 per annum Minor	2 per annum Minor	7 per annum Minor
	Neart na Gaoithe	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
3	**Hornsea Project Two**	5 in breeding season, 1 in non-breeding season.	5 in breeding season, 3 in non-breeding season	1in breeding season, 1 in non-breeding season.	1 in breeding season, <1 in non-breeding season.	<1 in breeding season, <1 in non-breeding season.	11 in breeding season, 38 in non-breeding season	153 in breeding season, 76 in post-breeding season, 29 in non-breeding season.	50 in breeding season, 40 in post-breeding season, 16 in non-breeding season.	14 in breeding season, 8 in non-breeding season.

Notes:

Shaded cells contain information from projects which was determined to be compatible with Project One assessment, and therefore is included quantitatively.

FHBC SPA = Flamborough Head and Bempton Cliffs SPA

Where species were not taken forward to impact assessment, or where no levels of significance were predicted, this is represented by a dash ‘-‘.

Levels of significance in each project’s Environmental Statement have been standardised to correlate with those presented for Project One. For example, ’Medium’ = Moderate, ‘Low’ = Minor and ‘Very Low’ = Negligible. Where a value of ‘Not significant’ was provided, this is assumed to be Negligible or lower. Although not stated, all significances are assumed to be adverse.

Flamborough Head and Bempton Cliffs SPA

Fulmar

In-combination displacement mortality

5.5.16 The potential for displacement impacts to fulmar in-combination with other plans or projects is higher than with Project One alone.

Tier 1 projects

5.5.17 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur.

5.5.18 No quantitative assessments of displacement to fulmar were carried out for any other Tier 1 projects, but where displacement was considered to be a potential impact for the species, the level of significance was determined to be Negligible or Minor adverse (Table 5.41). Despite relatively high fulmar peak counts for Project One in comparison with other sites (e.g., a peak of 129 individuals reported at London Array, one of the larger Tier 1 sites, compared to 948 for Project One), the predicted mortality rates from displacement were low (up to four adult deaths during the breeding season and one during the winter). This indicates that for other smaller Tier 1 projects, mortality is likely to be even lower.

Tier 2 projects

5.5.19 Again, only a qualitative assessment was possible for Tier 2 projects, and from Table 5.41, the levels of significance predicted were also negligible or minor adverse, with the higher value likely to be more of a reflection of the species' conservation status rather than vulnerability to displacement.

5.5.20 As an example, displacement was predicted to be Negligible at East Anglia One, based on mean peak site population estimates of 53 individuals in winter, 66 on spring migration, 33 in breeding season and 253 on autumn migration. For this project it was concluded that all birds would be displaced to surrounding areas, with no assumption of mortality. At Beatrice, up to 1,096 birds were predicted to be displaced, but failure to breed in some pairs rather than mortality was assumed. Fulmar was not considered to be a sensitive species at Dogger Bank, with zero birds displaced.

Tier 3 projects

5.5.21 Mortality rates calculated from preliminary population estimates from Project Two, predicted five deaths during the breeding season, and one death during winter. Assuming around two thirds of birds are adults, then when combined with Project One results, a total mortality of seven adult birds during the breeding season would represent 0.2% of the Flamborough Head and Bempton Cliffs SPA population.

Although it is acknowledged that a quantitative assessment has not been possible for the large majority of projects, each project has been included as part of an in-combination qualitative assessment. The predicted levels of significance in each Environmental Statement chapter suggest that displacement effects are not a significant impact for fulmar, and even when combined, this level would not rise significantly. The level of impact that is therefore likely from all Tier 1 to 3 projects combined will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA.

Gannet

In-combination collision mortality

5.5.22 The potential collision risk to gannet in-combination with other plans or projects is higher than with Project One alone.

Breeding Season

Tier 1 projects

5.5.23 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur, compared to Tiers 2 or 3.

5.5.24 In the breeding season, the only colony within mean maximum foraging range of Subzone 1 is the Flamborough Head and Bempton Cliffs SPA, comprising 9,947 pairs in 2011. The Forth Islands SPA is within maximum foraging range, but there is evidence that birds do not travel as far south as Subzone 1 and other regional projects, with little overlap of foraging ranges (Wakefield *et al.,* 2013). The maximum distance that gannets from the Bass Rock colony have been recorded to the south during the breeding period is 260 km and the Hornsea Zone lies 363 km away (Hamer *et al.*, 2011).

5.5.25 Projects that are considered to be within foraging range of Flamborough Head and Bempton Cliffs SPA, with compatible breeding season data are presented in Table 5.42 below, which shows total mortality and adult mortality rates predicted for each project, using available data. Evidence from existing offshore wind farms indicates that avoidance behaviour by gannets will be significantly higher than the modelled 98% and consequently the total number of collisions will be lower than forecasted by the use of a 98% or lower avoidance rate (Leopold *et al.,* 2011). A 99% avoidance rate was considered appropriate by the Secretary of State (SoS) in the recent decision of the Triton Knoll Offshore Wind Farm application.

Table 5.42 Predicted in-combination collision mortality for gannet during the breeding season on the Flamborough Head and Bempton Cliffs SPA population.

Wind Farm Project	Tier	Avoidance Rate used in Environmental Statement	Predicted SPA Mortality Rate (Environmental Statement avoidance)	Predicted SPA Mortality Rate (99% avoidance)
Hornsea Project One	1	99%	7 (4)	7 (4)
Humber Gateway	1	98%	3 (2)	1-2 (1)
Dogger Creyke Beck A and B	2	98%	8-24 (5-14)	4-12 (2-7)
East Anglia One	2	98%	16 (10)	8 (5)
Triton Knoll	2	99% *	64 (45)	64 (45)
Hornsea Project 2	3	99%	14 (9)	14 (9)
Total			**112-128 (75-84)**	**99-108 (66-71)**

*Based on SoS decision for Triton Knoll Offshore Wind Farm (11 July 2013).

Figures in parentheses indicate numbers of birds apportioned to adults, either as provided by each projects' Environmental Statement/ HRA or based on proportions of adults recorded during Project One surveys. Here, 61.8% of all gannet observations during breeding period April to September were of adults.

5.5.26 The Tier 1 projects within gannets' mean maximum foraging range of Flamborough Head and Bempton Cliffs are Lynn and Inner Dowsing, Lincs, Humber Gateway, Sheringham Shoal and Teesside. According to the East Anglia One Environmental Statement, "*Gannets were almost entirely absent from the East Anglia ONE site during the breeding season*", reflecting that projects further afield (e.g. Outer Thames) are likely beyond regular foraging range, based also evidence of tagged Bempton Cliff birds' movements in Langston and Teuten (2012) and Wakefield *et al.* (2013).

5.5.27 The only other Tier 1 project with compatible data was Humber Gateway (albeit results were presented via the Triton Knoll HRA). Alongside Project One, an in-combination mortality of 10 gannets has been predicted for the SPA breeding population using project specific avoidance rates (Table 5.42).

5.5.28 This would result in an increase in baseline mortality (0.08, Furness and Wade, 2012) of 0.6% of the total SPA population. When accounting for adults only, a total of six birds are predicted to collide (Table 5.42) which is a 0.4% increase in baseline mortality of the SPA breeding population.

5.5.29 For the other Tier 1 projects, despite some being within regular foraging range of the Flamborough Head and Bempton Cliffs SPA, it is likely that fewer breeding gannets may be at risk due to the smaller size of the projects and the greater proximity to the coast. The likelihood of significant numbers of collisions is therefore low. In each of the respective Environmental Statement chapters, the significance of gannet collisions was considered to be negligible (Table 5.40) with other projects generally predicting total annual mortality in single digits, and at most 31 per annum for Sheringham Shoal (16 at 99% avoidance). Considering a sizeable proportion of the mortality will be on non-SPA and non-breeding birds, the actual regional breeding season mortality will be much lower.

Tier 2 projects

5.5.30 The Tier 2 projects within mean maximum foraging range of Flamborough Head and Bempton Cliffs SPA are Race Bank, Dudgeon, Triton Knoll, Westernmost Rough and Dogger Creyke Bank A and B (Table 5.42). Compatible mortality rates were only available for Dogger Creyke Bank A and B and Triton Knoll. Although outside of mean maximum foraging range, a breeding season mortality rate was predicted for the Flamborough Head and Bempton Cliffs SPA population at East Anglia One. This project is therefore included in the assessment.

5.5.31 When considering all Tier 1 and 2 projects within foraging range, the overall breeding season mortality will be 98 to 114 gannets. When considering adults only, a total of 75 to 84 birds are predicted to collide, and this equates to an increase in baseline mortality by 4.1 to 4.8%. If considering a more realistic 99% avoidance rate for all sites, a total of 57 to 62 adults are predicted to collide, which is an increase in baseline mortality by 3.5 to 3.8%.

5.5.32 This is likely to be an overestimate of the risks associated with these projects, since Dogger is subject to refinements and a reduction in numbers, and Triton Knoll used Option 1 of the Band model.

5.5.33 The other projects where only a qualitative assessment was possible predicted a range of significance for gannet collisions, ranging from Minor at Westernmost Rough and Race Bank to moderate for the regional population at Dudgeon.

5.5.34 At Westernmost Rough, only one collision every nine months was predicted, likely due to the small size of the site, and coastal location. Larger numbers were however predicted at Race Bank (494 collisions per annum at 95% avoidance) and at Dudgeon (597 deaths per annum at 97% avoidance). The use of low avoidance rates in these cases is likely to overestimate actual risks, with avoidance rates likely to be over 99% (Krijgsveld *et al.,* 2011).

5.5.35 At Race Bank, the annual mortality level was considered most appropriately assessed against the national population. The project's Environmental Statement noted that *"in broad agreement with shore-based observations and described patterns of occurrence at other proposed wind farm sites in the Wash…peaks in abundance were recorded from July through to October"*. This suggests post-breeding movements from other larger colonies further north and so the proportion of the 494 collisions attributable to breeding Flamborough Head and Bempton Cliffs SPA birds will be low, particularly if converted to a 99% avoidance rate.

5.5.36 At Dudgeon, peaks occurred during the pre- and post-breeding periods, and it was noted that there was a lack of foraging behaviour recorded, and that *"there is certainly no evidence of any regular use by adults from Bempton Cliffs or sites further north during the breeding season"*. Foraging maps provided by Langston and Teuten (2012, Barrier Effects) also indicate that Dugeon, and Race Bank, are outside of regular foraging range. Again therefore, the breeding season mortality rate for the Flamborough Head and Bempton Cliffs SPA birds will be very low.

<u>Tier 3 projects</u>

5.5.37 The predicted annual mortality rate for Project Two was 38 birds (using Option 4 of the Band model), of which 14 were during the breeding season (99% avoidance). When combined with Tiers 1 and 2, this gives 112 to 128 deaths in total, of which 75 to 84 are predicted to be adults. This would result in an increase in baseline mortality of 5% over the SPA breeding population. At a 99% avoidance rate, this would be reduced to 66 to 71 adults, which is an increase in baseline mortality by 4%.

Non-breeding season

5.5.38 In the non-breeding season, gannets may migrate widely from various colonies throughout the North Sea, and so birds from Flamborough Head and Bempton Cliffs SPA may be present at offshore wind farms along the east coast of Britain during winter months, thereby being at risk of collision. The regional east coast breeding population is an estimated 106,862 pairs, and the proportion of birds attributable to Flamborough Head and Bempton Cliffs SPA is 9.3%.

<u>Tier 1 projects</u>

5.5.39 All Tier 1 projects along the east coast were initially considered for collision mortality during the non-breeding season, with those in Table 5.43 providing sufficient information to be included in a quantitative assessment. Where a project was outside of foraging range from any colony (Outer Thames sites) all mortality was assumed to be on the east coast or flyway populations.

5.5.40 The only Tier 1 projects with sufficient information were Project One, Humber Gateway, Thanet and Egmond aan Zee which produce a combined non-breeding season mortality of 22 gannets. When accounting for the proportion that may be non-breeders (estimated to be 9.5%), a total of 19 adults are predicted to collide. Assuming that 9.3% of collisions would be to Flamborough Head and Bempton Cliffs SPA birds, this would equate to two individuals. This represents an increase in the baseline SPA population by 0.1%.

5.5.41 For most other Tier 1 sites, predicted annual gannet mortality was very low (Table 5.40, and consequently significance levels of Negligible or Minor adverse were generally predicted, which again reflects the small size, low peak counts and coastal location of these sites. London Array predicted a Moderate level of impact, presumably due to its larger size, although the baseline population was taken as the local population (wider area survey area) estimated from the aerial and boat surveys, and so impacts on the east coast population are likely to be much smaller.

5.5.42 The contribution of these other projects to Flamborough Head and Bempton Cliffs SPA birds is therefore likely to be minimal.

Table 5.43 Predicted in-combination collision mortality for gannet during the non-breeding season on the Flamborough Head and Bempton Cliffs SPA population.

Wind Farm Project	Tier	Avoidance Rate used in Environmental Statement	Predicted Mortality Rate (Environmental Statement avoidance)	Predicted Mortality Rate (99% avoidance)
Hornsea Project One	1	99%	19 (17)	19 (17)
Humber Gateway [2]	1	98%	0 (0)	0 (0)
Thanet [1]	1	99%	1 (1)	1 (1)
Egmond aan Zee [1]	1	99.1%	1.6 (1)	2 (2)
Dogger Creyke Beck A and B [2]	2	98%	0 (0)	0 (0)
Kentish Flats Extension [1]	2	98%	0.4 (0)	0.2 (0)
Galloper [1]	2	98%	112 (102)	56 (51)
East Anglia One	2	98%	29 (26)	15 (14)
Triton Knoll [2]	2	98%	0	0 (0)
Moray Firth	2	99.5%	26 (24)	52 (47)
Aberdeen European Offshore Wind	2	98%	8 (7)	4 (4)

Wind Farm Project	Tier	Avoidance Rate used in Environmental Statement	Predicted Mortality Rate (Environmental Statement avoidance)	Predicted Mortality Rate (99% avoidance)
Seagreen Alpha	2	98%	100 (91)	50 (45)
Seagreen Bravo	2	98%	109 (99)	55 (50)
Neart na Gaoithe	2	99.8%	5 (5)	25 (23)
Hornsea Project Two	3	99%	24 (22)	24 (22)
Total			**435 (395)**	**303 (276)**

Figures in parentheses indicate numbers of birds apportioned to adults, either as provided by each projects' Environmental Statement/ HRA or based on proportions of adults recorded during Project One surveys. Here, 90.1% of all gannet observations during the non-breeding period October to March were of adults.

[1] = annual mortality assumed on east coast/flyway populations since site is beyond foraging range of any colony (see Wakefield *et al.,* 2013).

[2] = all SPA mortality assumed to take place during breeding season.

Tier 2 projects

5.5.43 The total in-combination non-breeding season mortality for Tier 1 and Tier 2 projects with sufficient information (Table 5.43) was an estimated 411 birds, of which 373 were considered to be adults. If 9.3% of collisions are attributable to Flamborough Head and Bempton Cliffs SPA birds (35 adults), this represents an increase in baseline mortality over the SPA population by 2.2%. If considering a more realistic 99% avoidance rate, a total of 254 collisions, with 24 attributable to the SPA would be an increase in baseline mortality by 1.5%.

5.5.44 This is likely to be an overestimate of the risks associated with these projects, since most of those which contribute highest proportions (Seagreen in particular, but also East Anglia One) are subject to ongoing refinements which is likely to result in a reduction in numbers. In addition, Option 1 modelling has been conducted by Galloper and other projects which will overestimate risks.

5.5.45 As reported above, for all other Tier 2 projects, significance levels were predicted to be Negligible or Minor, including Dudgeon when the national breeding population is considered. The majority of annual mortality for Race Bank (494 birds) and Dudgeon (597) is likely to occur on the flyway population in the non-breeding season (up to 892,000 birds, Stienen *et al.,* 2007), but even when including some of these additional losses occurring on the SPA population, only very low numbers of collisions on SPA breeders during the non-breeding season is predicted.

Tier 3 projects

5.5.46 When adding the winter mortality predicted from Project Two (24 birds) to Tiers 1 and 2, a total winter mortality rate of 435 birds, or 396 adults are predicted to collide. With 9.3% of those coming from Flamborough Head and Bempton Cliffs SPA (37 birds), an increase in baseline mortality by 2.3% is predicted, which is reduced to 26 adults and a 1.6% increase in baseline mortality at a 99% avoidance rate.

Annual Mortality on the Flamborough Head and Bempton Cliffs SPA population

5.5.47 A breeding season SPA mortality rate of 75 to 84 adult gannets from Tiers 1 to 3 combined, plus 9.3% of non-breeding season mortality (equivalent of up to 37 birds) would result in an annual mortality rate of 112 to 121 adult gannets. This represents an increase in baseline mortality by 10%. When a more realistic 99% avoidance rate is used for all projects, a total of 91 to 96 adult collisions would represent an increase in baseline mortality by 6%.

5.5.48 It should be noted that the contribution of Project One is small (around 5%). Furthermore, with other Round 3 projects (Dogger Bank Creyke Beck A and B, East Anglia One and Seagreen Alpha/Bravo and Neart na Gaoithe) revising their outputs to be based on Option 3 or 4 of the Band model, cumulative numbers are likely to be revised downwards in the future. In addition for those consented projects that did not use Option 3 or 4, there will be a significant overestimate in mortality. As a result of these ongoing refinements there is a great deal of uncertainty with regard to the actual numbers from these live projects. Therefore, the inclusion of the current published mortality numbers from these projects within the quantified in-combination assessment should be treated with significant caution. The assessment on the overall in-combination number is therefore, considered highly precautionary.

5.5.49 The total breeding population of gannets at Flamborough Head and Bempton Cliffs SPA is 11,061 pairs (2012 count (Natural England and JNCC, 2012)) having increased from 1,631 pairs in 1993/94 (the closest population count at the time of designation). The population at the time when site specific surveys were undertaken in 2010 and 2011 was 9,947 pairs in 2011 and this population has been used in this assessment (Figure 5.3). The gannet population at Flamborough Head and Bempton Cliffs SPA has increased on average by 489 pairs per year over the last 17 years.

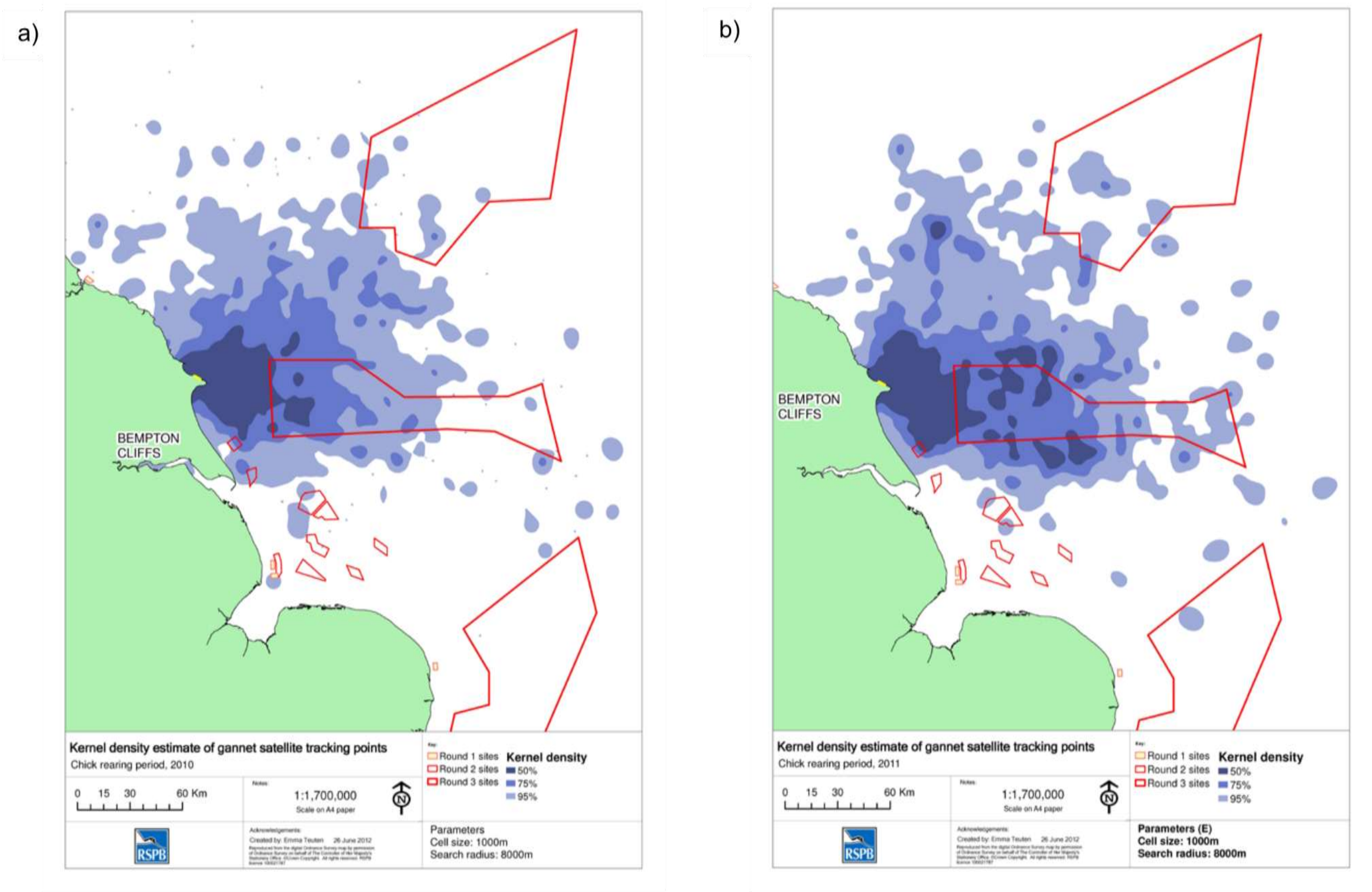


Figure 5.3 Kernel density estimation for breeding gannets from Bempton Cliffs during chick rearing period. a) = 2010, b) = 2011.

5.5.50 For this application, PBR modelling was calculated for the Flamborough Head and Bempton Cliffs SPA gannet population, but this time using the most recent data (Annex J). It shows that the gannet population may sustain a mortality of 452 birds (using a conservative recovery factor of 0.5, considering the increase in population outlined above) without the carrying capacity of the population being affected. The combined mortality rate of 91 to 96 adults therefore falls well below this threshold, and although there is some uncertainty in unquantifiable mortality rates from other projects it has been assessed that these projects would not contribute a mortality rate that would result in the threshold being met, and would likely be more than offset by the precaution provided by the inclusion of those projects that are subject to ongoing refinement.

5.5.51 The population of gannet at the Flamborough Head and Bempton Cliffs SPA is increasing and the potential increase in mortality arising from collision impacts from Project One alone and in-combination on gannets from Flamborough Head and Bempton Cliffs SPA is below that predicted to cause a decline in the gannet breeding population. Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA.

In-combination displacement mortality

5.5.52 The potential for displacement impacts to gannet in-combination with other plans or projects is higher than with Project One alone.

5.5.53 The potential for displacement impacts to gannet in-combination with other plans or projects from Tiers 1 to 3 is higher than with Project One alone.

5.5.54 Gannets breed a small number of colonies along the east coast and Northern Isles, with Bempton Cliffs being the only site along the eastern English coast. Langston and Teuten (2012) and Wakefield *et al.,* (2013) have however shown that the foraging range from this, and other colonies is relatively limited during the breeding season, and this is likely to be reflected in the seasonal peaks of this species at wind farms, particularly those further south, generally occurring in the post-breeding movement period (August to November). Some project sites such as Neart na Gaoithe in Sector 4 and Moray Firth in Sector 3 do however have clear peak population estimates during the breeding season, and this is likely due to their proximity to larger breeding colonies.

Tier 1 projects

5.5.55 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur compared with Tier 2 and 3 projects.

5.5.56 Predicted in-combination displacement impacts on gannets presented in submitted application documents for Tier 1 offshore wind farms are presented in Table 5.41.

5.5.57 No other Tier 1 projects contained sufficient information on gannet displacement to form a quantitative assessment. The level of significance concluded for each project was either negligible or minor adverse, and this is reflected in the low mortality rates predicted for Project One alone, with five deaths during the breeding season and two during winter months. Peak population estimates were generally low during the breeding season (e.g. 191 at Teesside), particularly at sites outside of foraging range from any colony (52 at Greater Gabbard, 47 at Kentish Flats). Peak numbers these sites tended to occur post-breeding (509 at Teesside, 262 at Greater Gabbard). This can be compared with breeding season and non-breeding season peaks of around 340 individuals at Project One.

5.5.58 Displacement is therefore generally not likely to result in significant mortality at any project in isolation, or combined.

Tier 2 projects

5.5.59 Again, no Tier 2 projects contained a detailed quantitative assessment on operational displacement for use in this assessment. Levels of significance were similar to those in Tier 1, with negligible or minor adverse predicted at all sites that considered displacement to be a possible issue for gannet (Table 5.41).

5.5.60 At East Anglia One a Minor adverse impact was predicted based on 39 birds being displaced during breeding season, 66 during winter, 33 on spring migration and 1,829 on autumn migration. It was concluded that a redistribution of birds rather than mortality would be the result. Gannet was not considered a sensitive receptor to displacement at Dogger Bank, as although up to 344 birds may be displaced (233 in winter), zero mortality was predicted.

5.5.61 An increase in baseline mortality due to Tier 1 and 2 projects is therefore likely to be very small to the SPA population, when considering that the population is in favourable condition (an increase to 11,061 pairs in 2012, (Natural England and JNCC, 2012)) and nationally.

Tier 3 projects

5.5.62 The combined gannet mortality rates from Project One (peak of five birds during breeding season, two in the non-breeding season) and Project Two (preliminary results suggesting five in breeding season and three in the non-breeding season) results in 15 losses. This would be an increase in baseline mortality over the SPA breeding population (9,947 pairs) by 0.9%, in the unlikely scenario that all annual mortality would be to adult breeders.

Annual mortality on the Flamborough Head and Bempton Cliffs SPA population

5.5.63 Although a quantitative assessment was not possible for gannet, the evidence from estimated mortality rates as a result of displacement from Project One and Project Two suggests that mortality rates will be relatively low in comparison with the Flamborough Head and Bempton Cliffs SPA population.

5.5.64 Although total combined mortality of Project One and Project Two reached a 0.9% increase in baseline mortality, not all gannets that may be displaced will be adults and a proportion will be non-breeding immature birds and therefore not part of the SPA breeding population (estimated to be 61.8% adults in this period). Outside of the breeding period, gannets will be from other colonies aside from the Flamborough Head and Bempton Cliffs SPA (9.3% of the east coast population), and it is likely that less than one bird on average will die during the non-breeding season as a direct result of displacement. An annual SPA mortality of at least six adults is therefore predicted.

5.5.65 The potential in-combination displacement impact from Tier 1 to 3 projects is considered to be significantly below the results from the PBR, (Annex J), that indicates the population could withstand a loss of 452 birds per year before an unsustainable decline in the population occurring.

5.5.66 The population of gannet at the Flamborough Head and Bempton Cliffs SPA is increasing and the potential increase in mortality arising from displacement impacts from Subzone 1 alone and in-combination with other projects (i.e., including those with no estimates) on gannets from Flamborough Head and Bempton Cliffs SPA is likely to be relatively small compared to the total breeding population. Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA.

Black-legged kittiwake

Collision mortality

5.5.67 There is a potential in-combination impact arising from other offshore wind farms from Tiers 1 to 3.

Breeding Season

Tier 1 projects

5.5.68 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur, compared to Tiers 2 and 3.

5.5.69 Projects with compatible breeding season data are presented in Table 5.44.

5.5.70 Based on a mean maximum foraging range of 60 km, no Tier 1 projects are within this distance from Flamborough Head populations. With nearly half of the annual mortality from Project One for this species predicted during the breeding season (March to July), it is likely that birds from the east coast will regularly travel further from colonies than predicted by Thaxter *et al.* (2012). Usage of the 120 km maximum foraging range therefore includes Project One, Teesside, Lynn and Inner Dowsing, Lincs, Sheringham Shoal and Humber Gateway.

5.5.71 Of these other projects, only Humber Gateway (via the Triton Knoll Appropriate Assessment) presented sufficient information to be part of a qualitative assessment. Here, a total of 14 collisions were predicted on the Flamborough Head and Bempton Cliffs SPA population. Of the remaining projects, only Teesside took the species forward to impact assessment for collision risk, concluded a negligible level of significance, based on an annual mortality rate of 28 birds. With very small numbers of kittiwakes at Lynn and Inner Dowsing, Lincs, and Sheringham Shoal, collision risk is also likely to be negligible for these sites.

Table 5.44 Predicted in-combination collision mortality for kittiwake during the breeding season on the Flamborough Head and Bempton Cliffs SPA population.

Wind Farm Project	Tier	Avoidance Rate used in ES	Predicted Mortality Rate
Hornsea Project One	1	98%	14 (13)
Humber Gateway[1]	1	98%	14 (13)
Dogger Creyke Beck A and B [2]	2	98%	167-381 (101-291)
East Anglia One	2	98%	6 (5)
Triton Knoll [1 2]	2	98%	158 (104)
Hornsea Project Two	3	98%	21 (19)
Total			**380-594 (255-445)**

Figures in parentheses indicate numbers of birds apportioned to adults, either as provided by each projects' Environmental Statement/ HRA or based on proportions of adults recorded during Project One surveys. Here, 90.1% of all kittiwake observations during breeding period March to July were of adults.

[1] = annual mortality for Flamborough Head and Bempton Cliffs SPA population provided. Assumed here that this occurs during breeding season only.

[2] = total adult mortality provided in project's Environmental Statement.

5.5.72 The combined Project One and Humber Gateway collision mortality during the breeding season is 28 birds, of which 26 would be adults. This represents an increase in baseline mortality of the SPA population by 0.1%.

Tier 2 projects

5.5.73 Using a maximum foraging range, Westernmost Rough, Triton Knoll and Race Bank are the Tier 2 projects within foraging range of the Flamborough Head and Bempton Cliffs SPA breeding population. In addition, Dudgeon and Dogger Bank Creyke Beck A and B are just outside of maximum foraging range, and East Anglia One predicted a breeding season mortality rate to the Flamborough Head and Bempton Cliffs SPA population, and so these projects area also included.

5.5.74 From Tier 1 and 2 projects with sufficient information to allow a quantitative assessment (Table 5.44), a combined breeding season mortality of 359-573 birds was predicted. Using the proportions of adults attributed to each site, a total of 236-426 adult collisions would represent an increase in baseline mortality by 1.4-2.5%.

5.5.75 At Race Bank and Westernmost Rough, the significance for the species was deemed to be Minor (when considering annual mortality). This was evidently the case for Westernmost Rough where 1-2 collisions per annum were predicted. For Race Bank an annual mortality of 241 birds was predicted (at 95% avoidance), but this was considered within the context of the passage population only, reflecting the definite peak in numbers during the autumn migration period. As such, few collisions are likely to be attributable to the Flamborough Head and Bempton Cliffs breeding population (particularly when converting to a 98% avoidance rate).

Tier 3 projects

5.5.76 The predicted annual mortality rate for Project Two was 41 birds, of which 21 will occur during the breeding season. When adding this to Tiers 1 and 2 combined to give 380 to 594 birds, and 255 to 445 adult collisions. This represents an increase in baseline mortality of 1.5 to 2.6% on the SPA population.

Non-breeding season

5.5.77 Large kittiwake colonies are present along the east coast of Scotland, with the breeding population an estimated 219,543 pairs, of which Flamborough Head contributes 20.3% (from SMP database). Fredericksen *et al.* (2012) estimated that 15% of the 4.5 million kittiwakes in the Atlantic wintered in the North Sea and west and south of the British Isles, giving a potential biogeographic winter population of up to 675,000 birds. Ringed kittiwakes from Norway, Russia and France have been recovered in Britain during winter (Wernham *et al*., 2002), showing that there is much dispersal of numbers, and a large potential pool of birds found within Subzone 1 and other projects is likely.

5.5.78 For Round 1 and 2 sites within the Outer Thames, generally the peak numbers of kittiwakes were within the non-breeding season. However some colonies are within foraging range (502 pairs at Sizewell Rigs, 160 pairs at Lowestoft, 635 pairs in Kent) and so no attempt can be made to separate annual mortality rates into non-breeding season impacts.

Table 5.45 Predicted in-combination collision mortality for kittiwake during the non-breeding season on the regional population.

Wind Farm Project	Tier	Avoidance Rate used in ES	Predicted Regional Mortality Rate
Hornsea Project One	1	98%	17 (12)
Humber Gateway [1]	1	98%	0 (0)
Dogger Creyke Beck A and B [1]	2	98%	0 (0)
East Anglia One	2	98%	9 (6)
Triton Knoll [1]	2	98%	0 (0)
Moray Firth	2	99%	10 (7)
Aberdeen European Offshore Wind	2	98%	7 (5)
Beatrice	2	99%	70 (50)
Seagreen Alpha	2	98%	474 (337)
Seagreen Bravo	2	98%	361 (256)
Neart na Gaoithe	2	99.5%	16 (11)
Hornsea Project Two	3	98%	20 (14)
Total			**984 (698)**

Figures in parentheses indicate numbers of birds apportioned to adults, either as provided by each projects' Environmental Statement/ HRA or based on proportions of adults recorded during Project One surveys. Here, 71% of all kittiwake observations during the non-breeding period August to February were of adults.

[1] = all SPA mortality assumed to take place during breeding season.

Tier 1 projects

5.5.79 No Tier 1 projects apart from Project One held sufficient information to be included in a quantitative assessment (all collisions attributable to Humber Gateway were included within the breeding season total). If 20.3% of collisions are attributable to the Flamborough Head and Bempton Cliffs SPA population then three birds, of which two would be adults, would collide during this period.

5.5.80 Table 5.45 shows that for the other Tier 1 projects, impacts (where kittiwake was a receptor) were concluded to be of negligible significance when considering the annual mortality total, with Thanet potentially reaching minor adverse significance, although only one collision per annum was predicted. Teesside predicted 28 annual collisions, but with numerous colonies closer to the site than those at Flamborough Head and Bempton Cliffs (Mitchell *et al.,* 2004), the contribution from the SPA population considered here will be negligible.

Tier 2 projects

5.5.81 Based on the projects where sufficient quantitative information was available (Table 5.45, a non-breeding season mortality rate of 984 birds is predicted from Tier 1 and 2 projects. Of this, 684 adults are predicted to collide, and assuming that 20.3% of these will be attributable to Flamborough Head and Bempton Cliffs SPA, 139 deaths are predicted. This represents an increase in the baseline SPA population by 0.8%.

5.5.82 Of those Tier 2 projects which can only be considered qualitatively, Race Bank, Galloper and Westernmost Rough predicted a Minor adverse effect due to total annual mortality, and Kentish Flats Extension predicted negligible significance.

5.5.83 As outlined previously, the majority of the 241 collisions at Race Bank will occur during the non-breeding season, although this is likely to be an overestimate of actual risks, since the Band (2000) Option 1 version was used with a 95% avoidance rate. Kentish Flats Extension predicted five annual collisions, Westernmost Rough 1-two collisions, and Galloper up to 74, with peaks occurring on passage. Again, the relatively high rate at Galloper was based on Option 1 style assessment using the Band *et al.* (2007) model, so is likely to be an overestimate. Nevertheless, even when accounting for these differences in predictions, only around 20% of collisions would be attributable to Flamborough Head and Bempton Cliffs SPA birds.

Tier 3 projects

5.5.84 When adding the winter mortality predicted from Project Two (20 birds) to Tiers 1 and 2, a total winter mortality rate of 984 birds is predicted, which equals 698 adult collisions. Assuming that 20.3% are attributable to the Flamborough Head and Bempton Cliffs SPA population, this equates to 142 adult collisions, which represents an increase in the baseline SPA mortality by 0.8%.

Annual mortality on the Flamborough Head and Bempton Cliffs SPA population

5.5.85 A breeding season SPA mortality rate of 255-445 adult kittiwakes from Tiers 1 to 3 combined, plus 20.3% of non-breeding season mortality (equivalent of up to 142 adult birds) would result in an annual mortality rate of 397 to 587 adult kittiwakes. This represents an increase in baseline mortality by 2.3 to 3.5%.

5.5.86 It should be noted that the contribution of Project One is small (around 3-4%). Furthermore, with other Round 3 projects (East Anglia One, Dogger Bank Creyke Beck A and B, Seagreen Alpha/Bravo and Neart na Gaoithe) revising their outputs, in-combination numbers are likely to be revised downwards in the future. The contribution from these live projects is large – for instance 40 to 65% of collisions in the breeding season were attributed to Dogger Creyke Beck A and B, and 85% of collisions in the breeding season were attributed to Seagreen Alpha and Bravo.

5.5.87 In addition for those consented projects that did not use Option 3 or 4, there will be a significant overestimate in mortality. As a result of these ongoing refinements there is a great deal of uncertainty with regard to the actual numbers from these live projects. Therefore, the inclusion of the current published mortality numbers from these projects within the quantified in-combination assessment should be treated with significant caution. The assessment on the overall in-combination number is therefore, considered highly precautionary.

5.5.88 PBR modelling for this application using the most recent available data on Flamborough Head and Bempton Cliffs SPA (including the expanded SPA colonies) predicted that 1,023 adult kittiwakes can be removed annually from the population without an effect on the carrying capacity (0.2 recovery factor). The predicted level of in-combination mortality therefore falls considerably below this value, and even when accounting for projects not included in the quantitative assessment, the threshold is not predicted to be exceeded.

5.5.89 Further supporting information in the PVA model (Annex K) shows that an additional mortality rate of 1,000 birds would not have a significant effect on the growth rate of the Flamborough Head and Bempton Cliffs SPA population (an increase in decline in an already reducing population by 0.8%). The results of the PVA would therefore indicate an insignificant increase in the risk of the kittiwake population declining significantly more rapid due to impacts from Tier 1 to 3 projects.

5.5.90 The conservation objectives of the Flamborough Head and Bempton Cliffs SPA site are not currently being met. However, based on the results from the PBR modelling and supplementary PVA modelling, it is predicted that the potential impact on kittiwakes in-combination with Tier 1 to 3 offshore wind farms will not affect the integrity of the site.

Displacement mortality

5.5.91 The potential for displacement impacts to kittiwake in-combination with other plans or projects is higher than with Project One alone.

5.5.92 In Subzone 1, kittiwake numbers peaked, between July and September, indicating that the assemblage was likely to comprise of breeders, non- or failed-breeders, and adults and young birds dispersing away from breeding colonies in the UK and beyond.

5.5.93 An increase in densities in the central North Sea from July onwards was also recorded by Stone *et al*. (1995), and similar peaks were recorded at Triton Knoll in August and September. Later peaks at in December and January were recorded further south at Greater Gabbard and Galloper.

Tier 1 projects

5.5.94 For Project One alone, the annual mortality rate for kittiwakes from Flamborough Head and Bempton Cliffs SPA was 19 birds, with 15 being adults.

5.5.95 No quantitative assessment was carried out for any other Tier 1 project, but the levels of significance predicted were either Negligible or Minor adverse for the species. Comparatively, Project One recorded far higher peak counts than any other Tier 1 project during the breeding or non-breeding season, with for example over 20,000 birds during the post-breeding period compared to the next highest peak of 838 birds at Teesside during the breeding season, with the next highest (London Array) being roughly half of that. The contribution of other sites to overall SPA mortality is therefore likely to be minimal.

Tier 2 projects

5.5.96 A quantitative assessment of mortality as a result of displacement was undertaken for the Dogger Bank Creyke Beck A and B Environmental Statement. It was predicted that annually there would be 248 to 323 deaths with 98-136 attributable to the Flamborough Head and Bempton Cliffs SPA population. Assuming that there may be some SPA deaths during the non-breeding season at sites beyond foraging range, from the nine annual losses due to Seagreen Alpha and Bravo, 20.3% would be attributable to Flamborough Head and Bempton Cliffs SPA birds (with complete intermixing of east coast populations), and assuming 70.1% are adults, an additional one adult loss would be attributable to these two projects.

5.5.97 This would result in a combined annual mortality of 126 to 164 birds, of which 77 to 107 would be adults (61-91 from Dogger, 15 from Project One and one from Seagreen Alpha/Bravo). This would be an increase in baseline mortality over the regional breeding population (44,520 pairs) by 0.4 to 0.6%.

Tier 3 projects

5.5.98 Preliminary results from Project Two predicted 11 deaths in the breeding season, and 38 in the non-breeding season. Using similar proportions to Project One, this would result in an annual mortality on the SPA population of 19 deaths, of which 16 are adults.

5.5.99 Combined with the Tier 1 and 2 estimates to give an annual SPA mortality of 145 to 183 birds, with 93 to 123 adults, this represents an increase in baseline mortality over the regional population of 0.5 to 0.7%.

5.5.100 PBR modelling for this application predicted that 1,023 adult kittiwakes can be removed annually from the population without an effect on the carrying capacity (0.2 recovery factor). The predicted level of in-combination mortality therefore falls considerably below this value, and even when accounting for projects not included in the quantitative assessment, the threshold is very unlikely to be exceeded.

5.5.101 As a result of the ongoing refinements to projects such as Dogger Bank Creyke Beck A and B and Seagreen, there is a great deal of uncertainty with regard to the actual numbers from these live projects. Therefore, the inclusion of the current published mortality numbers from these projects within the quantified in-combination assessment should be treated with significant caution. With Dogger Bank Creyke Beck A and B predicted to contribute 65 to 74% of all adult mortality on the Flamborough Head and Bempton Cliffs SPA population, the assessment on the overall in-combination number is therefore, considered highly precautionary.

The conservation objectives of the Flamborough Head and Bempton Cliffs SPA site are not currently being met and therefore, it is assumed that this will trigger remedial action from Natural England where possible (if confirmed to be in an unfavourable declining state). Notwithstanding this, based on the population trend as it stands the PBR and PVA indicate that the in-combination contribution fall within levels that the population can accommodate (i.e., it is considered unlikely cause significant increase in decline) and therefore, will not have a significant effect on the fate of this population. It is therefore predicted that the potential impact on kittiwakes in-combination with Tier 1-3 offshore wind farms will not affect the integrity of the site.

Herring gull

Collision mortality

5.5.102 No impacts on herring gulls from the Flamborough Head and Bempton Cliffs SPA are predicted likely to occur due to Project One and therefore there will be no in-combination impacts.

Guillemot

Displacement mortality

5.5.103 The potential displacement of guillemots from other plans or projects may cause an in-combination impact.

Tier 1 projects

5.5.104 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur.

5.5.105 The Project One mortality rates as a result of displacement were estimated to be 74 adult guillemots during the breeding season, 50 during post-breeding and three during the non-breeding season. This equated to an annual loss to the Flamborough Head and Bempton Cliffs SPA population of 127 adults (174 birds in total).

5.5.106 Only a qualitative assessment is possible for other Tier 1 projects, and from each of the Environmental Statements, a negligible or minor adverse effect was predicted.

5.5.107 Unsurprisingly since Project One is much larger than most other Tier 1 projects, peak population estimates were also much higher, with over 19,000 birds in the post-breeding period compared to the next highest peak of around 6,500 at Teesside during the post-breeding season, when many birds from the Farne Isles are likely to be present. All other project annual peaks were below 2,000 individuals, indicating that other sites hold no particular importance for the species. This suggests that Flamborough Head and Bempton Cliffs SPA numbers lost to displacement will be much lower at other Tier 1 sites.

Tier 2 projects

5.5.108 The assessment of mortality as a consequence of displacement at Dogger Bank Creyke Beck A and B predicted 2,814-3,058 deaths in total, based on a very conservative 50% displacement and 25% mortality rate. It should be noted that these results are preliminary and subject to ongoing revisions. Of these, 572 to 938 were attributed to the Flamborough Head and Bempton Cliffs SPA population, of which this includes 165 to 596 breeders (Table 5.41). Combined with Project One, a Tier 1 to 2 annual mortality of 292 to 723 adult birds is predicted to occur on the SPA breeding population.

5.5.109 During the non-breeding season, it is assumed that there is regular intermixing of populations along the east coast. Therefore some Flamborough Head and Bempton Cliffs SPA birds may be present at wind farm sites outside of foraging range.

5.5.110 When considering projects with quantifiable information, peak annual mortality rates from Aberdeen Offshore Wind Farm (38 to 386 deaths assuming 50% displacement and up to 100% mortality) and 36 deaths from Seagreen Alpha and Bravo (17% displacement and 1% mortality) were estimated by the respective projects. Although it is very unlikely that all of these losses would occur during the non-breeding season, they have been included here as a precaution.

5.5.111 The total annual mortality from these two projects resulted in a total of 74 to 422 birds lost during the winter periods, of which, 9.7% or 7 to 41 birds would be attributed to Flamborough Head and Bempton Cliffs SPA. Assuming 70% are adults, this would result in a mortality of 5 to 29 birds.

5.5.112 A total of 297-752 adult birds from Flamborough Head and Bempton Cliffs SPA may therefore be lost due to these Tier 1 and 2 projects. This represents an increase in baseline mortality over the SPA population by 3 to 8%.

5.5.113 Although displacement from other Tier 2 projects may result in some mortality to guillemots, with the exception of Galloper, all designate a Negligible or Minor adverse significance (mainly due to winter peaks), With the closest Tier 2 sites (e.g., Triton Knoll, Race Bank) at the edge of foraging range from Flamborough Head and Bempton Cliffs SPA, like Project One, peak populations will likely occur during winter months when mortality to the SPA population will be relatively low, particularly since these peaks were much lower than Project One (1,023 and 4,222 birds at Race Bank and Triton Knoll, respectively).

Tier 3 projects

5.5.114 The preliminary population estimates carried out for Project Two resulted in the predicted loss of 153 guillemots in the breeding season, 76 in the post-breeding season, and 29 in non-breeding season. It should be emphasised that the confidence in these results is low, as they will potentially overestimate numbers at Project Two, since some of the population estimates were derived from studies across the whole Hornsea Survey Area, thereby including peak densities recorded in Subzone 1, which appeared to be relatively high.

5.5.115 Nevertheless, based on the same assumptions as Project One, Project Two would result in the loss of 107, 31 and 2 adult birds during the respective seasons, and therefore 140 annually.

5.5.116 When combining the breeding season estimate with Tiers 1 and 2, a total of 437 to 892 birds is predicted and this would be an increase in baseline mortality over the SPA breeding population by 5-9%.

5.5.117 Only 14 to 29% of this total annual mortality was attributable to Project One, but up to 67% of this mortality rate is attributable to Dogger Bank Creyke Beck A and B, where very conservative displacement and mortality rates were used, which are subject to ongoing refinements. Another 37 deaths were attributed to Aberdeen Offshore Wind Farm when considering the very unlikely scenario of 100% mortality from 50% displacement. Therefore, this assessment is considered to have significant precaution built in, particularly when assuming that the breeding, post-breeding and non-breeding season mortality rates are additive. As a result of these ongoing refinements there is also a great deal of uncertainty with regard to the actual numbers from these live projects. Therefore, the inclusion of the current published mortality numbers from these projects within the quantified in-combination assessment should be treated with significant caution. The assessment on the overall in-combination number is therefore, considered highly precautionary.

5.5.118 Nevertheless, even when incorporating a good deal of precaution, the level of combined mortality falls below the threshold value of 1,293 guillemots estimated from the PBR model (Annex J). The level of impact predicted will not affect the conservation status of the species, nor the conservation objectives of the site and therefore there will be no adverse effect on the integrity of the SPA from Project One, either alone or in-combination.

Razorbill

Displacement mortality

5.5.119 The potential displacement of razorbills from other plans or projects may cause an in-combination impact.

Tier 1 projects

5.5.120 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur.

5.5.121 The Project One mortality rates on Flamborough Head and Bempton Cliffs SPA adults as a result of displacement were estimated to be 30 adult razorbills during the breeding season, 44 during post-breeding and 5 during the non-breeding season. This equated to an annual mortality rate of 79 adults, from 101 birds in total.

5.5.122 Only a qualitative assessment is possible for other Tier 1 projects, and from each of the Environmental Statements, a negligible or minor adverse effect was predicted.

5.5.123 As with guillemot, peak population estimates at Project One were also much higher than at other Tier 1 projects, with over 7,000 birds in the post-breeding period compared to the next highest peak of 1,690 at Sheringham Shoal. All other project annual peaks were below 400 individuals. This suggests that SPA numbers lost to displacement will be much lower at other Tier 1 sites, particularly with peak numbers most likely to occur outside of the breeding season, thereby minimising the risk for Flamborough Head and Bempton Cliffs SPA birds.

Tier 2 projects

5.5.124 The assessment of mortality as a consequence of displacement at Dogger Bank Creyke Beck A and B predicted 567 to 885 deaths in total, of which 133 to 177 were attributed to the Flamborough Head and Bempton Cliffs SPA population. This includes 10 to 31 adult breeders.

5.5.125 If including the peak annual mortality of 13 to 129 birds at Aberdeen Offshore Wind Farm (which assumes the very precautionary rate of up to 100% mortality from 50% displacement), and four attributable to Seagreen Alpha and Bravo, an extra 5 to 36 birds (27.3% of east coast population) would be from the Flamborough Head and Bempton Cliffs SPA population, of which 4 to 29 would be adults.

5.5.126 Including the 79 razorbills from Project One, a total of 93 to 139 adult SPA birds represents an increase in baseline mortality over the SPA population by 5 to 7%.

Tier 3 projects

5.5.127 The preliminary population estimates carried out for Project Two resulted in the predicted loss of 50 razorbills in the breeding season, 40 in the post-breeding season, and 16 in non-breeding season. When considering the Flamborough Head and Bempton Cliffs SPA adult population only, a predicted mortality rate of 40, 30 and 3 adult birds in the three seasons gives an annual mortality of 73 adults.

5.5.128 When combining the annual SPA estimate with Tiers 1 and 2, a total of 166 to 212 adult birds is predicted and this would be an increase in baseline mortality over the SPA breeding population by 8 to 10%.

5.5.129 A good deal of conservatism is built in by including results from Dogger Bank Creyke Beck A and B, and Seagreen Alpha/Bravo, whose figures are subject to ongoing refinements which will likely reduce numbers. As a result of these ongoing refinements there is a great deal of uncertainty with regard to the actual numbers from these live projects. Therefore, the inclusion of the current published mortality numbers from these projects within the quantified in-combination assessment should be treated with significant caution. The assessment on the overall in-combination number is therefore, considered highly precautionary.

5.5.130 Nevertheless, even when incorporating a good deal of precaution, the level of combined annual mortality falls well below the threshold value of 607 razorbills estimated from the PBR model (Annex J). The level of impact predicted will not affect the conservation status of the species, nor the conservation objectives of the site and therefore there will be no adverse effect on the integrity of the SPA, due to Project One either alone or in-combination.

Puffin

Displacement mortality

5.5.131 The potential displacement of puffins from other plans or projects may cause an in-combination impact.

Tier 1 projects

5.5.132 The Tier 1 in-combination assessment considers Project One in-combination with operational projects and projects under construction. There is a higher level of confidence that the impacts associated with Tier 1 projects are likely to occur.

5.5.133 The Project One mortality rates as a result of displacement were estimated to be 43 puffins during the breeding season and five during the non-breeding season, of which a total of three losses were attributed to the Flamborough Head and Bempton Cliffs SPA breeding population. Puffin was only considered in impact assessment for a small number of Tier 1 projects, with those projects considering the species judging significance to be negligible. This is likely to be a reflection of the very small peak counts recorded at each site, particularly during the breeding season (highest being an estimated 137 puffins during winter at Teesside, which is relatively close to the larger colonies at Coquet Island and the Farne Isles).

Tier 2 projects

5.5.134 The assessment of mortality as a consequence of displacement at Dogger Bank Creyke Beck A and B predicted 59 to 70 puffin deaths in total, of which 1 to 2 were attributed to the Flamborough Head and Bempton Cliffs SPA population (up to two breeders).

5.5.135 Outside of the breeding season, a peak of 6-62 losses per annum was predicted from the Aberdeen Offshore Wind Farm, and 14 from Seagreen Alpha and Bravo. If, assuming that all mortality is during the non-breeding season and that only 0.2% of losses would be attributable to the Flamborough Head and Bempton Cliffs SPA during this period (the proportion of the SPA population compared to the east coast population), then zero mortality is predicted.

5.5.136 The in-combination mortality on adult SPA puffins is therefore five birds, and this represents an increase in baseline mortality over the Flamborough Head and Bempton Cliffs SPA population by 10%.

Tier 3 projects

5.5.137 The preliminary population estimates carried out for Project Two resulted in the predicted loss of 14 puffins in the breeding season and eight in the non-breeding season. It should be noted that these are likely to be overestimates of actual peaks in Project Two, since the values derived were taken from results across the larger Hornsea Zone, which incorporated those within Subzone 1, which appeared to produce higher peaks than the surrounding area.

5.5.138 Of these losses, nine and five adults are predicted to be lost during each season. Using the same procedure of apportioning between colonies, up to one adult bird may be lost from Flamborough Head and Bempton Cliffs SPA each year (with none in the non-breeding season).

5.5.139 When combining the breeding season estimate with Tiers 1 and 2, a total of six birds is predicted and this would be an increase in baseline mortality over the SPA breeding population by 12%.

The level of combined annual mortality falls below the precautionary PBR threshold value of 7.6 adult puffins estimated from the PBR model, using a precautionary recovery factor of 0.2 (Annex J). Even when considering projects that could only be assessed qualitatively, which are likely to have negligible annual mortality rates, particularly on Flamborough Head and Bempton Cliffs SPA breeders, the level of impact predicted will not affect the conservation status of the species, nor the conservation objectives of the site and therefore there will be no adverse effect on the integrity of the SPA.

<u>Conclusion</u>

5.5.140 Based on the assessment above it is concluded that there will be no adverse effects on the integrity of the Flamborough Head and Bempton Cliffs SPA as a result of the Project One development alone or in-combination with other plans and projects.

Firth of Forth Islands SPA

<u>Gannet</u>

Collision mortality

5.5.141 There is potential for an in-combination impact from increased mortality arising from collisions with other plans or projects. The assessment of potential in-combination impacts from Tier 1 and Tier 2 offshore wind farms on gannets are presented in the section above for Flamborough Head and Bempton Cliffs SPA and only summarised below.

5.5.142 No Firth of Forth Islands SPA gannets are predicted to collide with Project One turbines during the breeding season, and so no in-combination effects are predicted during this period.

5.5.143 In the non-breeding season, gannets may migrate widely from various colonies throughout the North Sea, and so birds from Firth of Forth Islands SPA may be present at offshore wind farms along the east coast of Britain during winter months, thereby being at risk of collision. The regional east coast breeding population is an estimated 106,862 pairs, and the proportion of birds attributable to the Firth of Forth Islands SPA is 53%.

Tier 1 projects

5.5.144 From the total of 19 adults that are predicted to collide with Tier 1 projects, assuming that 53% of collisions would be to Firth of Forth Islands SPA birds, this would equate to ten individuals. This represents an increase in the baseline SPA population

(55,482 pairs) by 0.1%. The contribution of other projects to the Firth of Forth Islands SPA population is likely to be minimal (as described above).

Tier 2 projects

5.5.145 The total in-combination non-breeding season mortality for Tier 1 and Tier 2 projects with sufficient information was an estimated 411 birds, of which 373 were considered to be adults. If 53% of collisions are attributable to Firth of Forth Islands SPA birds (198 adults), this represents an increase in baseline mortality over the SPA population by 2.2%. If considering a more realistic 99% avoidance rate for all projects, a total of 254 collisions, with 135 attributable to the SPA would be an increase in baseline mortality by 1.5%.

5.5.146 This is likely to be an overestimate of the risks associated with these projects, since most of those which contribute highest proportions (Seagreen in particular) are subject to refinements and a reduction in numbers. In addition, Option 1 modelling has been conducted by Galloper and other projects which will overestimate risks.

5.5.147 As reported above, for all other Tier 2 projects, significance levels were predicted to be negligible or minor, including Dudgeon when the national breeding population is considered. The majority of annual mortality for Race Bank (494 birds) and Dudgeon (597) is likely to occur on the flyway population in the non-breeding season (up to 892,000 birds, Stienen *et al.* 2007), but even when including some of these additional losses occurring on the SPA population, only very low numbers of collisions on SPA breeders during the non-breeding season is predicted.

Tier 3 projects

5.5.148 When adding the winter mortality predicted from Project Two (24 birds) to Tiers 1 and 2, a total winter mortality rate of 435 birds, or 396 adults are predicted to collide. With 53% of those coming from Firth of Forth Islands SPA (210 birds), an increase in baseline mortality by 2.3% is predicted, which is reduced to a 1.6% increase in baseline mortality at a 99% avoidance rate.

5.5.149 The population of gannet at the Forth Islands SPA is in favourable conservation status and the potential increase in mortality arising from collision impacts from all Tier 3 projects on gannets from Forth Islands SPA is below the level of impact predicted to affect the conservation status of the species and/or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA. It should be stressed that the contribution of mortality from Project One was predicted to be a very small part of the in-combination mortality rate for the non-breeding season.

Displacement mortality

5.5.150 There is potential for an in-combination impact from increased mortality arising from collisions with other plans or projects. The assessment of potential in-combination impacts from Tier 1 and Tier 2 offshore wind farms on gannets are presented in the section above for Flamborough Head and Bempton Cliffs SPA and only summarised below.

Tier 1 projects

5.5.151 As outlined above for Flamborough Head and Bempton Cliffs SPA displacement, no Tier 1 projects have sufficient information to be considered for a quantitative assessment. However, the Tier 1 projects are generally small and outside of foraging range from the Forth Islands SPA, and so mortality during the non-breeding season will be minimal.

Tier 2 projects

5.5.152 Again, no Tier 2 projects contained a detailed quantitative assessment on operational displacement for use in this assessment. Levels of significance were similar to those in Tier 1, with negligible or minor adverse predicted at all sites that considered displacement to be a possible issue for gannet (Table 5.41).

5.5.153 At East Anglia One a minor adverse impact was predicted based on 39 birds being displaced during breeding season, 66 during winter, 33 on spring migration and 1,829 on autumn migration. It was concluded that a redistribution of birds rather than mortality would be the result. Gannet was not considered a sensitive receptor to displacement at Dogger Bank, as although up to 344 birds may be displaced (233 in winter), zero mortality was predicted.

5.5.154 An increase in baseline mortality due to Tier 1 and 2 projects is therefore likely to be very small to the Forth Islands SPA population, when considering that the population is in favourable condition.

Tier 3 projects

5.5.155 Preliminary results of gannet displacement from Project Two suggest a total mortality of three birds in the non-breeding season, of which 1 to 2 are predicted to be adults from the Forth Island SPA.

5.5.156 The combined gannet mortality rates from Project One (10 adults) and Project Two (1 to 2 adults) would be an increase in baseline mortality over the SPA breeding population by up to 0.1%. This is well below the level of mortality of 2,000 birds per year predicted by PVA that might cause a population decline at the Forth Islands SPA (WWT, 2011).

5.5.157 Although a quantitative assessment was not possible for gannet, the evidence from estimated mortality rates as a result of displacement from Project One and Project Two suggests that mortality rates will be very low in comparison with the Forth Islands SPA population when considering all Tier 1 to 3 projects.

5.5.158 The population of gannet at the Forth Islands SPA is in favourable conservation status and the potential increase in mortality arising from displacement impacts from all Tier 3 projects on gannets from Forth Islands SPA is below the level of impact predicted to affect the conservation status of the species and/or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA.

Collision and displacement mortality combined

5.5.159 It is acknowledged that for gannet, collision and displacement effects may together result in added mortality rates for the Forth Islands SPA population. The interaction of these two impacts is however not straightforward. In the assessment, conservative values for proportion of birds displaced (displacement) and avoidance rates (collision risk) have been used, and these are incompatible with each other – one cannot have a worst-case displacement and a worst-case collision rate simultaneously. Therefore although some birds may be affected by displacement and others by collision risk, total impact cannot be determined by adding together these two variables.

5.5.160 As a result of the ongoing refinements there is a great deal of uncertainty with regard to the actual numbers from live projects such as Dogger Bank Creyke Beck A and B, Seagreen and East Anglia One. Therefore, the inclusion of the current published mortality numbers from these projects within the quantified in-combination assessment should be treated with significant caution. The assessment on the overall in-combination numbers is therefore, considered highly precautionary.

5.5.161 Nevertheless, even when combining the very low mortality estimates for collisions and displacement, the potential increase in mortality arising from all Tier 3 projects on gannets from Forth Islands SPA during the non-breeding period is well below the level of impact predicted to affect the conservation status of the species and/or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA.

Conclusion

5.5.162 Based on the assessment above it is concluded that there will be no adverse effects on the integrity of the Firth of Forth SPA as a result of the Project One development alone or in-combination with other plans and projects.

5.6 Mitigation Measures and Monitoring

Introduction

5.6.1 To ensure that the likelihood of adverse effects are minimised or eliminated, a series of mitigation measures will be implemented and delivered through the Code of Construction Practice. Through the implementation of these measures any effects as a result of potential impacts associated with the offshore components of Project One, (as described in Section 5.2 and 5.3), on Natura 2000 sites and qualifying features will be reduced considerably. Mitigation measures proposed for qualifying features affected by the onshore components of Project One are described in Section 6.4.

SAC/SCI Features

5.6.2 As part of the project design process a number of mitigation measures have been proposed to reduce the potential for impacts on marine mammals (Table 5.46). These measures are considered standard industry practice for this type of development and will be embodied within the Marine Mammal Mitigation Protocol (MMMP). The MMMP will inform the Code of Construction Practice (the provision for which is made within the draft Marine Licence for Project One).

Table 5.46 Designed-in mitigation measures adopted as part of the project with respect to marine mammals.

Mitigation measure adopted as part of the project	Justification
A 30 minute modelled soft/slow-start will be used for all piling activities. Piling will commence at a maximum of 20% hammer energy with a reduced strike rate. Hammer energy will ramp up with a maximum increase up to full hammer energy. The strike rate will increase from every six seconds to every four seconds over the soft start.	The soft start will provide an audible cue to allow marine mammals to flee the area before piling at full hammer energy commences. The soft/slow start will help to mitigate any potential PTS injury.
A MMMP approved by the MMO, will be implemented during construction. Marine Mammal Observers and Passive Acoustic Monitoring may be used to detect marine mammals within the mitigation zone. For piling starts during darkness or periods of poor visibility (e.g., fog or high wave height) acoustic deterrents may be employed 30 minutes prior to piling. The use of acoustic deterrents will only be employed in consultation and agreement with JNCC following recommended guidelines.	The use of an approved MMMP will mitigate for the risk of physical or permanent auditory injury to marine mammals within a 500 m mitigation zone. The mitigation zone is determined based on the potential for instantaneous auditory injury based on an initial hammer strike at 600 kJ (soft start hammer energy) or auditory injury from cumulative SEL as predicted by the underwater noise modelling assessment.
Codes of conduct for vessel operators including advice to operators to not deliberately approach marine mammals and to avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride.	To avoid the impacts of collision risk on, and potential injury to, marine mammals.

Mitigation measure adopted as part of the project	Justification
A Code of Construction Practice (CoCP) will be developed and implemented to cover the construction phase and an appropriate Project Environmental Management and Monitoring Plan (PEMMP) will be produced and followed to cover the operation and maintenance phase of Project One. The latter will include planning for accidental spills, address all potential contaminant releases and include key emergency contact details (e.g., EA, Natural England and Maritime and Coastguard Agency (MCA)).	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and decommissioning activities is minimised. In this manner, accidental release of potential release of contaminants from rigs and supply/service vessels will be strictly controlled, thus providing protection for marine life across all phases of the development.
The maximum working distance between the two installation vessels will be 3 km.	Setting limits on the distance between installation vessels will reduce the maximum area of ensonification from the concurrent installation of foundations.
Mitigation will be applied for construction of the section of the cable route corridor that lies within 4 NM (7.4 km) of the Humber Estuary SAC and Ramsar site and/or 30 NM (55.6 km) of The Wash and North Norfolk Coast SAC. The MMMP will be developed in this regard incorporating best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors.	The cable route corridor lies within the zone of potential risk for corkscrew injury as defined by JNCC (2012) (see Table 5.4). The Developer commits to developing a MMMP in consultation with statutory advisors. This document will set out the detail of any specific marine mammal mitigation and or monitoring.

5.6.3 Monitoring will be carried out in order to test the predictions of the impact assessment and to address residual uncertainties in the conclusions. The Developer will work with the statutory authorities and key stakeholders to develop a comprehensive MMMP. The primary objective of the MMMP would be to understand potential effects of construction-related activities, particularly noise, on Annex II marine mammal populations within the study area. The details of the MMMP will be informed by the baseline studies and the assessment presented within the Environmental Statement Volume 2, Chapter 4: Marine Mammals, relevant guidance (e.g., JNCC, 2012), and consultation with statutory advisors. The Interim PCoD Framework, which is aimed at addressing the uncertainties associated with predicting disturbance effects on populations, will also be reviewed once publically available in order to provide further guidance (Lusseau *et al*., unpublished).

SPA Features

5.6.4 There are no proposed mitigation measures for SPA (bird) features.

6 INFORMATION TO INFORM APPROPRIATE ASSESSMENT (STAGE 2 OF THE HRA) – HUMBER ASSESSMENT

6.1 Introduction

6.1.1 As discussed in Section 4.5, LSE was determined for the Humber Estuary European Marine Site (i.e., the Humber Estuary SAC, SPA and Ramsar site), River Derwent SAC, Coquet Island SPA and Farne Islands SPA as a result of Project One project components and activities within the Humber Estuary (e.g., cable laying in subtidal sections of the Humber Estuary, the export cable landfall and onshore, including all onshore infrastructure required to achieve connection with the National Grid substation; see Section 1.5).

6.1.2 In the following sections the effects of Project One on the qualifying habitats and species within these Natura 2000 sites are reviewed in light of further investigation and surveys.

Qualifying Features to be considered in Appropriate Assessment

6.1.3 The features of the Natura 2000 sites on which an LSE from Project One was identified, alone or in-combination with other projects, are presented in Table 6.1.

Table 6.1 Qualifying features of the Natura 2000 sites identified as having the potential for LSEs.

Designated Site(s)	Qualifying Feature	Potential Effects
Humber Estuary SAC and Ramsar	Estuaries	Habitat loss, reduction in water quality
Humber Estuary SAC and Ramsar	Mudflats and sandflats not covered by seawater at low tide	Habitat loss
Humber Estuary SAC and Ramsar	*Salicornia* and other annuals colonising mud and sand	Habitat loss
Humber Estuary SAC and Ramsar	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Potential habitat disturbance
Humber Estuary SAC and Ramsar	Embryonic shifting dunes	Habitat loss
Humber Estuary SAC and Ramsar	Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)	Habitat loss
Humber Estuary SAC and Ramsar River Derwent SAC	River lamprey	Disturbance during construction Effects on migration (EMF) during operation

Designated Site(s)	Qualifying Feature	Potential Effects
Humber Estuary SAC and Ramsar River Derwent SAC	Sea lamprey	Disturbance during construction Effects on migration (EMF) during operation
Humber Estuary SAC and Ramsar	Grey seal	Disturbance (collision risk and accessibility of SAC for breeding)
Humber Estuary SPA and Ramsar	Bar-tailed godwit	Habitat loss, disturbance, indirect effects
Humber Estuary SPA and Ramsar	Golden plover	Habitat loss, disturbance, indirect effects
Humber Estuary SPA and Ramsar	Dunlin	Habitat loss, disturbance, indirect effects
Humber Estuary SPA and Ramsar	Knot	Habitat loss, disturbance, indirect effects
Humber Estuary SPA and Ramsar	Redshank	Habitat loss, disturbance, indirect effects
Humber Estuary SPA (assemblage) and Ramsar	Dark-bellied brent goose	Habitat loss, disturbance, indirect effects
Humber Estuary SPA (assemblage) and Ramsar	Sanderling	Habitat loss, disturbance, indirect effects
Humber Estuary SPA (assemblage) and Ramsar	Ringed plover	Habitat loss, disturbance, indirect effects
Humber Estuary SPA (assemblage) and Ramsar	Oystercatcher	Habitat loss, disturbance, indirect effects
Humber Estuary SPA (assemblage) and Ramsar	Grey plover	Habitat loss, disturbance, indirect effects
Coquet Island SPA; Farne Islands SPA	Common tern	Habitat loss, disturbance, indirect effects

6.2 Effect on SAC/SCI Features

Effects on SAC and Ramsar Habitat Features – Project One Alone

<u>Cable laying activities may cause temporary habitat loss/disturbance and/or reduction in water quality within the Estuary features of the Humber Estuary SAC and Ramsar site</u>

6.2.1 Project One may result in temporary habitat loss/disturbance, through cable laying activities. This will involve excavation or disturbance (depending on the installation method used; see Section 2.3) of intertidal and subtidal sediments, with those same sediments used to bury cables in intertidal/subtidal areas (i.e., no permanent removal of sediments from the Humber Estuary SAC). The duration of the impact will depend on the anticipated recovery times the component communities of these habitats (discussed in the sections below). Project One is expected to result in a maximum loss/disturbance of 1,748,120 m^2 of the estuary habitat, equating to less than 0.47% of the total area of the estuarine habitats in the Humber Estuary (see Annex E for full details of qualifying habitat extents within the Humber Estuary SAC). Approximately 128,000 m^2 of this temporary habitat loss will be in the subtidal environment within the SAC boundary (worst case, i.e., assuming four corridors of 10 m width), with up to 1,620,120 m^2 of temporary habitat loss in the intertidal zone (see Table 6.2 for full details of habitat loss/disturbance for each of the qualifying habitats discussed below). It should be noted that impacts on sediments within the temporary working area will be limited to anchor placement and vehicle movement and therefore the assumption of habitat loss within this entire area is likely to be an overestimate. This total area is discussed individually for each of the qualifying habitats within the SAC in the following sections. Due to the short duration of cable laying activities, any effects on beach morphology and hydrodynamics (i.e., sediment disturbance, sediment mobilisation and sediment deposition) will be short term, temporary and reversible (Volume 5, Annex 5.1.7: Landfall Assessment, Section 4.2). All cables will be completely buried in 1-5 m sediment, in order to ensure these remain buried for the entire operational phase of Project One allowing for variations in beach/bed elevations and migration of drainage channels (see paragraph 2.3.3). As a result, there will be no long term change to the distribution or spatial pattern of estuarine habitats as a result of construction, operation or decommissioning of Project One (Volume 5, Annex 5.1.7: Landfall Assessment, Sections 4.2 and 4.3).

6.2.2 Cable installation in the intertidal will be undertaken over a two phase installation (i.e., HDD ducts installed in phase 1 and all export cable circuits installed phase 2; see paragraph 2.3.26). This two phase installation will result in temporary loss/disturbance to a small proportion of the habitats within the cable convergence corridor during Phase 1 (see Figure 6.1) and more widespread habitat loss/disturbance during Phase 2 (i.e., within the convergence corridor and temporary working area; see Figure 4.3). Marine processes modelling of cable laying activities in subtidal areas (Volume 2, Chapter 1: Marine Processes, Section 1.6) has shown that increases of suspended sediments of up to 12 mg/l or 30 mg/l (depending on the sediment type) above baseline would be expected, with the majority of sediments depositing within 100 m of cable laying operations and within 15 minutes.

6.2.3 Marine processes modelling was also undertaken for jetting in intertidal areas (Volume 2, Chapter 1: Marine Processes and Volume 5, Annex 5.1.7: Landfall Assessment, Section 4.2) with dispersion of fine sediment from the jetting activity assessed using the SEDPLUME-RW model and site specific sediment data (Volume 5, Annex 5.2.1: Benthic Ecology Technical Report). The movement of the jetting equipment was simulated in the model for two tidal cycles and assumed that jetting will take place throughout the intertidal in water depths of greater than 3 m and that at other states of tide the jetting activity will not take place. It was assumed that the jetting equipment creates a trench 0.35 m wide and 3 m deep (1.05 m^2) and that the jetting equipment travels at 0.05 m/s and the density of the soil is assumed to be approximately 1700 kg/m^3. Based on these assumptions, the release rate of fine sediment was assumed to be 7 kg/s. Full details of the physical processes modelling are presented in Volume 5, Annex 5.1.7: Landfall Assessment, Section 4.2.

6.2.4 The modelling for jetting in intertidal areas predicted that increases in suspended sediments of up to 55 mg/l will occur in intertidal areas. These increases will be short lived (i.e., the plume will pass over in less than one hour) with the fine sediment plume moving through intertidal and subtidal areas and returning to background levels within a few tidal cycles (i.e., a few days). Fine sediment deposition is predicted to be minimal (i.e., <1 mm depth), while all intertidal sands remobilised during jetting would be deposited within 160 m, with deposition of less than 6 mm occurring within 10 m of jetting activity. Although the modelling assumed that jetting would occur throughout the intertidal, cable burial using jetting in the intertidal will only occur in the lower shore (i.e., approximately one quarter of the intertidal cable route) due to the shallow depths occurring throughout much of the intertidal even at high water (see Volume 5, Annex 5.1.7: Landfall Assessment, Section 3.6).

6.2.5 Figure 6.2 and Figure 6.3 show how sediment plumes from jetting would move through the intertidal, relative to the cockle beds and saltmarsh habitats. Figure 6.2 shows the maximum suspended sediment concentrations over the course of the entire model simulation and has been presented to show the worst case scenario for the plume extent. As previously discussed, jetting will not occur in the upper shore of the intertidal due to shallow water depths in these areas, and therefore the maximum extents presented in Figure 6.2 are considered to be extremely precautionary for habitats in the upper shore (i.e., cockle beds and saltmarsh habitats). Figure 6.3 shows plume movement throughout the intertidal at four points in time during the model simulation which shows that increases in suspended sediment concentrations will be temporary in nature.

6.2.6 Since much of the cable laying operations in the intertidal will occur during dry periods (i.e., trenching or ploughing during low tide) effects in the intertidal will be further reduced. Furthermore, background suspended sediment concentrations within the Humber are generally high, with concentrations ranging from 200 mg/l at the mouth of the Humber at low tide, to in excess of 1,000 mg/l in the mid estuary (IECS, 1987). Communities associated with these estuarine habitats are therefore adapted to high background suspended sediment concentrations, as would be expected in an estuarine environment (Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.6.72 *et seq.*).

6.2.7 Water quality effects may also occur as a result of remobilisation of contaminated sediments during cable laying operations. The assessment of intertidal sediment contamination at the landfall site concluded that heavy metal contamination in intertidal sediments was high (Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology, paragraph 2.6.82 *et seq.*). As detailed above, the extent of the potential impact in the intertidal area is localised within the Project One convergence corridor, with a maximum area of sediment likely to be disturbed by cable burial of 589,000 m^2. As discussed above, the majority of sediments remobilised during subtidal cable laying will be deposited within 160 m of cable laying operations. Any contaminants resuspended in subtidal areas would be expected to be quickly diluted and dispersed by the tide/currents. Intertidal sediments which are resuspended during cable laying are expected to be even more limited in extent as most of the cable laying operations will be undertaken during periods of low water.

6.2.8 The intertidal species and habitats present are considered to have intermediate to high sensitivity to heavy metal contaminants (Tyler-Walters, 2008; Tyler-Walters and Marshall, 2008; Volume 2, Chapter 2; Benthic Subtidal and Intertidal Ecology, paragraph 2.6.93 *et seq.*). Chromium and copper were recorded at high levels in the sediments and it has been reported that filter feeders such as cockles take up heavy metals mainly from solution rather than from the sediment (Bryan and Gibbs, 1983). Contamination in Humber Estuary intertidal sediments is the result of historic discharges and the persistent nature of the pollutants (Natural England, 2003). It has been reported in the scientific literature that pollution-specific responses expected in the presence of well-studied contaminants do not occur in estuaries such as the Humber where organisms are pre-disposed to withstand stress (García-Alonso *et al*., 2011; Elliott and Quintino, 2007). Furthermore, fine sediment plumes from jetting in the intertidal (primarily in the lower shore, see paragraph 6.2.4) are predicted to move to the west and northwest during flood tides and to the east and northeast (i.e., towards the offshore export cable route) during ebb tides, with minimal overlap with the cockle beds at Horseshoe Point (see Figure 6.2 and Figure 6.3, though extents shown are considered precautionary in the upper shore, as detailed in paragraph 6.2.5).

6.2.9 Due to the limited area over which sediment resuspension, deposition and related effects (i.e., resuspension of contaminated sediments) would occur and the short term, temporary nature of this impact, no reduction in the water quality of the Humber Estuary is expected as a result of cable laying operations.

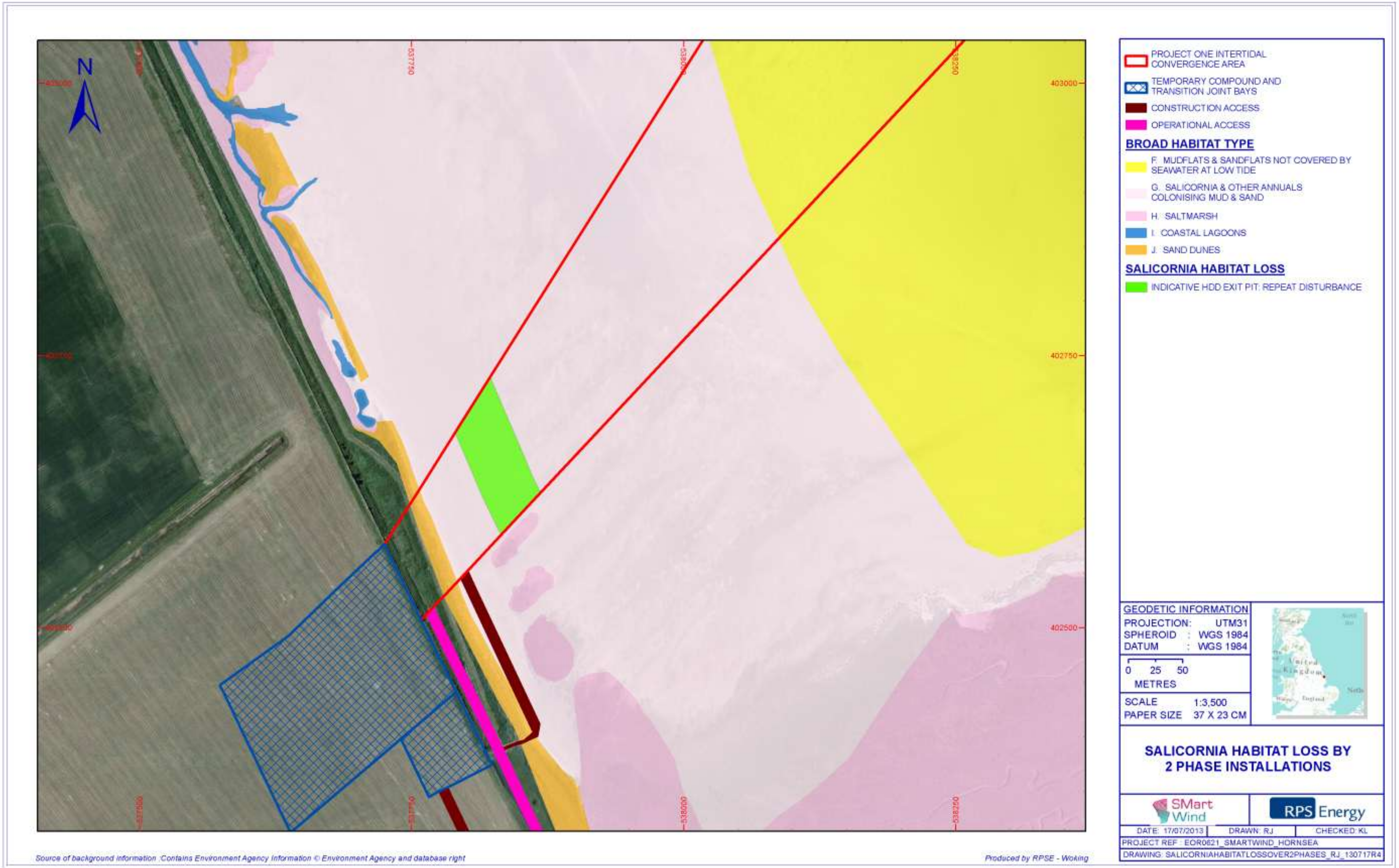


Figure 6.1 **Indicative location of HDD exit pit working area during Phase 1 of intertidal cable installation. During Phase 2, habitat loss is assumed to occur throughout the entire convergence corridor.**

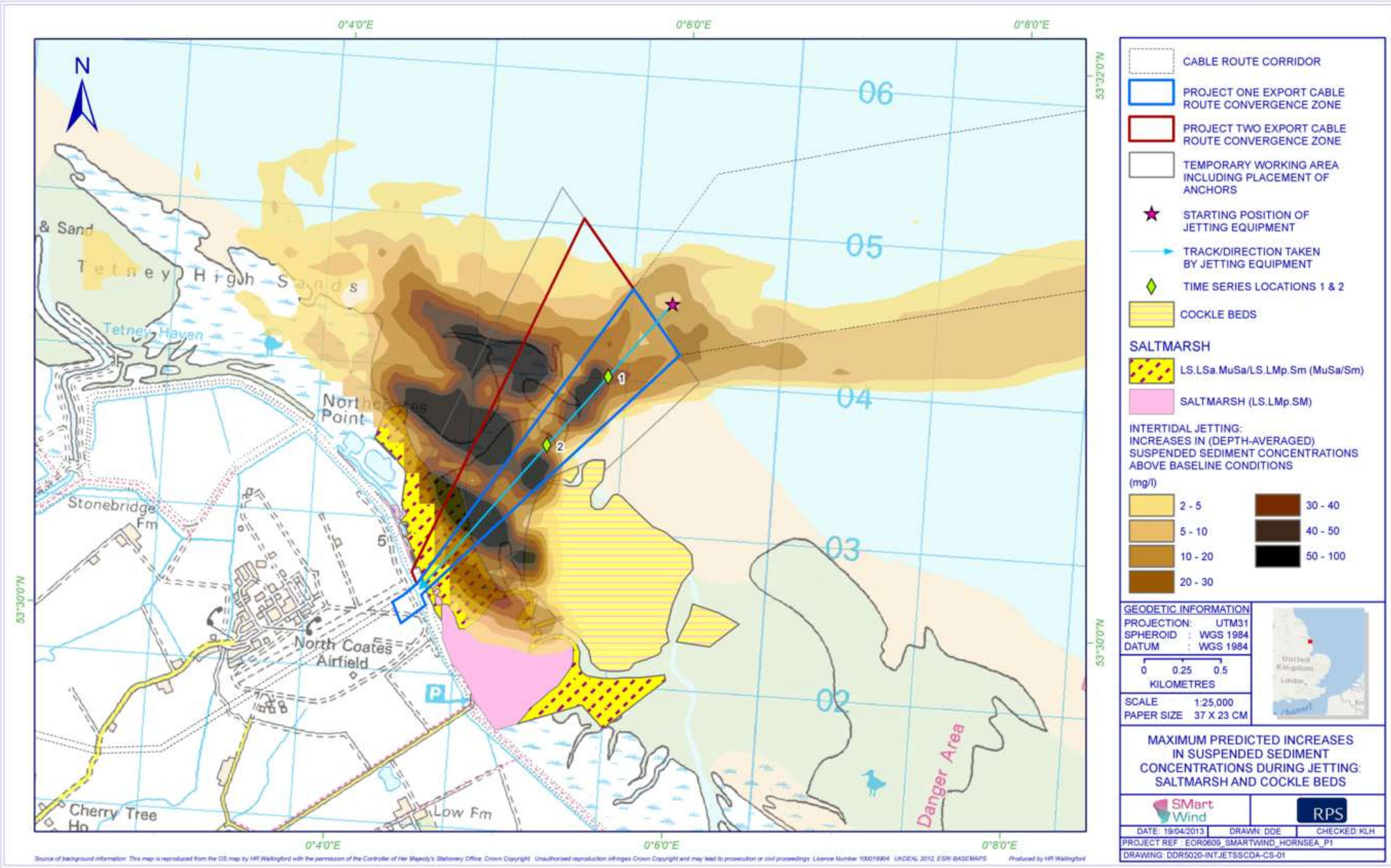


Figure 6.2 **Maximum cumulative increases in suspended sediment concentrations above baseline conditions during jetting activity over the course of the entire physical processes model simulation, with extents of cockle beds and saltmarsh habitats presented. See Volume 5, Annex 5.1.7: Landfall Assessment, Section 4.2 for full details of modelling.**

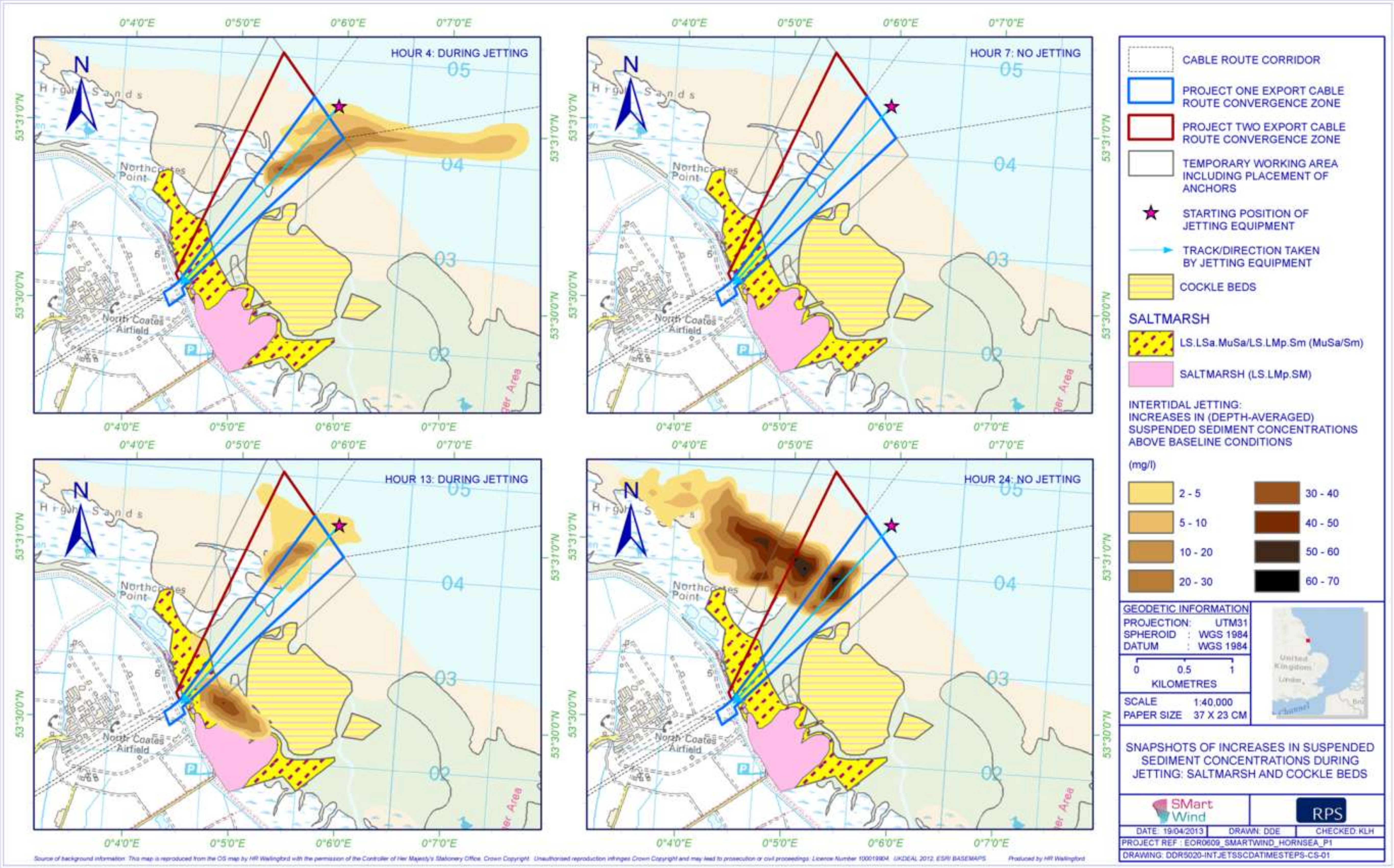


Figure 6.3 Increases in suspended sediment concentrations above baseline conditions during jetting activity at four points in time throughout the physical processes model simulation, with extents of cockle beds and saltmarsh habitats presented. See Volume 5, Annex 5.1.7: Landfall Assessment, Section 4.2 for full details of modelling.

6.2.10 Water quality within the estuary also has the potential to be affected by cable laying operations. During the construction phase, fuel spillages from vehicles or machinery may occur, which will have the potential to contaminate sediments in an area around the construction works, i.e., within the convergence corridor and temporary working area, with consequent effects on water quality. The risk of spillages and effects on designated habitats will, however, be limited through the implementation of the CoCP (see Section 6.4).

6.2.11 Due to the relatively small proportion of estuarine habitats temporarily lost/disturbed (further discussed in the sections below) and the limited effects on water quality within the estuary, no adverse effects are predicted on this feature of the Humber Estuary SAC and Ramsar.

Cable laying activities may cause temporary habitat loss/disturbance within mudflats and sandflats features of the Humber Estuary SAC and Ramsar site not covered by seawater at low tide.

6.2.12 Project One will result in temporary habitat loss/disturbance through cable laying and associated works, of approximately 1,572,000 m^2 of this habitat feature of the SAC, equating to approximately 1.675% of this habitat within the Humber Estuary SAC. This assumes that all cable laying operations will be restricted to within the convergence route corridor and temporary working area shown in Figure 4.3. This assumes total habitat loss within this corridor though cable burial is only likely to occur within a small proportion of the convergence route with habitat disturbance from vehicle movements and anchor placement occurring over a wider area. As discussed above, impacts on sediments in the temporary working area will be limited to anchor placement and vehicle movement and therefore the assumption of habitat loss within this entire area is likely to be an overestimate. Effects of vehicle movements across the intertidal will likely include physical disturbance of sediments, though these effects would be expected to be short lived, with vehicle tracks likely to be washed away by tide and wave action. The sensitivity of the communities to this type of disturbance is expected to be low (Tyler-Waters and Marshall, 2008). Recovery rates of the communities associated with this habitat are fast, with recovery expected within months of cable burial operations (Tyler-Waters and Marshall, 2008).

6.2.13 As discussed in paragraph 6.3.2, a two phase installation will result in only a small proportion of intertidal habitat area being affected during Phase 1 (limited to the Salicornia and other annuals colonising mud and sand Annex I habitat), with habitat loss/disturbance to this habitat feature restricted to the second phase of cable installation.

6.2.14 Due to the temporary nature of the impacts, the relatively small amount of loss/disturbance to this habitat within the Humber Estuary SAC and the limited effects on water quality within this habitat (as discussed in paragraph 6.2.2), no adverse effects are predicted on this feature of the Humber Estuary SAC and Ramsar.

Cable laying activities may cause temporary habitat loss/disturbance within *Salicornia* and other annuals colonising mud and sand features of the SAC and Ramsar site.

6.2.15 Project One will result in temporary habitat loss/disturbance, through cable laying and associated works, of this habitat feature of the SAC. Some recovery of Salicornia is expected to occur within months of cable burial operations (see Annex E, paragraphs E.41 *et seq.*) with full recovery of this habitat expected within 1 year following disturbance. Surveys at the Thanet Offshore Wind Farm landfall site showed recovery of Salicornia into disturbed habitats (i.e., continuous saltmarsh vegetation where cable installation had occurred) within two months of completion of cable burial operations (Royal Haskoning, 2010). This indicates that, as long as a viable seed supply is available for these species, recovery can occur over a short period of time. Seed dispersal typically occurs between September and November, i.e., primarily in the months after cessation of cable laying operations at Horseshoe Point. Cable laying in the intertidal is predicted to result in the temporary loss of approximately 45,500 m^2 of this habitat (i.e., total area within convergence corridor assuming HDD 100 m from the seaward edge of transition pit in the temporary working compound area), with an additional 2,500 m^2 of this habitat disturbed along the access to the intertidal works area (in total, equating to approximately 7.8% of this habitat within the SAC, see Figure 4.3). The SAC baseline used to calculate this proportion (i.e., 61.48 ha) is, however, likely to be an underestimate as an area greater than the baseline (i.e., approximately 68 ha) was mapped during site specific surveys at Horseshoe Point (see Annex E, paragraph E.44). This large area of undisturbed habitat at Horseshoe Point is therefore expected to provide a supply of seed which will aid recovery of this habitat following cable installation. Excessive surface sediment compaction will be avoided where possible following cable burial. This will aid recovery of *Salicornia* by providing appropriate substrate into which germinating seeds can anchor themselves.

6.2.16 Installation of export cables through the Humber Estuary SAC will be undertaken over two phases (paragraph 6.2.2). This two phase installation would result in repeat disturbance of a small proportion of this habitat during both Phase 1 (i.e., when HDD ducts will be installed; see Figure 6.1) and during Phase 2, when up to four export cable circuits are to be installed, resulting in temporary loss of up to 48,000 m^2 of this habitat. Repeat disturbance would therefore only affect a small proportion of this habitat (i.e., in the vicinity of HDD exit pit excavations and access to the HDD exit pits; Figure 6.1). This would represent temporary habitat loss/disturbance of approximately 6,000 m^2 of this habitat (or <1% of this habitat within the SAC) during Phase 1 cable installation.

6.2.17 Although a relatively large proportion of the *Salicornia* and other annuals colonising mud and sand qualifying habitat is expected to be affected by temporary habitat loss/disturbance (i.e., 7.8% of this habitat within the SAC) resulting in a reduction in the extent of this habitat feature in the short term, this habitat and its component species have high recovery rates. Therefore, no long term reduction in the extent of this feature is predicted as a result of cable laying operations for Project One and no adverse effect is predicted on this feature of the Humber Estuary SAC. Measures to be employed to reduce the area of this habitat affected and increase recovery rates are presented in Section 6.4: Mitigation Measures, along with details of pre and post construction monitoring of this habitat to assess recoverability.

Cable laying activities may cause temporary habitat loss/disturbance within Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) features of the SAC and Ramsar site

6.2.18 Based on the area of saltmarsh habitat mapped at Horseshoe Point in 2011 (see Figure 4.3) and assuming all cable laying operations will occur within the convergence route corridor, cable laying during Project One will not result in any loss of this Annex I habitat feature. As shown in Annex G, the saltmarsh vegetation to the south and east of the export cable route corridor has extended considerably in recent years, though primarily to the south and east. If the saltmarsh habitat continues to extend to the northwest, (i.e., towards the convergence route corridor), there is the potential for a limited amount of temporary habitat loss associated with cable laying operations. This area is likely to be small, limited to the periphery of the saltmarsh habitat and only likely to represent a very small proportion of the total area of this habitat within the SAC. Furthermore, as evidenced by the expansion of this area of saltmarsh in recent years, recovery of this part of the saltmarsh following cable laying operations is likely to be fast. This would be expected to occur within a few years provided substrate is fully restored (i.e., no excessive compaction of sediments or creation of new drainage channels).

6.2.19 Indirect effects on saltmarsh habitats are also not expected to occur as a result of cable installation activities. As detailed in paragraph 6.2.3 *et seq*. sediments mobilised during cable installation activities are expected to result in small increases in suspended sediments, with sediment deposition only occurring within 160 m of cable burial activities. Furthermore, as detailed in paragraph 6.2.3 *et seq.*, sediment plumes from jetting in the intertidal (primarily in the lower shore) are predicted to move to the west and northwest during flood tides and to the east and northeast (i.e., towards the offshore export cable route) during ebb tides. Sediment plumes will therefore not overlap with saltmarsh habitats, with no potential for effects on these habitats from sediment deposition or metal contaminated sediments (see Figure 6.2 and Figure 6.3, though extents shown are considered precautionary in the upper shore, as detailed in paragraph 6.2.5).

6.2.20 During the construction phase, fuel spillages from vehicles or machinery may occur, which could contaminate an area around the construction works, though effects on saltmarsh habitats will be limited as these habitats are outside the cable convergence corridor. The risk of spillages and effects on designated habitats will, however, be limited through the implementation of the CoCP (see Section 6.4).

6.2.21 All cables will be completely buried in 1-5 m of sediment, in order to ensure these remain buried for the entire operational phase of Project One allowing for variations in beach/bed elevations and migration of drainage channels. As such, no long term changes are predicted to hydrodynamics or beach morphology during the operational phase, with no consequent effects on saltmarsh habitats (see Volume 5, Annex 5.1.7: Landfall Assessment, Section 4.2 and 4.3).

6.2.22 Due to the absence of direct or indirect impacts on saltmarsh habitats as a result of cable installation, there are no predicted changes to the composition of saltmarsh habitats or interruption or degradation of the physical, chemical or biological processes that support these habitats and therefore no adverse effects on this feature are predicted.

Cable laying activities may cause temporary habitat loss/disturbance within embryonic shifting dunes and shifting dunes along the Shoreline with *Ammophila arenaria* ('white dunes') features of the SAC and Ramsar site

6.2.23 Based on the area of sand dune habitats mapped at Horseshoe Point in 2011 (see Figure 4.3) and assuming all cable laying operations will occur within the convergence route corridor, cable laying during Project One will not result in any loss of these Annex I habitat features.

6.2.24 Temporary habitat disturbance/loss of a small area of these habitats will occur as a result of access to the intertidal. The access tracks from the top of the sea wall to the intertidal (up to two) will be approximately 3 m wide and will cross approximately 20 m of sand dune habitat. This will result in temporary habitat loss/disturbance of approximately 120 m^2 (equating to 0.03% of this habitat within the Humber Estuary SAC). Recovery of these habitats following temporary habitat loss is likely to occur within a few years of cable laying operations, with recovery of sand dune vegetation (dominated by marram grass) likely to be aided by the presence of the sea wall which leads to stabilisation of the sediments and consequently the dune vegetation.

6.2.25 No adverse effects are therefore predicted on these features of the Humber Estuary SAC and Ramsar. Measures to reduce ground pressure in these areas will be employed to minimise the potential for destabilisation of sand dunes, with specific details of these measures detailed in the cable specification and installation plan, which will be circulated for discussion and agreement with the MMO at least four months prior to the commencement of cable installation operations, as a condition in the marine licence (see Table 6.5).

6.2.26 Screening of the sand dune habitat affected along the northern access route to encourage natural recolonisation of these areas is also proposed following cable installation in order to increase the rate of natural recovery of this habitat following disturbance (see Section 6.4: Mitigation Measures). Screening of the southern route may not be necessary as this may be used as a permitted access route to the intertidal following Project One cable installation (see paragraph 2.3.25).

Implementation of these measures further increase the confidence in the conclusion made with regard to no adverse effect on this feature.

Decommissioning Phase

6.2.27 As detailed in Section 2.5 and paragraph 4.4.15, in order to minimise disturbance to designated features of the Humber Estuary EMS, the preferred option is to leave cables in place with cable ends cut, sealed and securely buried. As such, effects of decommissioning on designated habitats of the Humber Estuary SAC are expected to be considerably less than those of the construction phase described in the preceding paragraphs. If cables were to be removed, effects would be expected to be the same or less than those predicted for the construction phase and as such, no adverse effects would be predicted to occur.

Table 6.2 Summary of temporary loss/disturbance of qualifying habitats within Humber Estuary SAC.

Qualifying Feature	Temporary Habitat Loss	
	Approximate Area	Approximate proportion of Habitat within SAC
Estuaries	1,748,120 m^2 (Subtidal: 128,000 m^2, Intertidal: 1,620,120 m^2)	<0.47%
Mudflats and sandflats not covered by seawater at low tide	1,572,000 m^2	<1.68%
Salicornia and other annuals colonising mud and sand	48,000 m^2	7.8%[1]
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	0 m^2	0%
Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)	120 m^2	0.03%

[1] This is based on a baseline of 61.48 ha for this habitat within the SAC, which is likely to be an underestimate (see paragraph 6.2.15)

Effects on SAC and Ramsar Habitat Features – In-combination

6.2.28 This section considers the potential in-combination effects on SAC and Ramsar habitat features from Hornsea Project One operations within the Humber Estuary and other developments in the vicinity of the Humber Estuary, with a summary of in-combination effects presented in Table 4.13. The projects considered for the in-combination assessment (and the EIA) were selected following discussions with statutory regulators and are presented in Figure 4.4.

6.2.29 Habitat loss is predicted to occur as a result of the AMEP development plans, with a proposed new quay resulting in a total loss of approximately 566,000 m^2 of estuarine habitat, 315,000 m^2 of which occurs within intertidal mudflat and 135,000 m^2 of which occurs in subtidal habitat (this total also includes 116,000 m^2 functional loss of mudflat for birds; Able Humber Ports Ltd. *et al.*, 2012). Compensation habitat will be created as mitigation for the loss of this intertidal habitat, with approximately 1,000,000 m^2 of intertidal mudflat being created as part of the development plans.

6.2.30 The Tetney to Saltfleet Tidal Flood Defence Scheme (Environment Agency, 2011) is predicted to result in the permanent loss of 125 m^2 of Atlantic Salt Meadow habitat, equating to 0.00076% of this habitat within the Humber Estuary SAC. This flood defence project is also predicted to result in the permanent loss of a total of 1,500 m^2 of "Dune Scrub" habitat and temporary disturbance (physical damage) to a total of 575 m^2 of "Dune Scrub" habitat within the Humber Estuary SAC.

6.2.31 The Phillips 66 Tetney sea line replacement project is also likely to lead to temporary habitat loss/disturbance of intertidal and subtidal habitats within the Humber Estuary SAC. The replacement of this pipeline is expected to take 15 months, with most works being undertaken in 2014 and the remaining works in 2015. The scoping report for this project has estimated that pipeline replacement is likely to result in temporary loss of up to 260,000 m^2 of estuarine habitat, with approximately 104,000 m^2 of this occurring in the intertidal and up to 160,000 m^2 in subtidal areas. The majority of this temporary habitat loss in the intertidal is predicted to be restricted to the *Mudflats and sandflats not covered by seawater at low tide* Annex I habitat, though some areas of saltmarsh, sand dune or *Salicornia and other annuals colonising mud and sand* Annex I habitats may also be affected through access arrangements (impacts of pipeline installation on saltmarsh and sand dune habitats are likely to be avoided through the use of tunnelling or HDD; RPS, 2013). It is currently not possible to quantify the amount of saltmarsh affected by access arrangements.

6.2.32 Proposed survey work in 2013 for the Phillips 66 Tetney sea line replacement project will access the intertidal from Horseshoe Point along a track adjacent to the saltmarsh habitats at Horseshoe Point, with saltmarsh restoration works occurring following completion of this work. The southern access route or alternative intertidal access proposed by Natural England (see paragraph 2.3.25) may also be used by Phillips 66 to access the intertidal during Project One cable installation and following completion of cable installation (though as discussed in paragraph 4.4.62, access related impacts during the operational phase are likely to be limited).

6.2.33 Temporary habitat loss as a result of Hornsea Project Two is assumed to be identical to that from Project One. The area affected is presented in Figure 4.3 which indicates that repeat disturbance of certain parts of the intertidal will occur due to cable burial and anchor placement. It is assumed that the Project Two cable convergence corridor will be adjacent to that of Project One (i.e., immediately to the north) and therefore will coincide with the Project One temporary working area (including anchor placement). Repeat disturbance within the area presented in Figure 4.3 may therefore occur between the temporary working areas (including anchor placement) and convergence corridors for each project, though impacts of cable burial operations are not likely to overlap as cable burial will be restricted to the convergence corridors for each project. As detailed in paragraph 6.2.12 *et seq*. communities associated with the mudflats and sandflats habitat feature are considered to have low sensitivity to this type of disturbance is expected to be low (Tyler-Waters and Marshall, 2008) with recovery expected within months of cable burial operations (Tyler-Waters and Marshall, 2008).

6.2.34 No repeat disturbance from cable burial for Projects One and Two is expected to occur within the *Salicornia* and other annuals colonising mud and sand Annex I habitat, as cable burial will be limited to the cable convergence corridors for each project (i.e., with no anchor placement occurring in this habitat; see Figure 4.3). As detailed in paragraph 6.2.15 *et seq*. recovery of species within these habitats following temporary habitat loss/disturbance associated with cable burial operations is expected to be fast, with some recovery expected within months and full recovery predicted within one year following disturbance.

6.2.35 The predicted loss of qualifying habitats as a result of Project One in-combination with these projects can therefore be summarised as follows:

- *Estuary:* Loss of up to 2,756,320 m^2 of estuarine habitat, of which 566,000 m^2 is long term and 2,190,320 m^2 is temporary. Of the total estuarine habitat loss (equating to 0.75% of total estuarine habitat within the Humber Estuary SAC), 551,000 m^2 is in subtidal environments and 2,205,320 m^2 in intertidal habitats;
- *Mudflats and sandflats not covered by seawater at low tide:* Loss of up to 2,107,000 m^2 of this habitat (equating to 2.24% of this habitat within the Humber Estuary SAC). Of this habitat, 431,000 m^2 is long term habitat loss (from the AMEP development), with the remainder temporary habitat loss;
- *Salicornia and other annuals colonising mud and sand:* Temporary loss/disturbance of up to 96,000 m^2 of this habitat (equating to approximately 16%[1] of this habitat within the Humber Estuary SAC);
- *Embryonic sand dunes, Shifting sand dunes ("white dunes") and Dunes with Hippophae rhamnoides*: Loss of 2,200 m^2 of this habitat (equating to approximately 0.2% of this habitat within the Humber Estuary SAC), of which 1,500 m^2 is long term habitat loss (from the Tetney to Saltfleet flood defence scheme); and
- *Atlantic salt meadows:* Long term loss of 125 m^2 of this habitat from the Tetney to Saltfleet flood defence scheme (equating to less than 0.001% of this habitat within the Humber Estuary SAC; none of this habitat loss is as a result of Project One or Project Two).

6.2.36 Most of the habitat loss summarised above will be temporary (all habitat loss for Project One and Two will be temporary), with long term habitat loss only occurring as a result of the AMEP development. Compensatory habitat will, however, be created as part of the AMEP development (with a net increase in estuarine habitat of over 400,000 m^2). Similarly, as part of the Tetney to Saltfleet Tidal Flood Defence Scheme, dune habitats will be reinstated as grey dune resulting in no net loss of sand dune habitat in the SAC.

6.2.37 Due to the small proportion of qualifying habitats affected by cable installation associated with Project One in-combination with other projects in the area and the temporary nature of the impacts, no adverse effect on the integrity of the Humber Estuary SAC and Ramsar is predicted.

6.2.38 Although the extent of the Annex I habitat *Salicornia* and other annuals colonising mud and sand is predicted to be reduced in the short term, the long term extent of this habitat is not predicted to be affected, due to the high recovery potential for this habitat and its component species and therefore no long term reduction in the extent of this habitat is predicted.

Summary of effects on SAC and Ramsar site habitat features

6.2.39 Due to the small proportion of the qualifying habitat features affected by temporary habitat loss due to cable laying, there is predicted to be no adverse effect on the integrity of the Humber Estuary SAC and Ramsar site.

6.2.40 A larger proportion of the *Salicornia* and other annuals colonising mud and sand qualifying habitat is expected to be affected by temporary habitat loss (i.e., 7.8% and 16% of this habitat within the SAC for the Project One and in-combination, respectively) resulting in a reduction in the extent of this habitat feature in the short term. However, due to the high recovery potential of this habitat (i.e., evidence of recovery likely within months with full recovery within one year of cable installation; see Annex E, paragraphs E.41 *et seq*.) and its component species, this reduction is expected to be temporary, with recovery occurring within months of cable laying. Therefore, no long term reduction in the extent of this feature is predicted as a result of cable laying operations for Project One.

6.2.41 Mitigation measures have been proposed to reduce habitat loss and increase recovery rates within the *Salicornia* and other annuals colonising mud and sand qualifying habitat and other Annex I habitats following Project One cable installation. These are described in Section 6.4: Mitigation Measures.

Effects on SAC and Ramsar Species Features – Project One Alone

Cable laying activities may cause habitat loss and disturbance to river and sea lamprey using the Humber Estuary SAC/Ramsar and migrating to the River Derwent SAC

6.2.42 Cable laying operations in the subtidal environment around the Humber Estuary SAC, may cause temporary disturbance to migrating river and sea lamprey (intertidal works will not affect this species as works will be undertaken at low tide) with potential for the creation of artificial barriers impairing adults from reaching spawning grounds (see Annex E, Table E.4). For the purposes of this assessment, barrier effects may occur as a result of suspended sediment plumes during cable laying and effects of EMF on migrating fish species.

6.2.43 Any plume related disturbance is likely to be limited, however, with physical processes modelling (Volume 2, Chapter 1: Marine Processes, paragraph 1.6.123 *et seq.*) showing that suspended sediment plume effects would only be likely to extend to approximately 100 m from the cable laying operations and sediment would settle out of suspension within 15 minutes following cable laying operations. Therefore any associated effects are likely to be highly limited in extent and duration and would not be expected to increase the annual mean suspended solid concentration (see Annex E, Table E.4). Furthermore, due to the naturally high background sediment concentrations occurring within the Humber Estuary, lamprey species are likely to be tolerant to high levels of suspended sediments as would be expected in the Humber Estuary. Cable laying operations would represent a temporary disturbance and since lamprey are a highly mobile species they would be able to avoid areas of local disturbance. Cable laying operations would not therefore represent a barrier to lamprey migration between the North Sea and the Humber Estuary. Other fish species on which lamprey are known to feed (e.g., cod, herring and salmon), which occur within the Humber Estuary and further offshore, would be expected to be affected in a similar manner, with the potential for short term and localised avoidance of a limited area around cable laying vessels (see Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.6.57 *et seq.*). This would not lead to a significant indirect effect on lamprey species in the Humber Estuary or further offshore.

6.2.44 Lamprey may be affected by EMF from buried export cables during the operational phase of Project One. Information on the effects of EMF on these species (and other fish species) is limited, often with contradictory and unpredictable results (see Volume 2, Chapter 3: Fish and Shellfish Ecology, paragraph 3.6.176). EMF comprise both the electric (E) fields, measured in volts per metre (V/m), and the magnetic (B) fields, measured in tesla (T). Background measurements of the magnetic field are approximately 50 μT in the North Sea, and the naturally occurring electric field in the North Sea is approximately 25 μV/m (Tasker *et al*., 2010). It is common practice to block the direct electrical field (E) using conductive sheathing, meaning that the EMFs that are emitted into the marine environment are the magnetic field (B) and the resultant induced electrical field (iE). A key misconception in the understanding of the effects of EMF has been the assertion that cable burial will work to mitigate iE and B field effects and that there will be no externally detectable electric fields generated by industry standard subsea power cables. The conclusion of the COWRIE EMF study (Gill *et al*., 2005) and subsequent clarification in the Phase 2 COWRIE EMF report (Gill *et al*., 2009) highlights the fact that it is impractical to assume that cables can be buried at depths that will reduce the magnitude of the B field, and hence the sediment-sea water interface induced E field, below that at which they could be detected by certain marine organisms.

6.2.45 A variety of design and installation factors affect EMF levels in the vicinity of the cable. These include current flow, distance between cables, cable orientation relative to the earth's magnetic field (DC only), cable insulation, number of conductors, configuration of cable and burial depth. Clear differences between AC and DC systems are apparent: the flow of electricity in an AC cable changes direction (as per the frequency of the AC transmission) and creates a constantly varying electric field in the surrounding marine environment (Huang, 2005). Conversely, DC cables transmit energy in one direction creating a static electric and magnetic field. Average magnetic fields of DC cables are also higher than those of equivalent AC cables (see Volume 2, Chapter 3: Fish and Shellfish Ecology, Table 3.20).

6.2.46 Induced electric fields emitted from AC and DC cables are not directly comparable, though modelling studies have shown average iE fields from submarine DC cables of 0.194 mV/m at 0 m horizontal distance from the cable (assuming cable burial to 1 m below seabed and a five knot current), with field strength decreasing with horizontal and vertical distance from the cable. As fish and other mobile marine organisms also cause movement of electrical charges even in still water, the movement of a fish at five knots would also experience a similar electrical field. The modelling of induced electrical fields for AC cables requires consideration of the size of an organism and its distance from the cable. Modelling of induced electrical fields in a small shark of 150 cm length, swimming 0.6 m above and parallel to a 60 Hz AC cable buried to 1 m produced a maximum iE field strength of 0.765 mV/m (Normandeau *et al*., 2011). Other orientations will result in lower values of induced electric fields. Ultimately, the effects would depend on site and project specific factors related to both the magnitude of EMFs and the ecology of local populations including spatial, temporal patterns of habitat use.

6.2.47 The strength of the magnetic field (and consequently, induced electrical fields) decreases rapidly horizontally and vertically with distance from source. Modelling studies have indicated that the range of the field is in the order of 10 m each side of the cable (assuming 1 m burial; see Volume 2, Chapter 3: Fish and Shellfish Ecology Table 3.20; Normandeau *et al*., 2011).

6.2.48 Lampreys possess specialised ampullary electroreceptors that are sensitive to weak, low frequency electric fields (Bodznick and Northcutt, 1981; Bodznick and Preston, 1983), but information regarding what use they make of the electric sense is limited. Chung-Davidson *et al*. (2008) found that weak electric fields may play a role in the reproduction of sea lamprey and it was suggested that electrical stimuli mediate different behaviours in feeding-stage and spawning-stage individuals. This study (Chung-Davidson *et al*, 2008) showed that migration behaviour of sea lamprey was affected (i.e., adults did not move) when stimulated with electrical fields of intensities of between 2.5 and 100 mV/m, with normal behaviour observed at electrical field intensities higher and lower than this range. These levels were considerably higher than modelled induced electrical fields expected from DC or AC subsea cables (i.e., 0.194 and 0.765 mV/m, respectively; see paragraph 6.2.46).

6.2.49 Studies on other migratory fish (e.g., European eel and Atlantic salmon) have shown that cables associated with offshore wind farms may have short term, localised effects on these species (e.g., reduction in swimming speeds in the vicinity of cables), though they do not create a barrier to migration with the overall direction of migration unaffected (Ohman *et al*., 2007; Westerberg and Langenfelt, 2008). The induced electrical field strength expected to occur as a result of DC or AC export cables are considerably lower than those observed to affect behaviour of migrating sea lamprey. Furthermore, export cables associated with Hornsea Project One would not cross the entire mouth of the Humber Estuary and, if effects were to occur, cables would therefore not represent a complete barrier to migration between the North Sea and Humber Estuary. This conclusion is also reflected in the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) which states that "operational EMF impacts are unlikely to be of sufficient range or strength to create a barrier to fish movement".

6.2.50 While cable burial does not reduce EMF to below externally detectable levels (see paragraph 6.2.44), cable burial would serve to increase the distance between the cable and the receptors, resulting in a reduction in magnetic (and induced electrical) fields due to this greater distance. For example, burial of cables to the maximum depth of 5 m (as described in paragraph 2.3.3, this burial depth would only be required in a limited number of places to allow for seasonal changes in seabed levels) would result in a reduction in iE field strength by approximately one order of magnitude (Normandeau *et al*., 2011). It should be noted, however, that although the 5 m maximum subtidal export cable burial depth and 3 m maximum intertidal export cable burial depth may be achievable in some parts of the export cable corridor, this will not guarantee that 3 to 5 m of sediment will cover the cable for the duration of the operational phase.

6.2.51 No barrier effects are therefore predicted on migrating sea or river lamprey and as such there is predicted to be no adverse effect on these features of the Humber Estuary SAC and River Derwent SAC as a result of sediment plumes and EMF effects.

Cable laying activities may cause disturbance to grey seal using the SAC and Ramsar site.

6.2.52 Grey seal populations within the Humber Estuary SAC have the potential to be affected by Project One. Plume effects are not predicted to lead to effects on this species and as such were not assessed further (see Volume 2, Chapter 4: Marine Mammals, paragraphs 4.6.180 *et seq.*).

6.2.53 Disturbance to grey seal as a result of underwater noise from construction vessels (including those associated with cable laying operations) was assessed in paragraph 5.2.43. Disturbance from vessel noise is predicted to occur primarily as a series of short term events (e.g., during installation of cable circuits in the subtidal areas of the Humber Estuary SAC) over the construction period. This would most likely result in avoidance behaviour for the sensitive species (e.g., grey seal) with the distance over which effects will occur varying according to the species and the ambient noise levels. Against a background of high vessel activity within the Humber Estuary from commercial shipping and fishing, and including many smaller vessels operating a fast speeds, it is considered unlikely that this increase in vessel activity will affect grey seals in the Humber Estuary SAC due to their apparent habituation to vessel noise.

6.2.54 The sensitivity of grey seal to noise from vessel traffic was therefore considered to be low (Volume 2, Chapter 4: Marine Mammals, paragraph 4.6.12 *et seq.*), and therefore and it is not expected to affect the conservation objectives of grey seal populations within the Humber Estuary SAC.

6.2.55 As discussed in Section 5.2, injuries to marine mammals from collisions with vessels include blunt traumas from impact with the ship's hull and lacerations from propellers (see paragraph 5.2.52 *et seq*.). As detailed in paragraph 5.2.57, cable installation within the Humber Estuary SAC presents a medium risk to grey seal according to the relevant JNCC guidelines (see Table 5.4). The recommendations are to consider alternatives to the use of ducted propellers and/or to avoid the breeding season if possible. As detailed in Table 5.46 and Section 6.4, best practice guidance will be followed in in accordance with latest JNCC guidance (JNCC, 2012) during cable installation, in order to minimise the potential for injuries to grey seal. As a result, no adverse effects on grey seals are predicted as a result of cable laying operations within and around the Humber Estuary SAC.

Decommissioning Phase

6.2.56 As detailed in Section 2.5 and paragraph 4.4.15, in order to minimise disturbance to designated features of the Humber Estuary EMS, the preferred option is to leave cables in place with cable ends cut, sealed and securely buried. As such, effects of decommissioning on designated species of the Humber Estuary SAC are expected to be considerably less than those of the construction phase described in the preceding paragraphs. If cables were to be removed, effects would be expected to be the same or less than those predicted for the construction phase and as such, no adverse effects would be predicted to occur.

Effects on SAC and Ramsar Species Features – In-combination

In-combination effects on river and sea lamprey using the Humber Estuary SAC/Ramsar and migrating to the River Derwent SAC

6.2.57 Potential for in-combination LSE were identified for lamprey species as a result of the Hornsea Project One, Project Two, the Phillips 66 Tetney sea line replacement project and the development works at AMEP, particularly due to underwater noise associated with piling operations and loss of subtidal habitat (see Table 4.13 and Figure 4.4). Underwater noise modelling undertaken for the AMEP development shows that noise associated with piling operations is not predicted to represent a barrier to lamprey migration (Able UK Ltd., 2011) with proposed mitigation (e.g., soft starts, the use of pile pads, seasonal restrictions on percussive piling) also reducing the potential for barrier effects (Able Humber Ports Ltd. *et al.*, 2012). The in-combination effects of cable laying operations (during the construction phase of Project One), EMF effects (during the operational phase of Project One) and underwater noise effects (during the AMEP construction phase) are not likely to affect lamprey migration between the North Sea and the Humber Estuary (and associated tributaries).

6.2.58 Loss of subtidal habitat (used for transit to/from spawning grounds upstream) at the AMEP site was also not predicted to have an adverse effect on lamprey, due to the small area of habitat affected. As discussed above, in-combination loss of habitat from the AMEP, Phillips 66 Tetney sea line replacement project and Hornsea projects would result in a total habitat loss of approximately 0.75% of the total area of the estuary, with the majority of this represented by temporary habitat loss associated with pipeline and cable burial activities. This therefore represents only a very small proportion of the available subtidal habitat available for lamprey within the Humber Estuary.

6.2.59 Impacts on sea and river lamprey from the Phillips 66 Tetney sea line replacement project are expected to be similar to those for Project One (i.e., disturbance due to increases in suspended sediment concentrations) and impacts from Hornsea Project Two are expected to be identical to those of Project One. As discussed in paragraphs 6.2.42 *et seq.*, due to the temporary nature of the disturbance associated with these activities and the small proportion of the available subtidal habitats affected, any behavioural effects would be limited with no adverse effects on the qualifying species for the Humber Estuary SAC and Ramsar site and the River Derwent SAC, (i.e., sea and river lamprey species).

In-combination effects on grey seal using the Humber Estuary SAC/Ramsar

6.2.60 Impacts on grey seal from the Phillips 66 Tetney sea line replacement project are expected to be similar to those for Project One (i.e., presence of construction vessels) and impacts from Hornsea Project Two are expected to be identical to those of Project One. As discussed in paragraphs 6.2.52 *et seq.,* due to the temporary nature of the disturbance associated with these activities and the small proportion of the available subtidal habitats affected, any behavioural effects would be limited with no adverse effects on the qualifying species for the Humber Estuary SAC and Ramsar site, (i.e., grey seal). In addition, the use of best practice guidance (JNCC, 2012) to minimise the potential for injuries to grey seal (see paragraph 6.2.55) will further reduce the potential for impacts on this qualifying species.

Summary of effects on SAC and Ramsar site fish and marine mammal features

6.2.61 Due to the nature of the disturbance associated with cable laying activities (i.e., temporary disturbance to a small area of habitat) and construction activities at other projects within the Humber Estuary and the low likelihood of EMF related barrier effects on lamprey species, there are predicted to be no adverse effects on the Annex II qualifying fish species for the Humber Estuary SAC and Ramsar and River Derwent SAC, (i.e., sea and river lamprey species), for Project One alone, or in-combination with other projects.

6.2.62 Due to the nature of the disturbance associated with cable laying activities, the construction activities at other projects within the Humber Estuary and the commitment to follow best practice guidance (JNCC, 2012), (see paragraph Table 5.46 and Section 6.4), there are predicted to be no adverse effects on the Annex II qualifying marine mammal species for the Humber Estuary SAC and Ramsar, (i.e., grey seal), for Project One alone, or in-combination with other projects. This conclusion has been agreed with Natural England as part of Phase 4 consultation (see Table 1.1).

6.3 Effect on SPA/Ramsar Features

Effects on SPA/Ramsar Features – Project One Alone

6.3.1 The eleven species (in this case nine wader species, dark-bellied brent goose and common tern) where a LSE cannot be discounted from the previous screening stage are assessed here. In much of the following section, it is considered acceptable that these species can be grouped together as they share common characteristics of behaviour and biology, and therefore are likely to respond to effects in a broadly similar way. This is the method used by Natural England in their Conservation objectives statement for the Humber Estuary SSSIs, where species features are split into *“Breeding bird assemblage”* and *“Passage and wintering waterfowl species”*. It is, however, acknowledged that wader, tern and wildfowl species may differ in the extent and duration of response (e.g., Smit and Visser, 1993; Burton *et al.,* 2002a), and where appropriate, the assessment considers each species individually.

6.3.2 To determine whether an adverse effect on any SPA will occur, an assessment is therefore required based on the identified effects of cable construction activities and their potential impact pathways in relation to the relevant SPA conservation objectives, with the main impact pathways presented in Table 6.3.

Table 6.3 Matrix of the identified effects on the qualifying features of the Humber Estuary SPA and correlation with its conservation objectives (conservation objectives for the Farne Islands and Coquet Island SPAs are identical to those of the Humber Estuary SPA; see Annex E, paragraph E.74).

SPA conservation objectives	Habitat loss	Disturbance	Indirect effects
The extent and distribution of the habitats of the qualifying features.	✓	✓	✓
The structure and function of the habitats of the qualifying features.	-	-	✓
The supporting processes on which the habitats of the qualifying features rely.	-	-	✓
The populations of the qualifying features.	✓	✓	✓
The distribution of the qualifying features within the site.	✓	✓	✓

6.3.3 The following sections expand on the relationships between the identified effects and conservation objectives identified in Table 6.3. For each impact pathway, a summary of the potential effects which may compromise the relevant conservation objectives is presented with evidence and examples from the scientific literature where appropriate.

6.3.4 Based on the evidence available from the literature and results of baseline surveys, it is then determined whether there will be an adverse effect on any conservation objective and therefore on the integrity of the SPA.

<u>The installation of export cables may impact habitats (i.e., extent and distribution) of specific importance to important bird species and affect the variety and distribution of species using the Humber Estuary</u>

6.3.5 Waterfowl species normally congregate into flocks to feed and roost, for enhanced prey and predator detection. Variation in abundance of each species' selected prey items is the key determinant in habitat selection for feeding, and this is in turn determined by variation in substrate, salinity and other physical features of the environment (Colwell and Landrum, 1993).

6.3.6 Unlike selection of feeding sites, relatively little is known about roost selection in waders. Energy limitations, predation, disease or weather conditions may be determinants in roost selection and few studies have assessed the amount of movement between roosts.

6.3.7 The temporary loss of habitat for SPA birds due to cable laying at the Horseshoe Point landfall site may therefore result in loss of breeding, feeding or roosting habitat (see Table 2.1 and Section 6.2) and therefore individuals' fitness may be affected if alternative habitat of the same quality is unavailable. As shown in Table 2.1, the export cable corridor will converge to a landfall at Horseshoe Point. Export cables will be installed under the sea defences and through the intertidal area to sea, within the cable route convergence zone'

6.3.8 The maximum adverse scenario is for up to four cable trenches which will be buried at a maximum depth of 3 m in the intertidal (see Section 2.3). The width of intertidal area affected is predicted to be up to 40 m per trench, but where the export cable route convergence zone is <160 m from the sea wall it is assumed that the whole area may be affected.

6.3.9 As detailed in paragraph 2.3.26 *et seq*. the export cable installation will be a two-phase construction process with HDD operations and duct installation occurring in Phase 1 and cable circuit installation through the intertidal undertaken in Phase 2. The area of intertidal habitat likely to be affected will therefore be much smaller in Phase 1 compared to Phase 2 (as shown in Figure 6.1).

6.3.10 Project One may result in temporary habitat loss, through cable laying activities, of approximately 1,748,120 m^2 of the estuary, equating to less than 0.47% of the total area of the estuarine habitats in the Humber Estuary (note that these figures assume total habitat loss within this corridor though cable burial is only likely to occur within a small proportion of the convergence route with habitat disturbance from vehicle movements and anchor placement occurring over a wider area).

6.3.11 Approximately 1,620,120 m^2 of habitat affected would be within the intertidal zone. Of the area affected, approximately 1,572,000 m^2 is mudflats and sandflats not covered by seawater at low tide, which equates to less than 1.68% of this habitat within the Humber Estuary SAC. Approximately 48,000 m^2 would be *Salicornia* and other annuals colonising mud and sand habitat, equating to about 7.8% of this habitat within the SAC. The SAC baseline used to calculate this proportion of *Salicornia* is however likely to be an underestimate as an area greater than the baseline (i.e., approximately 68 ha) was mapped during site specific surveys at Horseshoe Point.

6.3.12 Effects of vehicle movements across the intertidal area will likely include physical disturbance of sediments, though these effects would be expected to be short lived, with vehicle tracks likely to be washed away by tide and wave action. The sensitivity of the communities to this type of disturbance is expected to be low (Tyler-Waters and Marshall, 2008). Recovery rates of the communities associated with this habitat are fast, with recovery expected within months of cable burial operations (Tyler-Waters and Marshall, 2008).

6.3.13 Recovery of *Salicornia* is also expected to occur within months, with full recovery expected within one year of cable burial operations (see paragraphs 6.2.15 *et seq*.) with full recovery of this habitat expected within one year following disturbance.

6.3.14 The two-phase installation would therefore reduce the proportion of each habitat affected at any one time (or during each year) allowing for recovery of habitats and associated communities between installation phases. Figure 6.1 demonstrates that in Phase 1 the temporary habitat loss will be minimal, relating mainly to the HDD exit pit working area and access to it, with impacts primarily occurring within the Salicornia and other annuals colonising mud and sand Annex I habitat.

6.3.15 The range of the qualifying interests of the Humber Estuary, Coquet Island and Farne Islands SPAs affected by temporary habitat loss, and therefore the significance of impact, will depend on the particular requirements of each species. Assuming that temporary habitat loss will occur over two phases, either directly or because of regeneration time, then each species may be affected during up to two breeding seasons, winters, or two autumn or spring passage periods, depending on construction periods. Since the main habitats affected in Phase 1 and Phase 2 are different, different species may be affected between phases, or alternatively the same species may be affected, but for alternative reasons (e.g., roosting or feeding).

6.3.16 Stillman *et al.* (2005) assessed the quality of the Humber for nine shorebirds (namely dunlin, ringed plover, knot, redshank, grey plover, black-tailed godwit, bar-tailed godwit, oystercatcher and curlew). Their model predicts overwinter survival, based on shorebird distribution and the diets of each species. A 2 to 8% reduction in intertidal area decreased predicted survival rates in redshank, grey plover, black-tailed godwit, bar-tailed godwit and curlew. Predicted survival rates were highest in dunlin and ringed plovers, the smallest species, and in oystercatchers, which consumed larger prey than the other species.

6.3.17 As detailed in paragraph 6.3.11, the magnitude of habitat loss predicted from cable route works is small compared to the overall habitat available within the Humber Estuary. However, species that may be specialised and rely on particular habitat requirements for feeding or roosting within the estuary may be proportionately more affected than otherwise would be the case. Waders fly long distances during migration, yet studies have shown that, once on their wintering grounds, they tend to move only short distances between roosts within an estuary (Rehfisch *et al*., 1996). In the Firth of Forth, studies have shown that movements of seven species of waders within and through the estuarine complex formed two groups - grey plover, turnstone, oystercatcher and redshank tended to stay within the same part of the estuary throughout the winter, whereas bar-tailed godwit, dunlin and knot ranged more widely (Symonds *et al.*, 1984).

6.3.18 Site-faithful species such as grey plover and oystercatcher would therefore be more threatened by habitat loss, unless alternative local sites were below their carrying capacity for the species and thus were able to support additional birds. If, however, alternative sites are of limited quality or extent and already at or near capacity, increased densities may lead to intense competition for available resources and thus potentially increased mortality in the population (Burton *et al.,* 2002a).

6.3.19 Each key species' habitat preference is therefore summarised in Table 6.4, with information obtained from BTO BirdFacts (Robinson, 2005), Allen *et al*. (2003), Prater (1981) and Cutts *et al.* (2009), and presented in more detail in Annex F: SPA Qualifying Species Accounts. In Annex F, the spatial distribution of each species at Horseshoe Point between April and September in 2011 and 2012, is shown in figures within species' accounts sections, and summarised in Table 6.4. In this set of figures, an indicative 'worst-case' layout is presented, which shows three excavators on site, and a 200 m disturbance buffer around each (based on noise disturbance criteria described in paragraph 6.3.47 below). It should be noted that these excavators may be located anywhere within the convergence zone, or potentially within the temporary working area for Projects One and Two, although actual installation work will be restricted to the convergence zone. The seasonal abundance of each key species at Horseshoe Point, between April and September (the proposed installation window as outlined in Section 6.4) is shown in the charts comprising Figure 6.4 below.

6.3.20 Based on the general habitat and diet preferences, and utilisation at Horseshoe Point presented in Table 6.4, and the abundance of each habitat within the estuary (Table 6.2) no species are expected to have habitat requirements that are specific to the area of the cable route works during Phase 1 and Phase 2, with even the most sensitive of species (e.g. ringed plover and knot, where high tide roosts may be present) able to find alternative habitat in the adjoining saltmarsh and mudflat habitats, if affected. Further information on key roost sites for these species within the Humber Estuary and the Horseshoe Point WeBs sector and alternative habitats available in the vicinity of Horseshoe Point are detailed in the SPA species accounts (Annex F).

6.3.21 In general, Phase 1 activities will cover a very small amount of area, and although this does not appear to be of particular significance to any species, alternative habitat in the local vicinity (see Annex F) would be available if temporarily lost for one season.

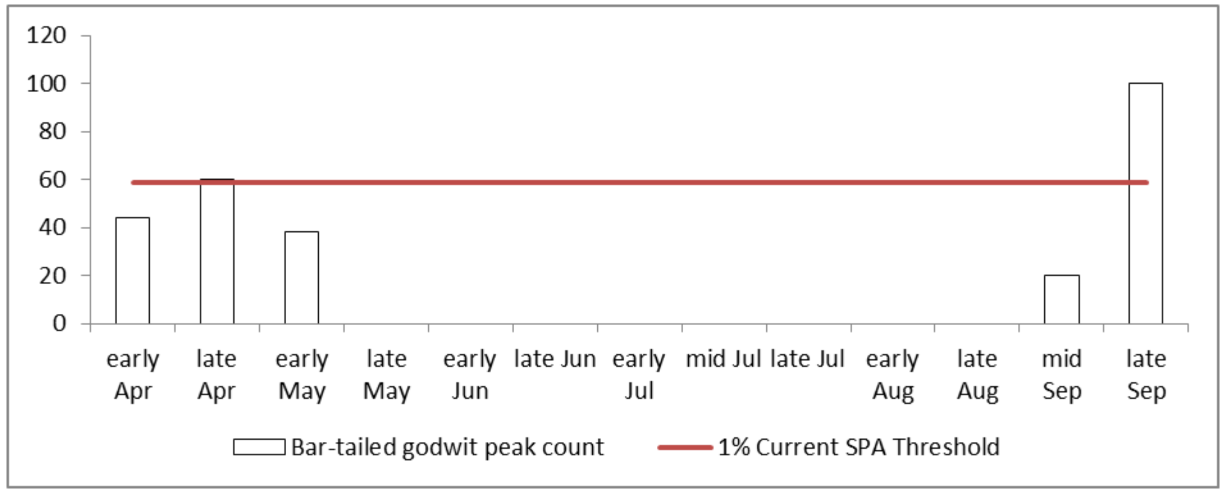
6.3.22 During Phase 2 the area of habitat lost for one season would be larger, but the majority of species show that the convergence zone and temporary working area is sub-optimal for feeding or roosting, with higher concentrations to the southeast along the cockle beds and creeks (at lower tides), or within the *Salicornia* areas in the upper shore (at mid-high tide) in particular (see SPA species accounts; Annex F).

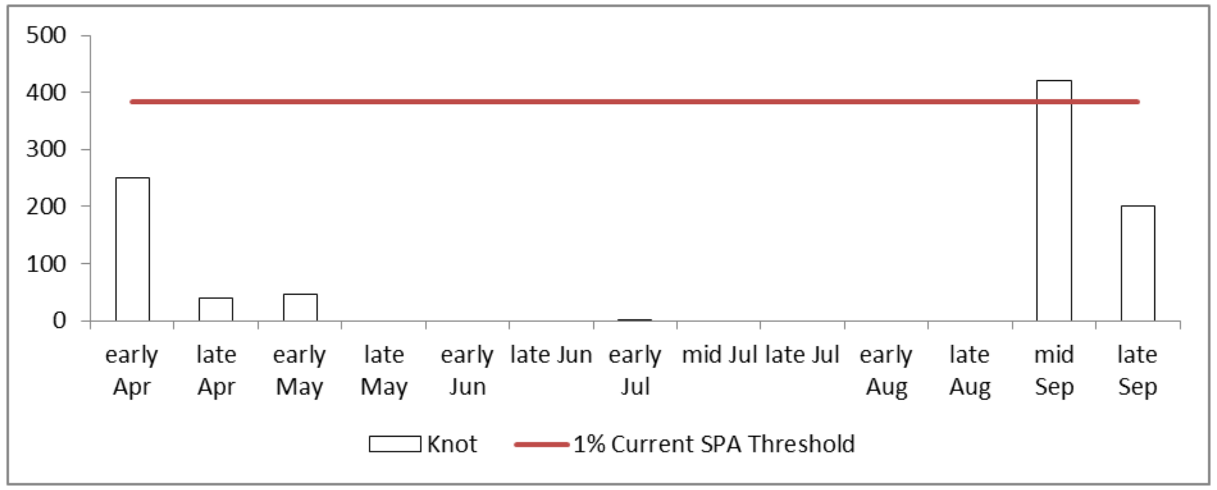
Table 6.4 Habitat and diet preferences and potential sensitivities of features of the Humber Estuary, Coquet Island and Farne Islands SPAs.

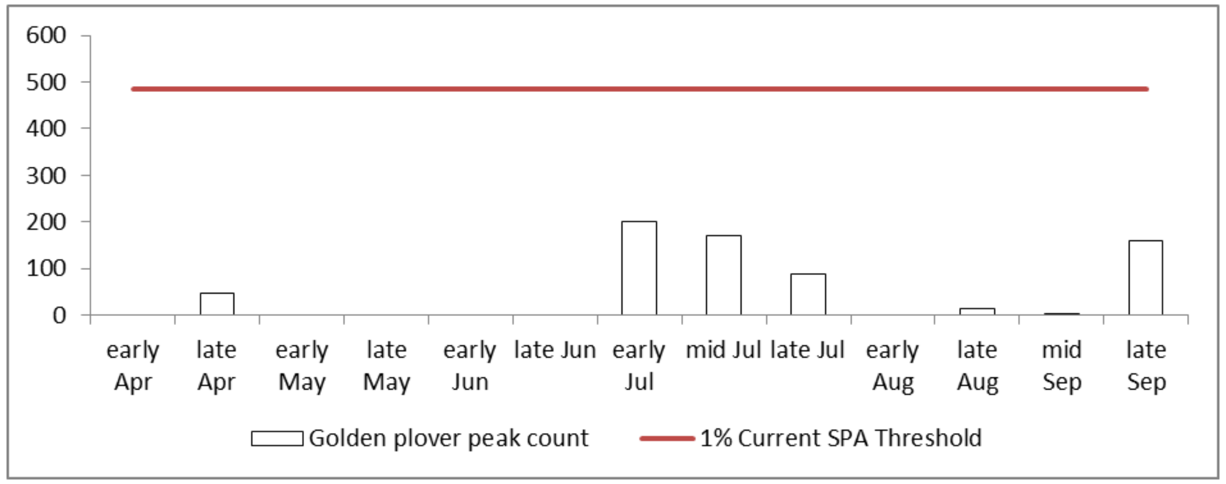
Species	General Habitat preferences	Diet	Sensitivity issues	Horseshoe Point Distribution (April to September)	Likely site usage at Horseshoe Point (April to September)	Potential impact of habitat loss at Horseshoe Point
Bar-tailed godwit	Mudflats, flooded fields. Normally feeds in flocks at the tidal edge, following the receding tide. Slower to leave high tide roosts as a result.	Invertebrates, especially insects, molluscs, crustaceans and worms.	Larger bird, sensitive to roost disturbance.	Recorded widely across mudflats, particularly in cockle bed and littoral sand areas to the south of the convergence zone. Annex F: Figure F.7; and Figures F.77 to F.80.	Mainly feeding along tidal edge, although evidence of low tide roost (Natural England). No evidence of particular concentration at any point within convergence zone or temporary working area.	Phase 1: None – no records of birds near working areas Phase 2: No significant impact – majority of records outside of working area, and species is mobile throughout winter.
Golden plover	Feeding and roosting occurs on intertidal mudflats in addition to inland feeding.	Prey items vary between habitats, with insects, worms and plants taken on inland sites and molluscs taken on intertidal mudflats.	Loss of feeding habitat.	Mainly recorded on saltmarsh habitats outside of the convergence zone, through all tidal states. Some use of the polychaete / bivalve dominated muddy sand, as well as inland field close to the convergence zone. Annex F: Figure F.11; and Figures F.77 to F.80.	Feeding/roosting area on upper shore during post-breeding and passage periods.	Phase 1: None – no records of birds near working areas Phase 2: No significant impact – majority of records outside of working area in saltmarsh habitat.
Dunlin	Utilises the entire mudflat for feeding, following receding tide.	Invertebrates, located by sight and touch.	Sensitive to roosting disturbance, particularly during autumn passage.	Spread widely across mudflats at Horseshoe Point, where tidal state allows, with concentrations also in *Salicornia* areas Annex F: Figure F.17; and Figures F.77 to F.80.	Roost in low, turning tide along mudflats (Natural England), although no evidence of particular concentration at any point within convergence zone or temporary working area.	Phase 1: No significant impact – few records within area affected Phase 2: No significant impact – majority of records outside of convergence zone and temporary working area, with large amount of alternative habitat available at all times.

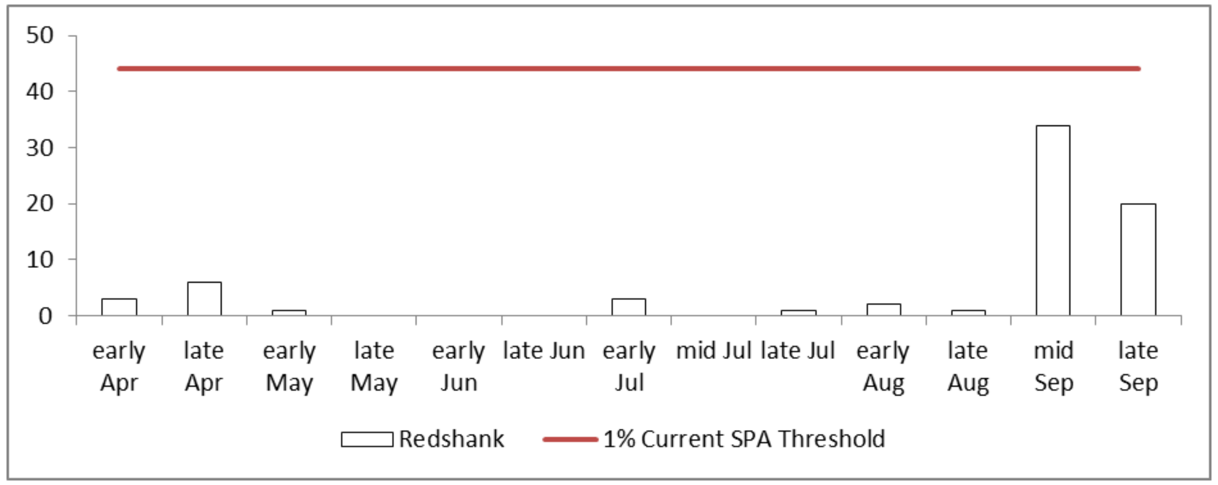
Species	General Habitat preferences	Diet	Sensitivity issues	Horseshoe Point Distribution (April to September)	Likely site usage at Horseshoe Point (April to September)	Potential impact of habitat loss at Horseshoe Point
Knot	Mid- and upper-shore feeder. Requires large, open mudflats to roost and feed. Roost on the shore at high tide.	Inter-tidal invertebrates, especially molluscs but also worms and crustaceans.	Sensitive to roosting disturbance.	Recorded widely across mudflats, particularly on littoral sands, within cockle beds and creeks. Annex F: Figure F.22; and Figures F.77 to F.80	Roost in low, turning tide along mudflats (Natural England).	Phase 1: No significant impact – evidence of birds roosting at high tide close to activity along sea wall, but also at a number of other locations. Phase 2: No significant impact – majority of records within cockle beds and creeks outside of working area.
Redshank	Saltmarsh is used by breeding birds. Mid- and upper-shore feeder on mudflats. Redshank feed both during the day and at night, whenever the tidal situation best suits their foraging style. During high tide when mudflats are covered, birds form small to medium-sized roosting flocks on the vegetated upper shore and often in coastal grassland. May feed on saltmarsh.	Invertebrates, especially earthworms, cranefly larvae (inland) crustaceans, molluscs, marine worms (estuaries).	Requires high percentage of time to feed on small prey. Affected during bad weather, at distances up to 250 m.	Recorded in small numbers across Horseshoe Point, but more commonly in saltmarsh areas and close to tidal defences. Annex F: Figure F.30; and Figures F.77 to F.80.	Probable feeding and roosting area along upper shore.	Phase 1: No significant impact – small number of isolated records in vicinity of work area. Phase 2: No significant impact - working area is generally sub-optimal for the species, with few records within.
Dark-bellied brent goose	Traditionally occurs on natural and semi-natural habitats (saltmarsh, mudflats, eelgrass beds), but also makes use of agricultural land.	Mainly eelgrass (*Zostera*) and various marine algae. Winter cereals and grass are mainly taken on farmland habitat when eelgrass is depleted.	Loss of feeding habitat.	Flocks recorded within saltmarsh area in winter period until May. Annex F: Figure F.43; and Figures F.77 to F.80.	Possible feeding/ roost site.	Phase 1: None – no records near work area. Phase 2: None - site usage well outside of convergence zone and temporary working area – generally unsuitable.
Sanderling	Sandy estuaries along the tideline.	Mostly small invertebrates, picking items of food from the tideline that are deposited there by the receding waves.	High numbers present during spring passage on Humber.	Mainly recorded along upper shore, particularly within saltmarsh areas during summer months. Annex F: Figure F.47; and Figures F.77 to F.80.	Evidence of roost upper shore during early summer.	Phase 1: None – no records near work area. Phase 2: None - site usage outside of convergence zone and temporary working area – habitat within appears to be sub-optimal.

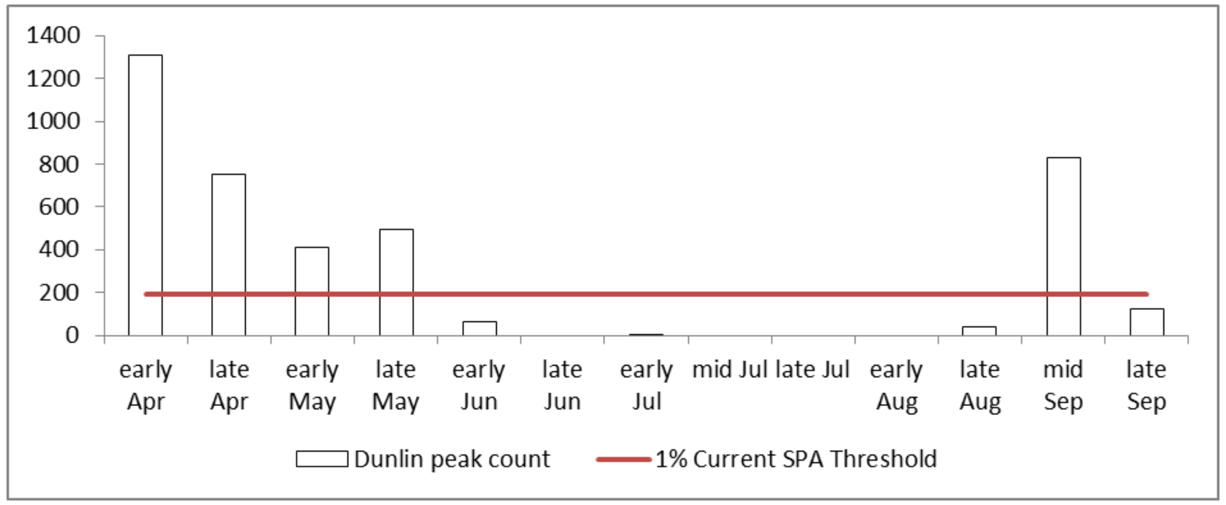
Species	General Habitat preferences	Diet	Sensitivity issues	Horseshoe Point Distribution (April to September)	Likely site usage at Horseshoe Point (April to September)	Potential impact of habitat loss at Horseshoe Point
Ringed plover	Nesting on shingle or sand with low vegetation by the coast. In winter they are attracted to mudflats and muddy beaches.	In summer, invertebrates, In winter primarily marine worms, crustaceans and molluscs.	Sensitive to roosting disturbance and also during breeding season.	Most commonly recorded along upper shore within saltmarsh area, although this may be a reflection of proximity to vantage point for recording this cryptic species. Annex F: Figure F.51; and Figures F.77 to F.80.	Evidence of roost upper shore during early summer.	Phase 1: Not significant – widely dispersed at lower tides but some records close to working areas at high tide. Alternative habitat nearby appears available (see Annex F). Phase 2: Not significant – very few records within working area.
Oystercatcher	Sandy, muddy, rocky beaches. Feeds mainly on mid-tide flats and fields when flats are submerged.	Predominantly bivalves especially cockles, mussels, tellins *Macoma* and earthworms when young.	Walks away frequently as a response to disturbance.	Strong preference for littoral sand and creeks close to cockle beds, to the southeast of the convergence zone. Annex F: Figure F.55; and Figures F.77 to F.80.	Roost at low and turning tide, particularly in creeks (Natural England).	Phase 1: None – habitat affected is generally sub-optimal for species with few records in vicinity of works; and Phase 2: Not significant – although found in high numbers close to working area, the vast majority of records are in more preferred habitat to the southeast.
Grey plover	Feed mainly on the middle and upper shore levels on estuaries where individuals are usually well dispersed, feeding at lower densities than many other species.	In winter primarily marine worms, crustaceans and molluscs.	May leave estuary altogether if disturbed.	Found widely across the mudflats and saltmarsh, although more commonly recorded within the middle and upper shore. Annex F: Figure F.68; and Figures F.77 to F.80.	Predominantly recorded as a high tide feeding area, although may be used as a roost.	Phase 1: Not significant – some records in vicinity but relatively unimportant for species. Phase 2: Not significant – birds spread widely across estuary with largest concentrations outside of working area.
Common tern	Sandy seacoasts, in winter marshes, estuaries.	Mostly fish, also crustaceans in some areas, mostly by plunge-diving.	Requires relatively clear water to be able to forage successfully.	Isolated records on saltmarsh along upper shore in summer, to the north of the convergence zone. Annex F: Figure F.76; and Figures F.77 to F.80.	Roost site in late summer along mid-lower shore (Natural England).	Phase 1: None – no records in vicinity of working area Phase 2: Not significant – roost appears to be intermittent, and spread over wide area.

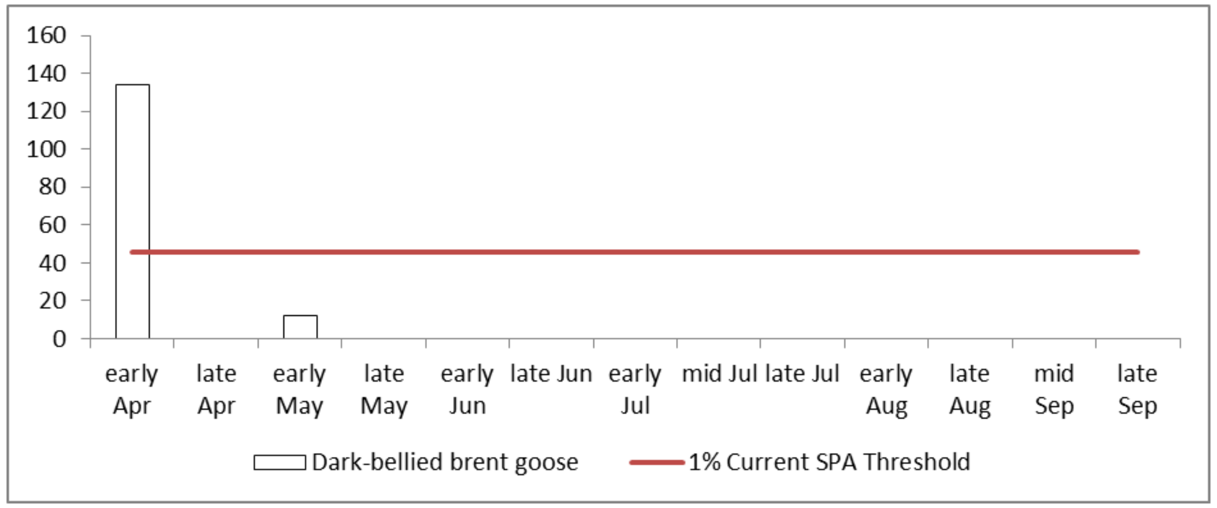

120
100
80
60
40
20
0
early Apr
late Apr
early May
late May
early Jun
late Jun
early Jul
mid Jul
late Jul
early Aug
late Aug
mid Sep
late Sep
Bar-tailed godwit peak count
1% Current SPA Threshold

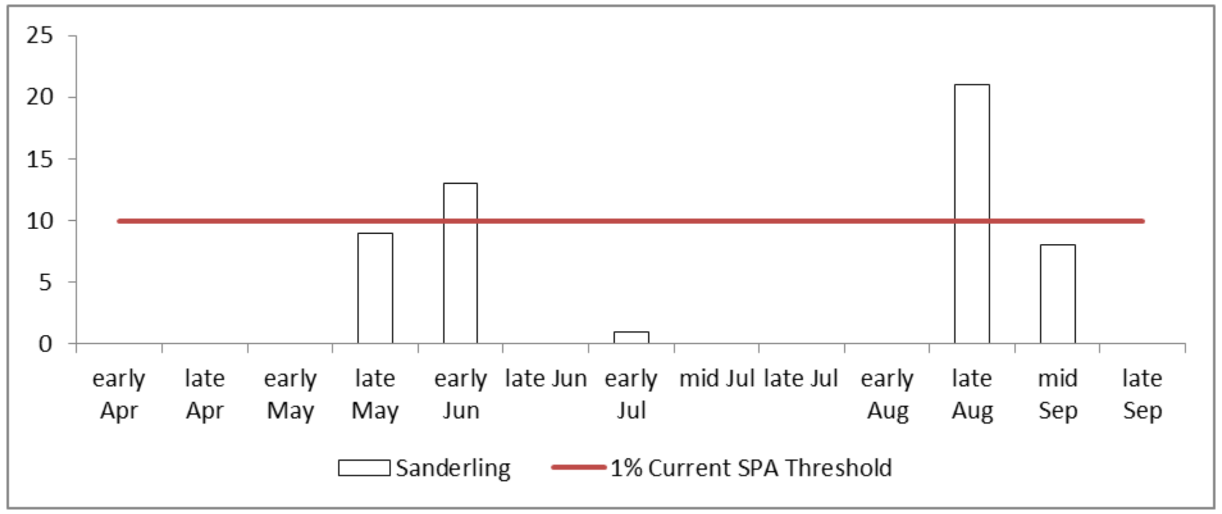

500
400
300
200
100
0
early Apr
late Apr
early May
late May
early Jun
late Jun
early Jul
mid Jul
late Jul
early Aug
late Aug
mid Sep
late Sep
Knot
1% Current SPA Threshold

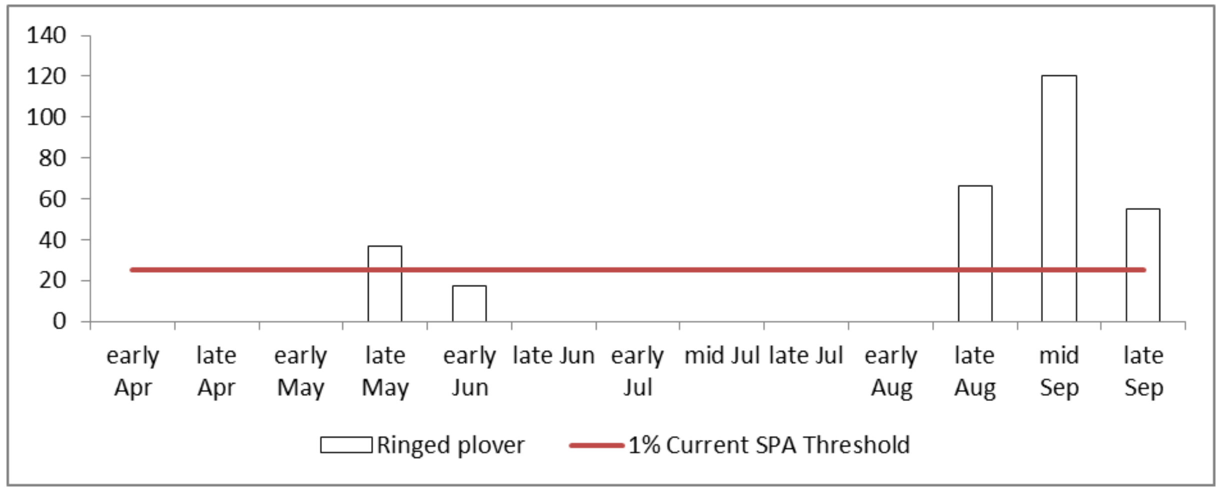

600
500
400
300
200
100
0
early Apr
late Apr
early May
late May
early Jun
late Jun
early Jul
mid Jul
late Jul
early Aug
late Aug
mid Sep
late Sep
Golden plover peak count
1% Current SPA Threshold

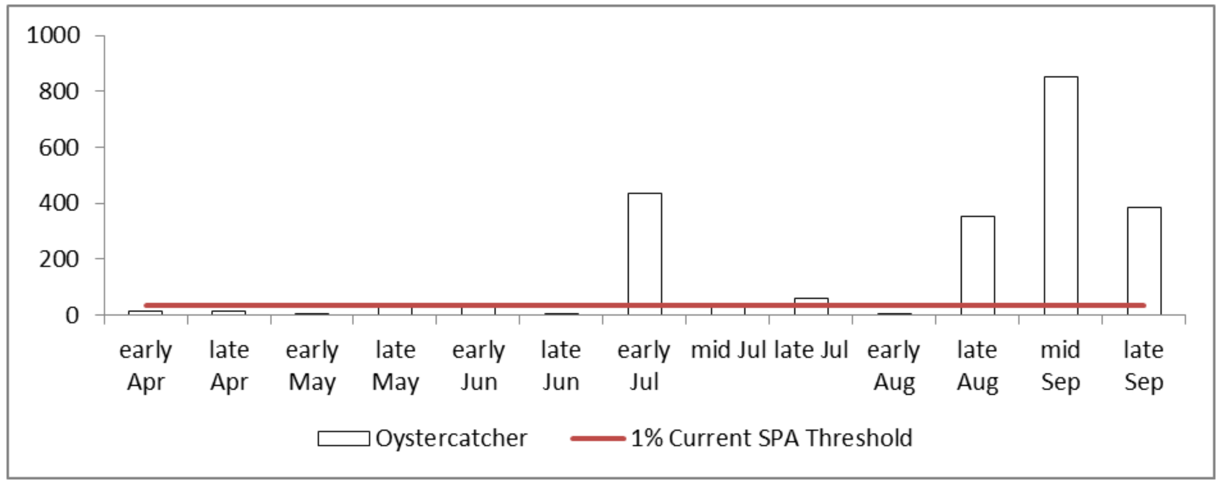

50
40
30
20
10
0
early Apr
late Apr
early May
late May
early Jun
late Jun
early Jul
mid Jul
late Jul
early Aug
late Aug
mid Sep
late Sep
Redshank
1% Current SPA Threshold


1400
1200
1000
800
600
400
200
0
early Apr
late Apr
early May
late May
early Jun
late Jun
early Jul
mid Jul
late Jul
early Aug
late Aug
mid Sep
late Sep
Dunlin peak count
1% Current SPA Threshold


160
140
120
100
80
60
40
20
0
early Apr
late Apr
early May
late May
early Jun
late Jun
early Jul
mid Jul
late Jul
early Aug
late Aug
mid Sep
late Sep
Dark-bellied brent goose
1% Current SPA Threshold







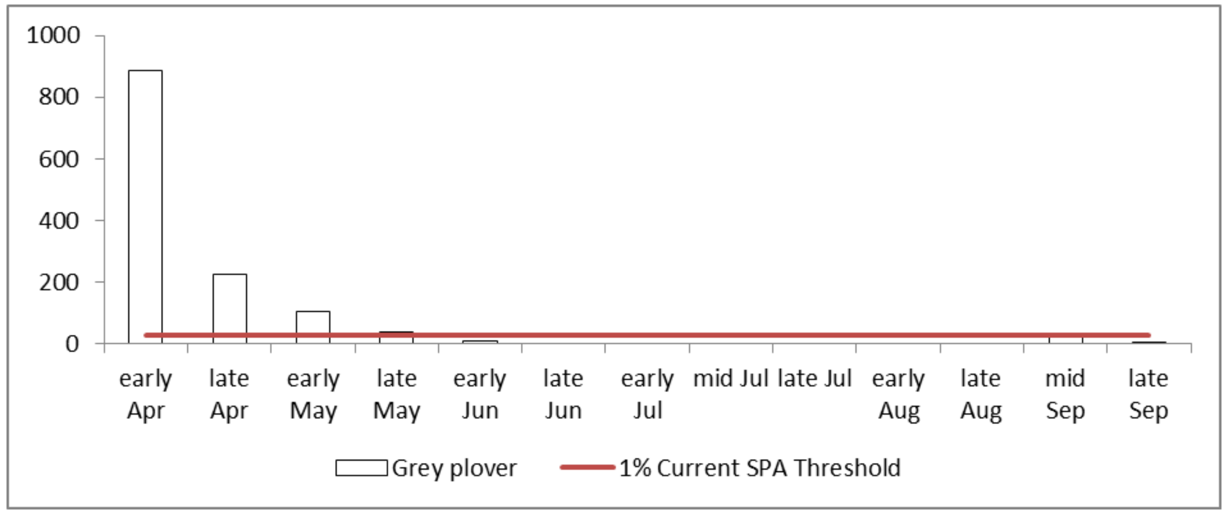


Figure 6.4 Peak counts for key SPA species during intertidal surveys at Horseshoe Point between April and September 2011&12, in relation to the current 1% SPA population threshold (based on WeBS 5 year peak mean counts of Humber Estuary).

6.3.23 The temporary loss of habitat at Horseshoe Point is unlikely to reduce survival rates for any species. No density-dependent effects at an SPA level are predicted from birds shifting temporarily to other parts of the estuary since the area and numbers affected will be relatively small. Any effects on individuals are likely to be restricted to temporary, reversible reductions in fitness levels due to reduced foraging efficiency, rather than on mortality or productivity effects.

6.3.24 In relation to the relevant conservation objectives, the extent and distribution of supporting habitats will not be significantly affected, with habitat loss/disturbance being minimal and restricted to one season (for a particular area), and the vast majority of habitat loss will be reversible within a short period. As a result, the numbers or distribution of qualifying species will not be affected by habitat loss.

6.3.25 It can therefore be concluded that unmitigated, no conservation objectives are expected to be compromised by habitat loss, and consequently there will be no adverse effects on the integrity of the Humber Estuary, Coquet Island and Farne Islands SPAs as a result of temporary habitat loss during cable installation at the landfall site.

6.3.26 To provide further confidence, mitigation measures have been proposed to reduce habitat loss and increase recovery rates within the *Salicornia* and other annuals colonising mud and sand Annex I habitat and other Annex I habitats following cable installation. These are described in Section 6.4: Mitigation Measures.

The installation of export cables may create disturbance impacts affecting population size, displacement and the variety of bird species using the Humber Estuary SPA and Ramsar Site

6.3.27 From a conservation perspective, human disturbance is only likely to be an important factor if it directly or indirectly affects the survival or fecundity of birds in a population and ultimately causes a decline in numbers (Gill *et al*., 2001). It is therefore important to determine whether the predicted disturbances would actually contribute to a population change and therefore adversely affect the integrity of any SPAs.

6.3.28 It has been observed that for waterfowl, disturbances usually only interrupts birds' activity patterns temporarily or displaces individuals short distances (e.g. Hockin *et al.,* 1992). Only a small proportion of disturbance events may actually cause birds to leave a site (Burton *et al*., 1996, Marsden 2000), and a number of studies have shown that birds may rapidly move back into areas when a source of disturbance has been removed (e.g. Owen 1993; Hirons and Thomas, 1993; IECS, 2007). However, longer-term impacts of disturbance on the numbers of birds using adjacent estuarine areas have been suggested in a number of studies (e.g. Pfister *et al.,* 1992; Tubbs *et al*. 1992; Townshend and O'Connor, 1993; Burton *et al*. 1996, Gill *et al*., 1996).

6.3.29 The extent to which avoidance behaviour takes place varies between waterfowl species and is independent of site characteristic. However, Gill (2007) has argued that many previous studies have recorded disturbance behaviour and assumed, without clear justification, that these changes will have fitness consequences for the individuals (e.g. Klein *et al.,* 1995). Gill argues that behavioural responses to disturbance are also context-dependent and will depend on trade-offs experienced by individuals. A bird's decision to remain in or leave an area may depend on:

- The quality of the area for feeding, roosting etc.;
- The availability and relative quality of alternative areas; or
- Relative predation risk on current and alternative sites.

6.3.30 Birds may therefore remain in disturbed areas if the cost of moving to a new location is too great. In contrast, those individuals that move readily in response to disturbance may do so if alternative locations have better food resources, or lower predation, or if the costs of moving are small (e.g. Beale and Monaghan, 2004). Impacts may also vary according to the stage of tide or the time of day. For example, although wader densities may be reduced in the daytime close to footpaths, the same areas may hold much higher densities at night (Burton *et al*., 2002b).

6.3.31 Klein *et al*. (1995) and Madsen (1995) have found that birds may become habituated to some forms of disturbance, particularly when repeatedly subjected to the same stimulus, and conversely may therefore be more sensitive to disturbance when they are subjected to a sequence of different, sudden or surprising stimuli (e.g. Goss-Custard, 2007). The effects of chronic or impulsive noise on the physiology, or population density of wintering birds are however poorly understood (Wright *et al*., 2010). As detailed in Table 6.3, the conservation objectives likely to be affected are as follows:

- Extent and distribution of the habitats of the qualifying features;
- Populations of qualifying features; and
- Distribution of qualifying features within the site.

6.3.32 The typical process for cable installation within the landfall area is outlined in Volume 1, Chapter 3: Project Description, and summarised in Section 2.3. Due to limited working time per year, it is anticipated that HDD and duct installation takes place in Phase 1 and cable installation in Phase 2.

Sensitivity to disturbance

6.3.33 Considering the bird species that are qualifying features of the Humber Estuary, Coquet Island and Farne Islands SPAs, those species most likely to be adversely affected by disturbance are those for which the fitness costs are high but they have little excess habitat to move to and are therefore constrained to stay in disturbed areas (or move to substandard areas) and suffer costs of reduced survival or reproductive success.

6.3.34 Cutts *et al*. (2009) found that from a review of shorebird responses to disturbance, sensitivity is likely to be greatest in spring and autumn migration periods, as well as in periods of hard weather conditions when food supply and habitat is limited. The authors undertook a sensitivity assessment of the Humber, based on WeBS sectors shown in Annex E, Figure E.3.

6.3.35 A series of criteria were used for judgement, including waterfowl assemblage (key species and their sensitivity to disturbance), function (roosting, feeding and breeding densities), disturbance stimuli (roads, public access recreation, port and industry), and environmental factors (mudflat width, topography etc.).

6.3.36 The area of Tetney Marshes (encompassing WeBS sectors MSE2 and MSF) was identified as a key high tide roost for knot, oystercatcher, golden plover, lapwing, dunlin and grey plover. The sectors are also used by golden plover and knot for feeding over winter, and for golden plover during autumn passage, although it was considered less important during spring passage. It was not, however, considered that the two sectors had the highest level of sensitivity within the estuary. Both sectors were categorised as being 3 out of a possible 12 for sensitivity to disturbance.

Noise and vibration disturbance

6.3.37 In this section, noise and vibration caused by cable installation activities has been considered. There is little evidence in the scientific literature on the impacts that vibrations may have on birds, with most studies on disturbance not separating between noise and vibration sources (nor indeed with visual disturbance). In practice, noise is considered likely to occur over a greater extent than vibration, as the levels of vibration will attenuate rapidly with distance, and, therefore, be far less noticeable in the areas used by waterbirds (indirect effects of disturbance on prey items are considered separately). As such, the estimations of extent of noise disturbance will also take into account vibration disturbance.

Phase 1

6.3.38 Any potential noise or vibration associated with HDD works on the landward side of the sea defence will be screened by the sea defences, such that no noise or vibration disturbance to birds on the intertidal would be expected as a result of the works on the landward side of the sea defence (only a very small number of records of SPA bird species were made on the landward side of the sea defences; see Annex F, Figures F.77 to F.79). The Transition Jointing Bays will be excavated by a mechanical excavator, and will require a diesel generator. In Volume 3, Chapter 8: Noise and Vibration, predicted noise levels were calculated from 20 m to 300 m from the source. With regard to the existing background noise level at the nearest noise sensitive receptors (e.g. SPA species) it is stated state that:

"On the basis of the available data, it is considered robust to adopt values of 35 - 40 dB LA90 [the noise level exceeded for the 90% of the time under consideration] as the 'representative' background noise level, in accordance with British Standard 5228-1:2009. The baseline data indicate that evening and night-time background levels may be expected to fall rarely below 35 dB LA90 and it is not uncommon for levels to be above 40 dB LA90. Daytime background levels are likely to be above 40 dB LA90 and are unlikely to fall below 35 dB LA90."

6.3.39 Predicted noise from a HDD compound (drill rig and diesel generator) in Season 1 would be 82 dB LAeq,T at a distance of 20 m, and would fall below 70 dB LAeq,T at 60 m, and 55 dB LAeq,T at 250 m. The drill rig itself will not create a significant noise or vibration source (SKM, 2011). This could potentially occur over several months within a 24 hour period, although once on-site generators have started up, the noise is likely to be consistent and predictable to birds, and so some form of habituation is likely to occur.

6.3.40 For a tracked excavator deployed in Phase 1 where the HDD works will occur in the intertidal area, the noise level at 20 m from the source would be 69 dB LAeq,T , but would fall below 55 dB LAeq,T at just over 100 m. This would occur during daytime only.

Phase 2

6.3.41 The noise and vibration sources associated with cable laying activities will be dependent on the exact location of works and the methods used (i.e., HVDC or HVAC), though worst case parameters have been assessed for all scenarios (see Table 2.1).

6.3.42 As detailed in paragraphs 2.3.2 et seq., the methods proposed for installing cables in the intertidal area (i.e., the area between low water and the sea wall) are jetting, trenching or ploughing;

- Jetting machines would be deployed from a suitable installation barge which will house the pumps and power supplies necessary to operate them. Jetting can only be carried out if water levels are suitable to provide water for the pumps. Therefore, jetting work would be interrupted if used where the ground is not submerged at low tide in the intertidal area. This process is likely to be confined to the lower shore;
- Trenching involves traditional or specialist digging equipment to excavate a trench in which a cable is installed and the excavated spoil is backfilled. Traditional excavator digging equipment is tracked to keep the ground pressure to a minimum. Access to the intertidal area will be either from the land via an approved access approach or from the sea via an installation barge; and
- A ploughing machine simultaneously opens a trench, inserts a cable or cables, and backfills the trench. It would likely be deployed and pulled from the cable installation barge, as close as possible to the HDD exit pit.

6.3.43 Based on worst-case noise estimates of construction associated with Phase 2 cable installation (tracked excavators deployed in the intertidal area), the noise level at 20 m from the source would be 69 dB LAeq,T , but would fall below 55 dB LAeq,T at just over 100 m. This would occur during daytime only.

6.3.44 Wright *et al*. (2010) have investigated the effects of impulsive noise on shorebirds and have reported that intentional disturbance at levels above 65.5 dB(A) is more likely to result in behavioural response of some kind, rather than no response. At above 72.2 dB(A) flight with abandonment of the site becomes the most likely outcome of the disturbance. If non-response and non-flight response were taken to be relatively harmless, and flight responses potentially costly (in terms of energy expenditure), then for those species studied, Wright *et al*. (2010) estimated that a costly outcome becomes more likely at 69.9 dB(A). The ranges in noise which caused behavioural responses were outlined as:

- No observable behavioural response: 54.9–71.5 dB(A) (with a high proportion of extreme outliers);
- Non-flight behavioural response: 62.4–79.1 dB(A);
- Flight with return: 62.4–73.9 dB(A); and
- Flight with all birds abandoning the site: 67.9–81.1 dB(A).

6.3.45 Dooling and Popper (2007) have also suggested that deleterious effects of chronic noise exposure may begin at levels as low as 55–60 dB(A), though data on physiological effects are lacking.

6.3.46 Cutts *et al*. (2009) consider impacts to birds utilising the Humber Estuary and summarise the general thresholds due to the potential effects of construction disturbance upon birds. Noise up to 50dB(A) is found to have no effect whereas noise between 50dB(A) and 85dB(A) causes head turning, scanning behaviour, reduced feeding and movement to nearby areas. Above 85dB(A), response includes preparing to fly away, flying away and possibly leaving the area. The authors recommend that 'Ambient construction noise levels should be restricted to below 70dB(A), birds will habituate to regular noise below this level. Where possible sudden irregular noise above 50dB(A) should be avoided as this causes maximum disturbance to birds'.

6.3.47 The above information corresponds with the range of noise levels which Natural England has previously identified as a concern elsewhere (Carter, 2012), whereupon at levels below 55dB(A), Natural England would accept that effects will not be significant, but when noise levels increase to around 70dB(A) there is a range of bird responses, which therefore require further consideration. As detailed in paragraph 6.3.43, noise levels would be expected to fall below 55 dB LAeq,T at just over 100 m and, as such, the raw bird count data presented in Annex F are also presented with indicative excavator locations and potential noise related disturbance contours around these vehicles (see paragraph 6.3.19 and Annex F).

6.3.48 Although Cutts *et al*. (2009) suggest that sudden noises between 55dB and 70dB should be avoided, it is not anticipated that construction will produce such irregular noises, except perhaps for occasional movements of dumper trucks gathering topsoil and waste. Machinery noises may be tolerated much better than people at the source of the disturbance (Burton *et al*., 2002b), particularly in the Humber Estuary.

6.3.49 IECS (2007) studied responses of shorebirds to flood defence works in the Humber Estuary. The study showed that birds continued to feed within 200 m of piling operations, and so complete exclusion within up to 250 m is considered very unlikely. During repair work along a pipeline birds remained within 100 m when workers were active and flocks returned to the nearby vicinity within 15 min of activity ceasing. Construction activity using a mechanical digger resulted in birds staying 100 m from the locality, but returned within 30 min of cessation.

6.3.50 Burger (1988) found that efforts to mitigate the adverse effects on birds by restricting demolition and beach clean-up activity to a 100 m stretch of beach at any one time succeeded in significantly reducing adverse effects and in allowing birds some space to rest and feed. It was suggested that birds can habituate to some noise and disturbance, particularly when it is contained in a restricted area.

6.3.51 It is therefore concluded that only a small proportion of birds present in the vicinity of the cable landfall site are likely to respond to noise and vibration stimuli, with general operations associated with the cable installation and HDD works being of acceptable level unless within around 100 m of birds (i.e., a range of effect of 100 m radius around excavators). The extent of noise disturbance during Phase 1 will be minimal and relatively predictable (and not predicted to affect any roost sites). In Phase 2 the actual intertidal area affected depends on the number of excavators deployed for cable works (i.e., maximum of three trenchers; see Section 2.3 and Table 2.1), and so it is possible that a cumulative effect may occur over a wider area. It should be noted however, that Phase 2 operations within the intertidal area will cease in the hours of darkness, when roosting birds may be particularly vulnerable.

6.3.52 Nevertheless, within this range of effect, any birds temporarily displaced are unlikely to be lost to the population and will be able to find alternative habitat nearby for the duration of the disturbance. Even if small numbers of birds are displaced, most likely to adjacent coastal habitats within or outside the Humber Estuary SPA rather than an increase in mortality, this would not likely be significant within the context of their respective SPA populations and so the conservation objectives will not be compromised as a result. Evidence presented by Cutts *et al*. (2009) from repair work to a pipeline in the Humber Estuary has shown that disturbed birds (within 100 m) are likely to return within a short time frame once disturbance ceases, potentially within 30 minutes, and with no evidence of effects on numbers during surveys the following week, emphasising the short-term nature of any impacts.

Visual disturbance

6.3.53 Most research conducted on disturbance effects to waterfowl does not distinguish between noise and movement components, measuring impacts of human disturbance as a whole. However, the recorded disturbance effects on waterfowl complied in a review by Goss-Custard (2007) appeared to result from more movements of pedestrians etc., rather than noise. Movement can interrupt shorebird activity by disturbing birds during foraging or roosting, resulting in reduced individual fitness and survival if significant in magnitude.

6.3.54 SPA species are likely to have differing reactions to disturbance. Goss-Custard (2007) demonstrated that flight distance varied tenfold (27 m to 250 m) between studies of roosting birds and even more (7 m to 350 m) in foraging birds, depending on factors such as climate conditions, species differences, habitat differences and flock size. Exposed human activity along the skyline is also commonly recorded as resulting in a larger-scale disturbance effect than if the visibility of human activity is screened in any way.

6.3.55 Burton *et al*. (2002b) demonstrated that numbers of six out of nine shorebird species they observed on mudflats at low tide (shelduck, knot, dunlin, black-tailed godwit, curlew and redshank), were significantly lower where a footpath was close to a count section. The distances to which footpaths affected species varied, ranging from 25 m (dunlin) to 200 m (curlew). Smit and Visser (1993) recorded distances of up to 120 m for roosting waders and gulls taking flight in response to human activity.

6.3.56 Cutts and Allen (1999) found that there was a minimal effect at distances of more than 300 m from feeding or roosting waterfowl on the Humber Estuary, with curlew being the most sensitive, and most common wader species showing responses out to 150 m.

6.3.57 Visually, during cable installation, the main physical presence within the intertidal area will be during Phase 2, comprising the barge, cables and associated machinery required to spool the cables through the ducts under the sea wall, as well as the machinery required to install the cables along the intertidal area.

6.3.58 During Phase 1, work will mainly be confined to the temporary construction compound on the landward side of the coastal defences, with a brief period of excavation work within the HDD pit working area, and so visual disturbance will be minimal.

6.3.59 The exact amount of pedestrian presence within the intertidal area during each work aspect is unknown, although is likely to be minimal, with most work taking place from vessels, vehicles (which may be remotely operated) or inside the compound. It is estimated that a maximum of 15 return vehicular movements per day will occur to/from intertidal works, comprising a mixture of excavators, bulldozers and quad bikes. The sporadic presence of workers, engineers and ecological clerks of work for example, may however cause unpredictable, temporary disturbance.

Impact of noise, vibration and visual disturbance on Individual SPA and Ramsar Site Species

Bar-tailed godwit

6.3.60 Bar-tailed godwits are likely to be present in numbers within the area around the cable landfall site from mid-September to early May (Figures F.4 to F.6 of Annex F). The species was recorded over winter and observed widely across the mudflats near the cable landfall site during low and rising tides (Figures F.5 and F.77 to F.80 of Annex F). It appears that a low tide roost of up to 800 birds may be present in winter (Annex E, Table 1.12), representing 29% of the cited Humber Estuary SPA population, or 13% of the most recent WeBS core count population for the Humber Estuary. Numbers present during each survey did, however, vary considerably despite similar tidal states, suggesting that alternative habitat is available within the estuary if required. In the Firth of Forth, studies have shown that bar-tailed godwits ranged more widely than most other species (Symonds *et al*, 1984), reflecting their flexibility in habitat choice (estuarine mudflats).

6.3.61 Although in a worst-case situation a significant number of SPA birds may be displaced if within around 100 m from human movements (as predicted from Smit and Visser, 1993), the distribution of individuals within the survey area suggests that birds may require moving only short distances across mudflats, away from where the restricted work area would be, and that a roost site would be maintained in the area. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Golden plover

6.3.62 Golden plovers are likely to be found mainly in the vicinity of Horseshoe Point from September to November (Figures F.8 to F.10 of Annex F) with peak numbers up to 8,000 individuals on autumn passage (Annex E, Table E.12) representing 26% of the cited and 16% of the current Humber Estuary SPA populations respectively. Numbers were however very low for the remainder of the year.

6.3.63 The saltmarsh area is likely to form part of a feeding site and high tide roost for the species during autumn passage, with the majority of records being close to land (Figure F.11 of Annex F). In a worst-case situation a significant number of roosting or feeding SPA birds may be displaced if within 100 m from human movements (as predicted from Smit and Visser, 1993).

6.3.64 Cutts and Allen (1999) recorded variable responses of golden plover to human disturbance associated with flood defence work in the Humber, although it was evident that effects were lessened when events occurred around low water mark when substantial areas of alternative mudflat habitat were available, compared to other tidal stages. Roosting flocks were, however, pushed off the site between mid-water and two hours prior to high water rather than being forced near construction work, and so the species may be more sensitive at this time.

6.3.65 Disturbance events during periods of high usage (5,000 to 10,000 individuals) were more commonplace, which resulted in the use of sub-optimal roost sites. However, as these events corresponded with peak migratory periods it is possible that birds have not become habituated when compared to the more sedentary wintering flocks.

6.3.66 The species is widely distributed within the Humber Estuary and the population is in favourable conservation status, suggesting that no particular locality is of significant importance within the context of the Humber Estuary SPA. Although significantly large numbers were recorded locally, golden plover does not appear to be particularly vulnerable to disturbance and key habitats for this species (i.e., saltmarsh habitats) are not within the area of effect (i.e., approximately 100 m from human movements/cable laying operations). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the limited effects on preferred habitats for this species and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Dunlin

6.3.67 Burton *et al*. (2002a) suggested that construction work may have affected dunlin on a studied estuarine site, by observing that numbers and feeding activity were significantly lower on intertidal count sections adjacent to construction work. Burton *et al*. (2002b) demonstrated that numbers of dunlin were significantly lower where a footpath was close to a count section, although such an effect was recorded only up to 25 m from the source of disturbance. A possible long-term disturbance impact on the numbers of dunlin using adjacent areas on the Solent has been observed by Tubbs *et al*. (1992).

6.3.68 Dunlin are likely to be present between September and May, with peaks in October and early April on passage (Figures F.15 to F.17 of Annex F). It is likely that up to 2,000-3,000 dunlin (Annex E, Table E.12, >10% of the Humber Estuary SPA population) use the mudflats close to the cable landfall survey area, particularly during autumn passage from late October, as determined from survey results and consultation with Natural England. Birds were recorded throughout the survey area, although predominantly above mean high water mark on muddy substrates (Figure F.18 of Annex F), suggesting that some individuals may be displaced by construction activities. The dunlin is widespread around the Humber at low water, and may form large roosting flocks at high water, although many birds remain along the tideline.

6.3.69 Cutts and Allen (1999) have recorded variable responses to human disturbance on the Humber, with minimum approach distances to construction activity being between 100 m and 200 m, although in some cases up to 50 m. Birds are then put to flight, with movements downshore or onto adjacent mudflats up to 500 m away, with a gradual return to the area of construction.

6.3.70 The widespread availability of potential alternative habitat (i.e., with a maximum of 1.68% of intertidal habitats within the Humber Estuary SPA being affected; see paragraph 6.2.1) across the estuary suggests that any birds displaced would likely find suitable sites elsewhere without any significant impacts (particularly as a small species, as per Stillman *et al*., 2005), although as the species has declined nationally and locally since the Humber Estuary SPA citation date (potentially due to a reduction in suitable habitat). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Knot

6.3.71 Knot are likely to arrive on site from September, peaking in November and remaining until early April (Figures F.19 to F.21 of Annex F). Surveys at the cable landfall site in 2011/12 recorded a peak count of 3,000 birds in November (Annex E, Table E.12), which equates to 10% of the cited Humber Estuary SPA population, or around 8% of the current Humber Estuary SPA population, although Natural England has advised that up to 10,000 birds may be present. Birds were located widely within the survey area, although some of the largest flocks were to be found well below mean high water mark at low tide (Figures F.22 and F.77 to F.80 of Annex F).

6.3.72 It is therefore possible that large numbers of birds may be affected by construction activities, however the small species is highly mobile between feeding and roosting areas on the Humber, in response to weather conditions, tidal conditions or disturbance (Allen *et al*., 2003). As such, it does not necessarily follow that displacement would result in a reduction in numbers, with alternative habitat undoubtedly available (i.e., with a maximum of 1.68% of intertidal habitats within the Humber Estuary SPA being affected; see paragraph 6.2.1) for the period of disturbance. In addition, although a possible high tide roost site may be present in the vicinity of the convergence corridor, similar roost sites were also recorded at a number of other locations within the Horseshoe Point survey area.

6.3.73 Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Redshank

6.3.74 Redshank are particularly vulnerable to severe weather conditions as they take small prey items in relation to body size, and so must spend longer periods feeding during severe weather (Mitchell *et al*., 2000). Displacement effects may therefore also be particularly acute for the species if feeding time is reduced, especially in bad weather; for example, Burton *et al*. (2006) found that displaced redshanks upon construction of a tidal barrage across Cardiff Bay, experienced a 44% increase in mortality rate. Results from Smit and Visser (1993) suggest that birds may be displaced up to around 120 m, the furthest of the species studied by the authors.

6.3.75 Redshank may be found on site throughout the year though much less frequently during summer (Figures F.27 to F.29 of Annex F). There is a peak on passage in the Humber in September and October, and again in April corresponding with the spring passage of what are presumed to be Icelandic birds. Small numbers of breeding birds may be present on saltmarshes through summer. At Horseshoe Point, numbers did indeed peak during October, but were much smaller on spring passage and throughout summer.

6.3.76 Although the species is widespread across the Humber Estuary, they have a preference for muddy river channels and saltmarsh (Allen *et al*., 2003), which means that their habitat choice may be more restricted than other species. The saltmarshes at Tetney and Grainthorpe Haven provide an important roosting site for redshank, and Donna Nook is of particular importance on very high spring tides when Tetney and Grainthorpe are completely covered by water (Cruickshanks *et al*., 2010). Despite the potential importance of the area, numbers were relatively low in the vicinity of the cable landfall site, as during surveys in 2011/12, a peak flock size of 87 individuals was recorded in October 2011 representing 1.2% of the cited passage Humber Estuary SPA population. Numbers were much higher in the nearby Grainthorpe Haven WeBS core count sector, with a mean of 697 individuals recorded at high tide in September, which equates to 9.3% of the cited Humber Estuary SPA population.

6.3.77 Cutts and Allen (1999) noted several responses of redshank to construction activity as birds prefer to feed close to the upper shore. Feeding during winter was restricted from 75 to 100 m, although there was some evidence that less habituated passage birds may have required distances up to 250 m, which reduced to around 150 m by necessity on the incoming tide. In other parts of the Humber study area, construction activities had limited influence on redshank distribution, with birds found within 150 m due to the presence of a creek system acting as a 'safety buffer'.

6.3.78 Although this is a sensitive species, with a declining population in the SPA, it appears that, although some birds may be displaced within the vicinity of construction works, the numbers are likely to represent less than 1% of the Humber Estuary SPA population. In addition, effects on this species' preferred habitats (e.g. saltmarsh) are not within the area of disturbance effects for this species. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the low number of birds expected to be affected and available alternative habitat, as well as the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Dark-bellied brent goose

6.3.79 The effects of disturbance on brent geese within estuarine sites are less reported than for waders. However, numbers of brent geese were found to decrease with increased proximity to a footpath access point on weekends, when use was likely to have been greatest (Burton *et al*., 2002a), suggesting that construction disturbance may be an issue.

6.3.80 More widely, Keller (1991) found that pink-footed within greylag geese wintering in northeast Scotland tended to avoid areas of fields 100 m of the nearest road and fields with centres closer than 100 m from a road were not visited. Foraging barnacle geese have been reported as being displaced from as far as 600 m from wind turbines on farmland habitat in winter (Kowallik and Borbach-Jaene, 2001). However, birds from the same population feed as close as 25 m to turbines during spring staging on Gotland (Percival, 1998), where more nutritionally-valuable habitat was in close proximity to wind turbines. This shows that displacement from less preferred foraging areas may more readily occur than from more important ones.

6.3.81 Dark-bellied brent geese are likely to be present in the Humber Estuary SPA on passage from October and November, and peak in December to February (Figures F.40 to F.42 of Annex F). Numbers fall rapidly by March (Allen *et al*., 2003). Birds feed over mudflats that are rich in *Zostera* and *Enteromorpha* and occur principally along the southern shore from Cleethorpes to Saltfleetby (Cruickshanks *et al*., 2010), suggesting that their range within the Humber is relatively constrained by habitat suitability. Interchanges between intertidal and inland fields due to human disturbance may occur in both habitats.

6.3.82 During surveys in 2011/12 at the cable landfall site, a peak of 835 individuals was recorded at low tide in March 2012 (Annex E, Table 1.12, with similar numbers in January), representing 40% of the cited Humber Estuary SPA population and around 18% of the likely current population, which has greatly increased. Birds were recorded mainly close to land on the mudflats (Figures F.43 and F.77 to F.80 of Annex F). High numbers of birds were recorded during WeBS core counts in January, with a five year peak mean of 1,130 individuals. This represents over 50% of the cited Humber Estuary SPA population, although around 25% of the more recent estimate.

6.3.83 Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the periods of the year when this species is present in significant numbers (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Sanderling

6.3.84 Sanderlings are potentially present within the Humber Estuary SPA most of the year, but peak numbers coincide with spring and autumn passage (Figures F.44 to F.46 of Annex F). During surveys in 2011/12 at the cable landfall site, a peak of 150 birds was however recorded in January 2012 (Annex E, Table E.12), which represents 31% of the cited wintering Humber Estuary SPA population, or 18% of the passage population. Numbers substantially declined in summer, with the species absent across the estuary during most surveys. WeBS core counts recorded a peak of 158 birds in May 2010 in the Tetney to Horseshoe Point sector (Annex E, Table E.10). Natural England reported that there is normally a concentration of roosting sanderling close to the shore, directly to the north of the cable landfall site in May, but cable landfall surveys only recorded small numbers of individuals during this period.

6.3.85 Sanderling are largely restricted to the outer southern shore of the Humber Estuary, and so habitat may be limited. Negative effects on sanderling, as a result of reduced time spent feeding due to human presence has been recorded by Burger and Gochfeld (1991) although the species can feed through the night and so more time can be devoted to feeding outside periods of disturbance. Additionally, the species tends to feed at the water's edge, and so will likely be further away from construction activities, and according to Stillman *et al*. (2005), should be more likely to survive as a smaller species. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the low numbers of birds likely to be affected and the available alternative habitat, as well as the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Ringed plover

6.3.86 Ringed plover may be present on site throughout the year, although numbers are likely to peak during migration periods (Figures F.48 to F.50 of Annex F). Autumn migration is from mid-July to early October, and spring migration is from late April to early June.

6.3.87 Cable landfall site surveys in 2011/12 recorded ringed plovers on the majority of surveys, with a peak of 120 birds in mid-September (Annex E, Table E.12) representing 7% of the cited Humber Estuary SPA passage population. Most records of ringed plover were above mean high water mark on the muddy substrates suggesting a probable roost site (Figures F.51 and F.77 to F.80 of Annex F).

6.3.88 Natural England reported that there is normally a concentration of roosting ringed plover close to the shore, directly to the north of the cable landfall site in May, although a peak of only 37 birds was recorded during cable landfall surveys in May 2012. A relatively high count of 778 birds was however recorded within the Horseshoe Point WeBS core count sector in May 2010, representing 44% of the cited Humber Estuary SPA passage population and 31% of the most recent Humber Estuary population.

6.3.89 Cutts and Allen (1999) recorded a dispersal of birds due to construction activity alongside dunlin, with similar responses predicted, (i.e., at distances of 100 m to 200 m), with a gradual return to the area of construction.

6.3.90 Survey results therefore suggest that the site is of relatively high importance, probably during passage movements in autumn and spring. If works were to take place during these periods, roosting may be disturbed. There is evidence for alternative roost sites outside the area of effect (i.e., approximately 100 to 200 m from human movements/cable laying operations) at Horseshoe Point (see Figure G.51 of Annex G), though it is not clear whether alternative habitat is available as in the adjacent Grainthorpe Haven WeBS sector where the species was recorded in much lower numbers. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat at Horseshoe Point and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Oystercatcher

6.3.91 Southerly passage of oystercatcher may occur in the Humber Estuary between July and September, with a large influx during September. Overall numbers may decrease slightly through the winter. A small summering and breeding population remains throughout summer (Figures F.52 to F.54 of Annex F).

6.3.92 The area between Horseshoe Point and Grainthorpe has been identified as an important feeding area during much of the year within the context of the Humber Estuary SPA. In addition, birds tend to establish high tide roosts close to key feeding areas (Catley, 2000). Near to the cable landfall site, oystercatchers roost in creeks mid-estuary in low, turning tides (Figures F.55 and F.77 to F.80 of Annex F), and at low tide roost size can reach up to around 3,000 individuals (November 2011 and February 2012, Annex E, Table E.12), representing much of the cited Humber Estuary SPA population (>94%). During winter, birds were generally concentrated on the mudflats on low and rising tides, some 1 km or more from the shoreline.

6.3.93 It is therefore possible that significant numbers could be disturbed by construction activities. Oystercatcher feeding rates have been recorded as being reduced due to human disturbance (Goss-Custard and Verboven, 1993) although this was compensated by shifting to other areas and habituation. Fitzpatrick and Bouchez (1998) found that arrival times of oystercatcher at their low water feeding sites were delayed as a result of human presence, with earlier departures when disturbed. Stillman *et al*. (2005) reported however, that oystercatcher survival rates are likely to be higher than other similarly-sized waders as they consume larger prey items.

6.3.94 Although high peak numbers of oystercatcher were recorded within the context of the Humber SPA, the preferred habitats for these species (i.e., creeks and cockle beds to the south of the convergence corridor) will largely be outside the area of effect (i.e., approximately 100 to 200 m from human movements/cable laying operations). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance (which will largely be away from key habitat for this species) and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Grey plover

6.3.95 Grey plover numbers within the Humber Estuary SPA rapidly build up through August to a September/October peak, and thereafter steadily decline. Numbers build up rapidly from March to May as birds arrive on spring passage, on the same scale as the autumn migration (Figures 65-67 of Annex F).

6.3.96 Cable landfall surveys in 2011/12 recorded a peak of 885 birds on spring passage in April during rising tide (Annex E, Table E.12, Figures F.68 and F.78 to F.80 of Annex F), which is 52% of the cited Humber Estuary SPA population, and 31% of the likely current population. Birds were located on the muddy substrate mainly below mean high water, although the saltmarshes may provide an important communal roost site in the wider Tetney Marshes area (Cruickshanks *et al*., 2010). The species was absent on surveys from mid-June until September around Horseshoe Point, with a smaller autumn passage (peak of 231 birds in October).

6.3.97 Cutts *et al*. (2009) identified the species as being particularly sensitive to roosting disturbance, with the overlapping WeBS sectors at Horseshoe Point being important within the estuary. In contrast to cable route surveys, the species was almost entirely absent during low tide counts from April to July inclusive in the two overlapping WeBS sectors (Mander and Cutts, 2005).

6.3.98 Although there is relatively little work directly on this species, (Smit and Visser, 1993; Burton *et al*., 2002a) it has been recorded that grey plover is territorial in winter (Turpie, 1995). Reaction distances may however be similar to golden plover, where in a worst-case situation a significant number of roosting or feeding birds may be displaced if within 100 m from human movements (as predicted from Smit and Visser, 1993).

6.3.99 Although the Humber Estuary SPA population is in relatively favourable conservation status, due to the high peak numbers within the context of the Humber Estuary SPA population, and this species has low thresholds for habituation during passage periods, it is possible that a significant number of roosting or feeding passage birds may be disturbed and leave the Humber Estuary SPA altogether (Cutts *et al*., 2009) during cable laying operations. The predicted area of effect is, however, relatively limited (i.e., approximately 100 m from human movements/cable laying operations) and although high tide roost sites may be present within the convergence corridor, alternative habitats were recorded within the survey area outside the predicted area of effect (i.e., to the north of the convergence corridor and within the saltmarsh habitat to the south; see Figure G.68 of Annex G). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative roosting habitat at Horseshoe Point and the commitment to avoid works within the most sensitive periods of the year (i.e., all works to be undertaken between April and September; see Section 6.4), it is concluded that there will not be an adverse effect on this feature or its conservation objectives.

Common tern

6.3.100 In late summer, it is known that the mudflats at Horseshoe Point have been used as a roost site for common tern (as advised by Natural England), although this was not recorded during surveys in 2012, with only a single record of two birds (Annex E, Table E.12). Up to 220 birds were however recorded in August during WeBS core counts in the adjacent Grainthorpe Haven sector, which is around 13% of the combined Coquet Island and Farne Islands SPA populations.

6.3.101 Although common terns are known to be relatively tolerant of human presence compared to other tern species (Lloyd *et al*., 1991), disturbance resulting from proposed cable installation activities may affect birds during passage periods.

6.3.102 It is acknowledged that most scientific studies on disturbance to terns have concentrated on breeding colonies, and so their translation to passage birds may be limited. Terns are normally however, relatively resistant to human activity in close proximity (for example a large breeding colony persists within the Imperial Lock Dock SPA, Edinburgh), Nevertheless, Erwin (1989) found that in mixed colonies of common terns and black skimmers, when faced with human threats, terns showed 'dread' responses at a mean distance of 142 m and that there were few statistically significant relationships between flushing distances (those at which birds fly away) and colony size. He recommended distances of 200 m for common terns for signposting of established colonies to negate the threat of human disturbance. Rodgers and Smith (1995) similarly suggested buffer zones of 180 to 200 m to negate all human disturbances of terns and Carney and Sydeman (1999) recommended a safe approach distance to common terns of 100 to 200 m to minimise negative impacts of different types of human visitation based on a literature review.

6.3.103 Very low peak counts were recorded at Horseshoe Point in 2011-12, however it is acknowledged that the use of the intertidal area by terns between July and September may be sporadic, and often most frequent in congregations from dusk onwards, which may be missed by surveys. Although the local area may still on occasion act as a roost site in late summer, it appears that the species' presence would be brief and intermittent between April and September. Most impacts may therefore take place during the post-breeding season, after juveniles have fledged, and so impacts on productivity are unlikely. With evidence suggesting that low tide roosts occur at dusk and into the night, disturbance will be negligible as this is outside the hours of planned intertidal works in Phase 2. No adverse effects on common tern are therefore predicted as a result of Project One cable laying within the Humber Estuary and along the onshore export cable route.

<u>Installation of export cables may have indirect effects on qualifying interest features of the Humber Estuary SPA/Ramsar or other SPAs including temporary reduction or redistribution in prey items due to disturbance caused by installation of the cable route, or a change in water quality due to increase in suspended sediments</u>

6.3.104 Waterfowl species feed on a variety of invertebrates within the underlying substrate, located by sight or touch, as well as plant material (e.g., *Zostera* for brent geese) and fish (particularly for common tern). Disturbance to prey, or disruption to the sediment regime or water levels due to construction activities in the vicinity of a feeding area in particular may therefore adversely affect birds' ability to obtain sufficient food items and consequently reduce fitness levels (potentially impacting on winter morality and summer breeding success). Reductions or redistributions in qualifying species' invertebrate prey within the intertidal area are most likely to occur due to temporary habitat loss/disturbance as described previously, or due to a reduction in substrate quality. As detailed in Table 6.3, the conservation objectives most likely to be affected by this impact are:

- Extent and distribution of the habitats of qualifying features;
- Structure and function of those habitats;
- Supporting processes on which the habitats of qualifying features rely;
- Populations of qualifying features; and
- Distribution of qualifying features within the site.

6.3.105 The construction activities that have been identified that are most likely to disturb prey species in the intertidal area are the installation processes (e.g. open trenching in Phase 2) with their associated vibrations, displacement of substrate and suspended sediment, as well as movements of vessels, vehicles and machinery over intertidal areas.

6.3.106 Potential sources of pollution may negatively impact the waterfowl population through changes in food availability by changes to invertebrate or fish communities (e.g. through nutrient addition, waste and sewage release through the water supply or siltation). This could potentially result in a reduction in individuals' fitness, or survival or productivity within a population.

6.3.107 Elsewhere, surface water flowing into the open-cut trenches carries a risk if not processed and discharged in a proper manner, in order to avoid sediment-rich or contaminated water covering potentially important feeding areas. In addition, there is a possibility that fuel spillages from vehicles or machinery may occur, which would contaminate an area around the construction works and adversely affect feeding habitat, though the risk of spillages and effects on feeding habitats would be limited through the implementation of the CoCP (see Section 6.4).

6.3.108 During Phase 1, HDD drilling at Horseshoe Point landfall site will likely employ bentonite mud to prevent collapse of the holes being drilled (SKM, 2011). There is potential for spillage of these substances with consequent effects on foraging habitat, however, the risk of this occurring will be limited spatially and minimised through the use of good working and management practices as detailed in the CoCP (Volume 4, Annex 4.3.5: Code of Construction Practice; further discussed in Section 6.4).

Disturbance to prey species

6.3.109 The intertidal sediments are dominated by communities that showed typical patterns of zonation within the intertidal area (see Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology of the Environmental Statement for full details). The lower shore, dominated by mobile sand sediments, has typically sparse infaunal communities, interspersed with areas of damper fine sand with richer communities of polychaetes and amphipods. Muddier sand sediments, which were found throughout the mid shore, supported communities rich in bivalve molluscs and a cockle bed was identified in the south of the proposed cable route landfall site. The upper shore was dominated by muddy sands, which for large parts were scattered with annual saltmarsh plants, and in the southwest of the landfall site graded into a block of continuous saltmarsh.

6.3.110 Temporary disturbance to intertidal habitats as a result of ploughing/jetting to install export cables within the intertidal area will affect predominantly sandy habitat in the lower shore, which has been shown to have lower invertebrate densities than further up the shore. Additional temporary habitat loss will occur as a result of barge anchor placements within the temporary working zone (see Figure 4.3). No temporary habitat loss is predicted for established saltmarsh or coastal lagoons as a result of export cable installation in the intertidal.

6.3.111 The sand/mudflat biotopes display low sensitivity to, and high recoverability from, temporary sediment displacement such as that likely to occur from trenching/ploughing/jetting methods used to install the export cable, and anchor placements. Burrowing species such as *Arenicola marina* and mobile epibenthic species are likely to re-establish themselves in the sediment, and this displacement is likely to result in higher availability to birds at the surface for a short period of time.

6.3.112 The recovery of these biotopes is dependent on the hydrodynamic regime, although sandy sediments are likely to recover in less than one year (Budd, 2008b).

6.3.113 Post construction saltmarsh recovery monitoring at the Thanet offshore wind farm landfall site demonstrated that *Salicornia* recolonised in the majority of affected areas within six months of cessation of works (Royal Haskoning, 2010).

6.3.114 Based on the apparent tolerance of the infaunal and epifaunal community within the sandflats, and the rapid recovery rate of pioneer saltmarsh plants, any impacts will be short-term and reversible. This includes possible benefits of increased prey availability if communities are disturbed.

6.3.115 In relation to the relevant conservation objectives the extent, distribution and function of supporting habitats will only be briefly affected in the local area, and will not result in the significant redistribution or reduction of populations within the Humber Estuary SPA. As such no conservation objectives are predicted to be compromised as a result of indirect disturbance, and so the integrity of the Humber Estuary, Coquet Island and Farne Islands SPAs will be unaffected.

Reductions in water quality

6.3.116 Shorebird species vary in sensitivity to changes in habitat quality, with some species such as ringed plover being more catholic in their diet choice than others and therefore being more flexible to cope with changes in environmental conditions. This is important, especially during the non-breeding season when invertebrate prey abundance often decreases and energetic costs associated with maintenance and migration increase.

6.3.117 Lourenço *et al*. (2004) found that areas around drainage channels are particularly important feeding sites for waders, with prey abundance corresponding closely to that of bird distribution. Water or mud discharge from construction areas into channels, which is likely to be of a greater extent than diffuse discharge over mud substrate, may therefore affect those species that have been observed to make particular use of these areas, which at Horseshoe Point appears to be oystercatchers, and possibly other wader species such as knot.

6.3.118 Saltmarsh areas may also be vulnerable as flooding and inundation of water brings sediment that may include nutrients. Saltmarsh succession is driven by nitrogen input, and during succession the quantity of the biomass (dry weight, canopy height) increases (Bakker and Stahl, 2004), but the food available to waterfowl such as redshank decreases.

6.3.119 In the migratory period, common terns require clear water to feed and so any sediment discharge into shallow waters of the estuary may affect the ability of birds to locate and obtain fish. It is, however, considered very unlikely that the extent of any such discharge would be great enough to prevent birds from feeding elsewhere in the nearby estuary.

6.3.120 Cable installation in the intertidal area via ploughing, trenching and jetting will result in increases in suspended sediment concentrations and deposition which will be dependent upon the type of sediment into which the cable is being installed.

6.3.121 The jetting process has the potential to release the greatest volume of sediments into suspension. However, time series modelling predicts that increases to more than 60 mg/l will be short lived (i.e., less than one hour) and returning to background levels during the time when there is insufficient water depth for the equipment to operate (Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology of the Environmental Statement).

6.3.122 In the mid and upper shore where jetting will not be possible due to shallow water depth, trenching and/or ploughing will be used for cable installation. On the sandy intertidal areas, ploughing will displace sediment locally and create a mound on either side of the cable alignment which may over subsequent tides be resuspended. Due to the short term nature of the construction activities, any increases in suspended sediment concentrations are considered to be localised and minimal. In addition, due to the topography of the shore at the landfall site it is likely that much of the works, particularly in the upper shore, will occur in the dry, minimising the potential for suspension of sediments. Furthermore, as discussed in Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology of the Environmental Statement, the background levels in the inshore area are relatively high, and as such, any increases in suspended sediment concentrations within the intertidal as a result of ploughing and trenching will be well within natural variability for this area.

6.3.123 Evidence therefore shows it is unlikely that sediment increases will significantly affect any species' SPA population, through impacts on their prey species. Indirect impacts on bird species will be short-term and areas affected are likely to be very small compared to available alternative habitat and prey items within these.

6.3.124 The majority of the ploughing and trenching works in the area will be undertaken at low water and as such the potential for resuspension of contaminated sediment (e.g., heavy metals) is minimal. Similarly, cable burial in the intertidal via jetting is only likely to occur in the lower shore due to the shallow depths occurring throughout much of the intertidal at high water. The potential for any discharges associated with construction activities will also be minimised through the implementation of good working and management practices as detailed in the CoCP (Section 6.4) and therefore adverse effects on the Humber Estuary, Coquet Island and Farne Islands SPA populations (i.e., through impacts on prey species) would not be expected.

6.3.125 Large numbers of oystercatcher, knot and other species may however make use of drainage channels at Horseshoe Point, and redshank is vulnerable due to limited habitat. As discussed in paragraph 6.2.3 *et seq.,* effects of plume dispersion are expected to be limited spatially and temporally and are not expected to affect important intertidal feeding habitats (e.g., cockle beds). As such, impacts of increases in suspended sediments and consequent effects on prey species, are not therefore predicted to result in an adverse effect on the populations of qualifying features of the Humber Estuary, Coquet Island and Farne Islands SPAs.

<u>Decommissioning Phase</u>

6.3.126 As detailed in Section 2.5 and paragraph 4.4.15, in order to minimise disturbance to designated features of the Humber Estuary EMS and other sites with connectivity, the preferred option is to leave cables in place with cable ends cut, sealed and securely buried. As such, effects of decommissioning on designated species of the Humber Estuary SPA, Coquet Island SPA and Farne Islands SPA would be expected to be considerably less than those of the construction phase described in the preceding paragraphs. If cables were to be removed, effects would be expected to be the same or less than those predicted for the construction phase and as such, no adverse effects would be predicted to occur.

Effects on SPA/Ramsar Features – In-combination

6.3.127 The projects in Table 4.13 where a LSE could not be ruled out when considered in-combination with Project One are AMEP, the Tetney to Saltfleet Tidal Flood Defence Scheme, the Phillips 66 Tetney Sea Line Replacement, Newton Marsh Extension (Bishopthorpe Farm) Wind Farm and Project Two (see Figure 4.4).

Habitat loss

6.3.128 As outlined under SAC qualifying habitats, habitat loss is predicted to occur as a result of the AMEP development plans, although a total of 100 ha of intertidal mudflat is being created as part of the mitigation measures required which effectively compensates for the total in-combination habitat loss of 0.75% of the total estuarine habitat, for the AMEP and export cable laying operations.

6.3.129 The Tetney to Saltfleet Tidal Flood Defence Scheme is predicted to result in the permanent loss of 0.0125 ha of Atlantic Salt Meadow habitat, and a total of 0.15 ha of *"Dune Scrub"* habitat along the upper shore. Although there is potential for temporary loss of these habitats (which may be used by species at high tide) as a result of cable burial for Project One, the area lost is predicted to be small, if any occurs at all.

6.3.130 The Phillips 66 Tetney Sea Line Replacement project will take place within an area of intertidal habitat similar to that found within the convergence zone and temporary working area for Project One. As outlined in the assessment of habitat loss for Project One alone, any loss will be localised and reversible within a relatively short timeframe. With installation procedures roughly comparable, no significant in-combination habitat loss is predicted.

6.3.131 As indicated for SAC habitats above, temporary habitat loss as a result of Hornsea Project Two is assumed to be identical to that from Project One, with some repeat disturbance of certain parts of the intertidal (i.e., within the temporary working area) that will occur due to cable burial and anchor placement. As there will be no resulting increase in habitat loss as a result of Project Two and due to the fast recovery rates expected for communities within these habitats, no in-combination impacts of habitat loss are predicted.

6.3.132 All other projects are outside of the Humber Estuary SPA, and further from Project One, and therefore in-combination habitat loss is not predicted to cause a significant effect on any SPA species at a population level, and no conservation objectives will be compromised as a result.

Disturbance from other projects

6.3.133 Construction work for Hornsea Project One is proposed to commence in 2015, with installation likely to be carried out over two phases.

6.3.134 If construction activities are coincidental, or sequential between construction projects within the same area, then there is a possibility of in-combination noise and visual disturbance affecting SPA bird populations over a wider extent and duration than if considering each project alone. This would increase the risk of a long-term adverse effect on an SPA population and therefore be more likely to compromise the integrity of the Humber Estuary, Coquet Island and Farne Islands SPAs.

6.3.135 In general, based on the projects with a risk of in-combination disturbance listed in Table 4.13, the SPA species that may be affected by in-combination impacts are likely to be similar to those that have been brought forward to the second stage in the HRA process.

6.3.136 This is particularly likely to be the case for the closest projects to Project One, namely the Tetney to Saltfleet Flood Defence Scheme and the Phillips 66 Tetney Sea Line replacement.

6.3.137 The latter project's scoping report presented preliminary results of intertidal surveys from April 2012 to March 2013, and figures presenting relative densities showed that although found in similar habitat, there were generally lower densities at the Phillips 66 Tetney Sea Line replacement site compared with at Project One.

6.3.138 For the Tetney to Saltfleet Flood Defence Scheme only birds utilising the upper shore area are likely to be affected, although based on results for Project One, this may comprise a number of key wader species.

6.3.139 If Project Two cable installation were to happen at the same time as Project One, this may lead to increased vehicle movements in the intertidal, though the maximum area within which disturbance to SPA species may occur (see Figure 4.3) would not increase and the maximum amount of time over which disturbance would be expected would similarly not be extended beyond that predicted for Project One. If Project Two cable installation were to occur during different years (e.g. straight after Project One is complete) birds may be affected over a longer timeframe than would otherwise have been the case.

6.3.140 Due to distance between the Project One Horseshoe Point landfall and these other projects (see Figure 4.4), (i.e., the AMEP development (>20 km from Horseshoe Point) and Newton Marsh Extension (Bishopthorpe Farm; over 3 km from Horseshoe Point)), in-combination disturbance effects on SPA features are unlikely for these other projects.

6.3.141 Currently, it is not possible to accurately predict total numbers potentially affected by each project or all projects combined, with little comparable data available from other projects, although there is a range of estuary-wide and sector-based information available to help determine the possible importance of each site and numbers that may be affected.

6.3.142 Due to the limited area of effect associated with Hornsea Project One and Project Two and accounting for the anticipated completion dates for the Tetney flood defence project (i.e., at least 2 years before the start of Project One and Two cable installation; see Table 4.13) and the Phillips 66 Tetney sea line replacement project (due to be completed by 2015) in advance of the start of Project One and Project Two cable installation, adverse effects are not expected for Project One in-combination with other projects. Mitigation measures for Project One, including seasonal restrictions on cable installation activities to avoid the most sensitive period, will ensure that disturbance related adverse effects on populations of the Humber

Estuary SPA, Coquet Island SPA and Farne Islands SPA will not occur (see Section 6.4, specifically paragraph 6.4.10 *et seq.*).

Indirect effects

6.3.143 Similar to disturbance effects, in-combination effects of disturbance or water quality changes for prey species are most likely to occur when construction phases of projects are coincidental. Although the nature and extent of any discharges associated with construction activities are difficult to predict with any accuracy, it is unlikely that individuals from most species will be adversely affected to a level that will significantly affect the populations within the relevant SPAs, with overall areas affected likely to be very small compared to available alternative habitat, even in-combination with other projects. This is particularly likely to be the case when best practice and mitigation measures are considered for other projects (which are likely to be conditions of consent). This minimises the risk of any in-combination discharge events and it can be reasonably concluded that no in-combination effects are likely to occur.

6.3.144 Disturbance to prey items by various project activities is likely to be highly localised with the area affected predicted to be small in the context of the Humber Estuary SAC/SPA. Other prey items would be available during the construction phase in similar habitats both at Horseshoe Point and in the wider SPA. In addition, effects are expected to be reversible with recovery time for prey species expected to be fast. As such, no in-combination effects on prey availability are likely to occur.

Summary of Effects on SPA Qualifying Features

6.3.145 The intertidal mud/sandflat habitat surrounding the cable route corridor is generally widespread throughout the estuary, and with foraging birds tending to be highly mobile, temporary habitat loss is not predicted to be significant for any species' SPA population. No important habitat areas (e.g., roost sites) are predicted to be significantly affected over a prolonged period, with habitat recovery expected to occur between Phases. As such there are no predicted adverse effects on SPA qualifying species as a result of temporary habitat loss.

6.3.146 Temporary disturbance patterns as a result of construction activities will be species-specific and depend on physical conditions (e.g., tidal state), but an adverse effect on the Humber the SPA species considered is not predicted as a result of this impact. Mitigation measures, including seasonal restrictions on cable installation activities to avoid the most sensitive period, will ensure that disturbance related adverse effects on SPA populations will not occur (see Section 6.4, specifically paragraph 6.4.10 *et seq.*).

6.3.147 Disturbance to prey species will be very localised, short-term, and reversible within months. A temporary increase in prey availability may also result from disturbance. No adverse effects on SPA qualifying species are predicted either alone or in-combination.

6.3.148 Areas of habitat potentially affected by any sediment increases or discharges are unlikely to be significant within the context of the relevant SPA populations and consequently, no adverse impacts are predicted. Mitigation measures discussed in Section 6.4 (specifically paragraphs 6.4.3 and 6.4.10) have been designed to reduce the risk of these events occurring and to minimise their effects should they occur and therefore will ensure that adverse effects on qualifying species of the Humber Estuary, Coquet Island and Farne Islands SPAs will not occur.

6.4 Mitigation Measures and Monitoring

Introduction

6.4.1 To ensure that the likelihood of adverse effects are minimised or eliminated, a series of mitigation measures will be implemented and delivered through the issue of ecological Method Statements as part of the Ecological Management Plan (Volume 6, Annex 6.3.12), CoCP and the cable specification and installation plan (being compiled as a condition of the Marine Licence). Through the implementation of these mitigation measures any effects (as described in Section 6) on the designated sites and qualifying features will be reduced considerably. This will include supervision of cable installation operations by an Ecological Clerk of Works who will be responsible for ensuring that impacts on designated features are minimised wherever possible, including ensuring that operations are spatially managed in the intertidal to avoid habitats such as Atlantic salt meadows and cockle beds (not listed as a qualifying feature of the SAC, but an important food source for SPA species) and to ensure operations are limited to within the defined boundaries (i.e., the cable convergence corridor and temporary working areas; see Table 6.5). Full details are presented in the Ecological Management Plan (Volume 6, Annex 6.3.12). A CoCP has been submitted with the DCO application detailing required mitigation identified in the Environmental Statement (Volume 4, Annex 4.3.5: Code of Construction Practice). Both the CoCP and the Ecological Management Plan have been provided as drafts and these will be completed and submitted for approval post consent.

6.4.2 Post construction monitoring of affected habitats (see paragraphs 6.4.5 *et seq.*) will be undertaken as a condition of the Marine Licence. In addition, the cable specification and installation plan will also be produced post consent (as a condition of the Marine Licence) and this will be circulated for discussion and agreement with the MMO at least four months prior to the commencement of cable installation operations. This document will include specific details of mitigation measures which cannot be finalised at this stage (e.g., reducing ground pressure levels along access tracks to the intertidal; see Table 6.5).

Table 6.5 Designed-in mitigation measures adopted as part of the project with respect to SAC features.

Mitigation measures adopted as part of Project One	Justification
An Ecological Clerk of Works will supervise the construction works in the intertidal zone and ensure that all works within the intertidal construction area, including plant movement and anchor placements will be restricted to the convergence zone and temporary working corridor.	Measure will ensure no loss/disturbance to intertidal habitats outside that described in this assessment. It will also ensure direct impacts to cockle beds are avoided. Within the Salicornia habitat, this measure would retain some areas of established plants as seed sources to enhance re-colonisation and recovery rates following construction disturbance within the working area.
Sediment within the affected *Salicornia* habitat will be smoothed over to remove deep depressions (i.e., those with depths greater than 10 cm) in the sediment, such as those from wheel ruts or tracks. Smoothing over of sediments will be undertaken by hand raking under the supervision of the Ecological Clerk of Works. This will be undertaken across the impacted areas (i.e., the convergence zone) following completion of all cable installation works at the end of each of the cable installation phases (i.e., September in each year; see paragraph 6.4.13).	Sediment smoothing will be undertaken in order to encourage seed capture in the intertidal sediments. Although a small amount of texture is required to encourage *Salicornia* seed capture, deeper depressions often become waterlogged resulting in reduced colonisation in these areas.
Measures to reduce ground pressure along the access tracks to the intertidal will be considered, including bog matting or trackways, as this type of mitigation has previously been successful at reducing ground pressures in areas of saltmarsh habitats (Centrica, 2012). The specific details of these measures have yet to be determined as details of the specific vehicles to be used for cable installation have not yet been confirmed. As such, the most appropriate measures will be detailed the cable specification and installation plan (to be produced post consent) which will be circulated for discussion and agreement with the MMO at least four months prior to the commencement of cable installation operations, as a condition in the marine licence	Measures to reduce ground pressures will be considered in order to reduce the potential for destabilisation of sand dunes as a result of vehicle and personnel movement to and from the intertidal area at Horseshoe Point.
Sand dune habitats affected by access arrangements to the intertidal will also be reinstated following the completion of all cable installation works at Horseshoe Point. This will be done by fencing off affected areas to ensure no further disturbance and allow the sand dune vegetation to naturally recolonise. This mitigation measure and monitoring of sand dune habitats will be focussed primarily on the northern access route, with the use of the southern access (e.g., by the Environment Agency, coastguard and the public) potentially continuing following completion of cable installation works.	Fencing off of affected sand dune vegetation will increase the rate of natural recolonisation. Post construction monitoring of these areas will be undertaken to determine the speed and success of recovery.
HDD drilling at Horseshoe Point landfall site will incorporate a small lagoon at the drill entry point, within the compound area on the landward side of the sea defence to contain the bentonite mud and cuttings exiting from the HDD. The drilling system (including HDD exit pits in intertidal) will use a closed circuit mud management system where the mud is constantly pumped out of the pit for processing and re-use and will minimise the risk of drilling mud escaping into the surrounding environment.	This measure is to be employed to ensure that all habitats, and especially channel networks, will be protected to maintain the foraging value of tidal flats and surrounding open estuary waters.
Commitment to follow best practice guidance (JNCC, 2012 and Table 5.46). The specific detail of this will be set out within the MMMP.	The cable route corridor lies within the zone of potential risk for corkscrew injury as defined by JNCC (2012a) (see Table 5.4).

SAC Qualifying Features

6.4.3 As part of the project design process a number of designed-in mitigation measures have been proposed to reduce the potential for impacts on SAC qualifying features of the Humber Estuary SAC (Table 6.5). Many of these measures are considered standard industry practice for this type of development, though some additional measures have also been included to ensure that SAC qualifying habitats affected by the proposed works recover quickly following disturbance (i.e., the *Salicornia* and sand dune habitats). These measures were discussed and agreed with Natural England during Phase 4 consultation (see Table 1.1).

6.4.4 For the purposes of the current assessment, it has been assumed that HDD will be undertaken to a minimum of 100 m from the seaward edge of transition pit in the temporary working compound area (this is the maximum adverse scenario). HDD may be undertaken to greater distances (i.e., a maximum distance of 700 m; see Section 2.3 and Table 2.1), with consequent reductions in the area of the *Salicornia* and other annuals colonising mud and sand habitat affected. If HDD operations are undertaken to a maximum distance of 700 m, habitat loss/disturbance to this habitat would be limited to a 10 m wide access track through this habitat (equating to an area of approximately 6,000 m^2, or <1% of this habitat within the Humber Estuary SAC.

Pre and post construction monitoring

6.4.5 As detailed in paragraph 6.4.1, an Ecological Clerk of Works will be employed to ensure cable installation works are appropriately managed in the intertidal and specifically to ensure direct impacts (i.e., cable burial) on saltmarsh and cockle beds are avoided. In order to ensure that direct impacts on these habitats are avoided, a pre-construction walkover survey will be undertaken at Horseshoe Point to provide up to date extents on cockle beds and saltmarsh and following this survey, anchor placement will be avoided in these areas.

6.4.6 In order to assess the effectiveness of the mitigation strategies proposed for temporary habitat loss/disturbance of the Annex I habitat *Salicornia and other annuals colonising mud and sand* and sand dune habitats (see Table 6.5), it is proposed that monitoring of these habitats at the Horseshoe Point landfall site should be undertaken. For sand dune habitats, this will comprise annual post construction surveys of areas affected by access to the intertidal. The purpose of these surveys will be to monitor the natural recovery rates of areas of sand dune which are to be fenced off post construction over a two to three year period following completion of cable installation works.

6.4.7 For the Annex I habitat *Salicornia and other annuals colonising mud* and sand a single survey will be undertaken one year prior to undertaking cable burial operations and following completion of cable burial operations. The aim of the surveys would be to determine the effectiveness of the proposed mitigation measures (i.e., leaving undisturbed areas in order to seed areas of temporary habitat loss) and to assess the speed of recovery of this species into disturbed areas.

6.4.8 The exact scope of pre and post construction surveys will be developed in consultation with Natural England and will be likely to consist of a single pre construction survey undertaken during summer months (June to August) in the year prior to cable installation and a post construction survey undertaken over the same time period during the summer following cable installation. Surveys should be undertaken during summer months to coincide with the main period of vegetative growth of this species to ensure accurate abundance estimates can be made. Recovery of this habitat is predicted to occur within 12 months of cable installation and therefore only one post construction survey has been proposed. The post construction survey will be undertaken following Phase 2 of cable installation and the area exposed to repeat disturbance during cable installation (i.e., the HDD exit pits; see Figure 6.1) would be specifically targeted to assess the recovery following repeat habitat loss/disturbance. Further post construction monitoring surveys may be required if the results of the post construction survey show that complete recovery of this habitat has not occurred.

6.4.9 Surveys should be identical in design, with *Salicornia* abundances estimated across the shore using quadrats. Abundances should be estimated both within and outside the impacted area during pre- and post-construction surveys and appropriate statistical analyses should be used to make comparisons between surveys and impacted/unimpacted areas.

SPA Qualifying Features

6.4.10 Under the Wildlife and Countryside Act 1981 as amended, it is an offence, subject to limited exceptions, to:

- Intentionally kill, injure or take any wild bird;
- Intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built;
- Intentionally take or destroy an egg of any wild bird;
- Intentionally or recklessly disturb any wild bird listed in Schedule 1 of the Wildlife and Countryside Act 1981 while it is building a nest or is in, on or near a nest containing eggs or young; and
- Intentionally or recklessly disturb dependent young of any wild bird listed in Schedule 1.

6.4.11 As part of the project design process a number of designed-in mitigation measures have been proposed to reduce the potential for impacts on qualifying features of the Humber Estuary SPA, Coquet Island SPA and Farne Islands SPA (Table 6.6). These include standard best practice to reduce the possibility of illegal damage, destruction or disturbance to occupied bird nests during the installation phase.

6.4.12 In order to minimise the risks for SPA qualifying species, activities in Phase 1 and Phase 2 will be limited to a well-defined construction area (Table 2.1 and Figure 6.1) so that the extent of potential disturbance events will be minimised as much as possible and birds within disturbance distances will be able to find alternative habitat nearby for the duration of activity. This will be particularly the case in Phase 1, where activities will be located primarily within the temporary compound area on the landward side of the tidal defences, and so the extent of disturbance within the intertidal area itself will be minimal, particularly in the lower shore where large numbers of birds may roost at low tide. In Phase 2, all work will take place within a small part of the defined cable convergence zone and temporary working areas at any one time, and as species' distribution figures in Annex F show, the number of birds that may be disturbed at any one time is likely to be minimised to numbers well below peak counts recorded across the whole Horseshoe Point survey area.

6.4.13 In order to minimise disturbance of SPA qualifying bird species cable installation activities should be undertaken during periods when birds are not present in significant numbers at Horseshoe Point landfall site. Figure 6.5 and Figure 6.6 provide a summary of seasonal importance for SPA qualifying species, based on the relative importance of their peak counts with respect to SPA populations. The data show that seasonal distribution at Horseshoe Point in 2011/12 (Figure 6.6) is representative of the wider area (as recorded in the surrounding WeBS sectors, Figure 6.5) and likely the Humber Estuary as a whole. These are further discussed in the context of the data collected in Annex F.

6.4.14 Using these figures as a guide to disturbance impact, it is clear that the overall importance of Horseshoe Point to key species is much lower in summer months compared to passage periods, and in particular mid-winter peaks in January. This correlates with results of Humber-wide surveys (e.g., Allen *et al.,* 2003; Cutts and Allen, 1999). Given this evidence, it can be concluded that the construction works could be undertaken within the proposed time period of April 1 to September 30 each year, with installation being undertaken over two seasons (see Table 6.6). These seasonal restrictions will ensure that qualifying species do not occur as a result of Project One cable installation in the intertidal. Discussions with Natural England on the need for mitigation concluded that a seasonal restriction would be required. Further discussions on the specific detailed of this restriction are ongoing with Natural England (see Table 1.1) though it has been agreed that this will be a Marine Licence condition.

Table 6.6 Designed-in measures and mitigation adopted as part of the project with respect to SPA features.

Designed in measures adopted as part of Project One	Justification
A suitably experienced ornithologist as Ecological Clerk of Works to locate any active nests close to construction works shortly before these commence.	Standard best practice to reduce the possibility of illegal damage, destruction or disturbance to occupied bird nests during the installation phase.
An Ecological Clerk of Works will supervise the construction works in the intertidal zone and ensure that all works within the intertidal construction area, including plant movement and anchor placements will be restricted to well defined construction areas (i.e., the convergence zone and temporary working corridor; see Figure 2.1 and Figure 6.1).	Measure will ensure that the extent of potential disturbance events will be minimised as much as possible and birds no loss/disturbance to intertidal habitats outside that described in this assessment. It will also ensure direct impacts to cockle beds are avoided. Within the *Salicornia* habitat, this measure would retain some areas of established plants as seed sources to enhance re-colonisation and recovery rates following construction disturbance within the working area.
HDD drilling at Horseshoe Point landfall site will incorporate a small lagoon at the drill entry point, within the compound area on the landward side of the sea defence to contain the bentonite mud and cuttings exiting from the HDD. The drilling system (including HDD exit pits in intertidal) will use a closed circuit mud management system where the mud is constantly pumped out of the pit for processing and re-use and will minimise the risk of drilling mud escaping into the surrounding environment.	This measure is to be employed to ensure that all habitats, and especially channel networks, will be protected to maintain the foraging value of tidal flats and surrounding open estuary waters.
Mitigation measures to be adopted as part of Project One	**Justification**
Undertaking all construction works in the intertidal within the period of April 1 to September 30 each year, with installation being undertaken over two seasons.	To avoid cable laying activities during periods when abundances of ornithological features are highest (i.e., during passage and mid-winter peaks).

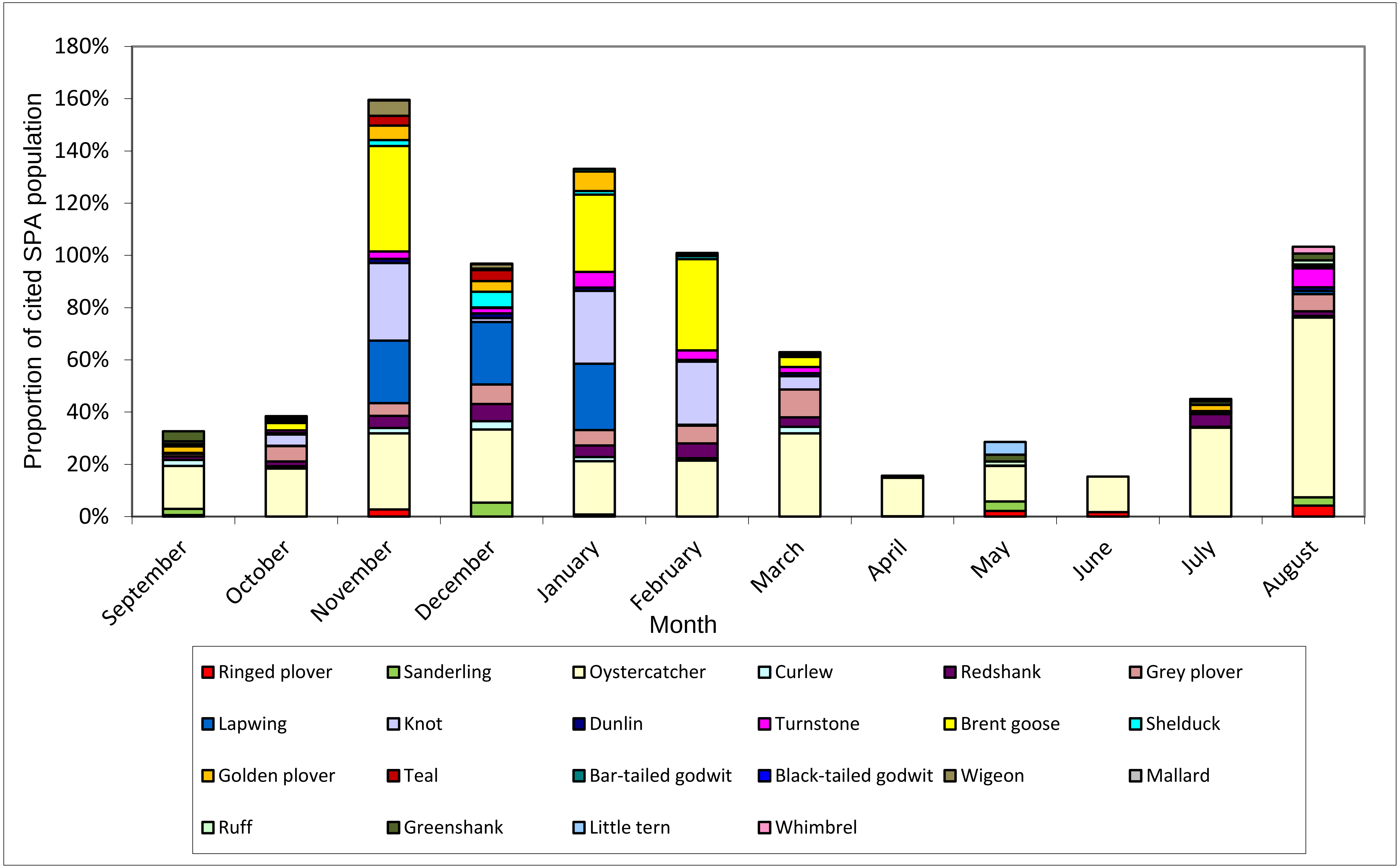


Figure 6.5 **Relative monthly importance of combined WeBS low count sectors (MSE2 and MSF) in 2003/04 overlapping with Horseshoe Point in comparison with overall SPA population for each species (see Annex F for further detail of these data).**

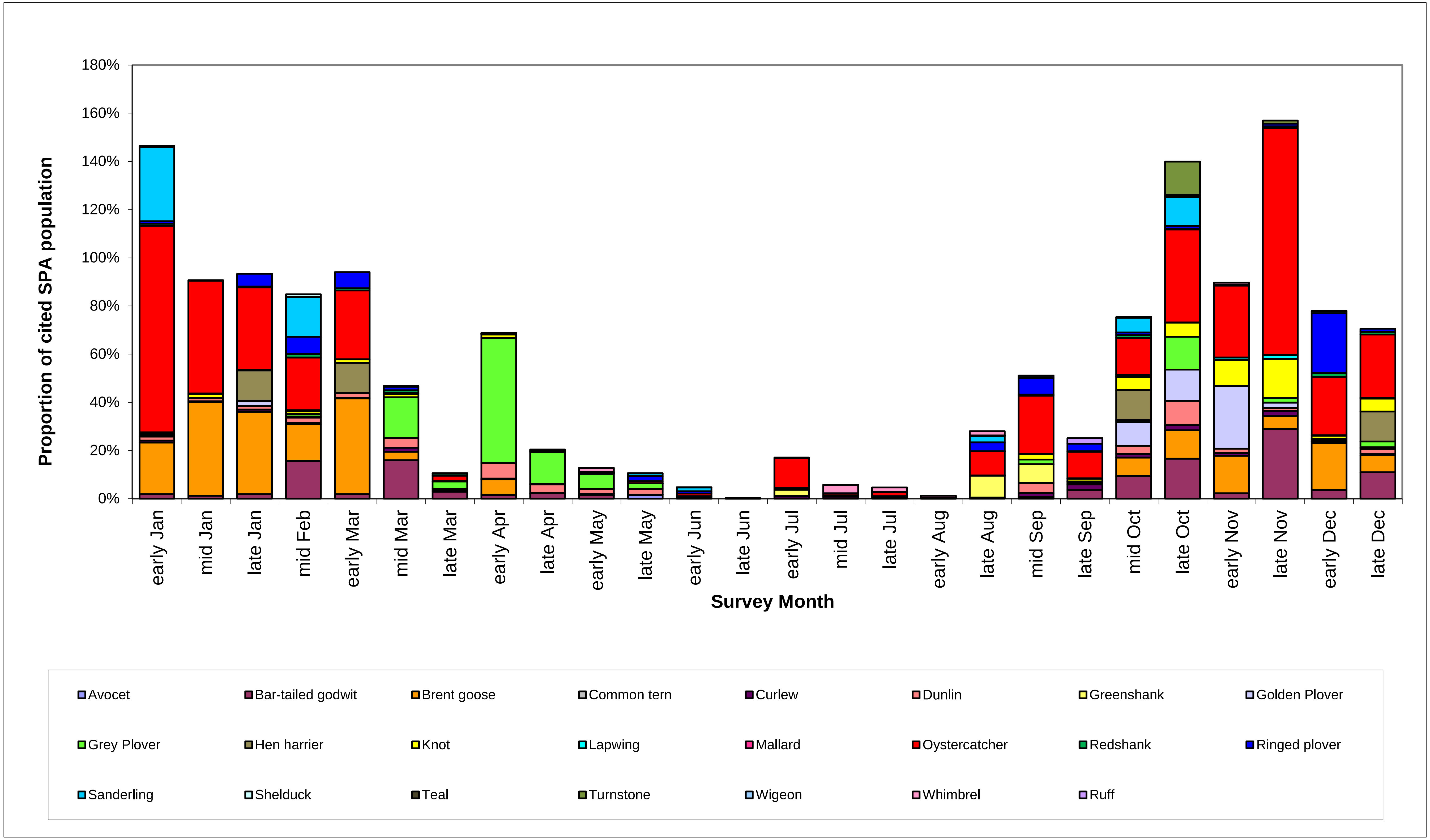


Figure 6.6 **Relative monthly importance (peak counts per survey) of Horseshoe Point cable landfall site (2011/12) in comparison with overall SPA population for each species (see Annex F for further detail of these data).**

7 SUMMARY OF ASSESSMENT OF EFFECT ON EUROPEAN SITE INTEGRITY

7.1 Introduction

7.1.1 There is predicted to be no adverse effect on the integrity of Natura 2000 sites as a result of construction, operation and decommissioning of Project One offshore and onshore components, either alone or in-combination with other plans and projects. This is based on the conclusion that adverse effects on the qualifying features (i.e., habitats and species) will not occur when mitigation measures are implemented. Individual conclusions on each feature are provided below.

7.2 SAC/SCI/Ramsar Features

Estuaries

7.2.1 A small proportion of the extent of this habitat within the Humber Estuary SAC (0.47%) is predicted to be temporarily affected (i.e., temporary habitat loss/disturbance) by cable installation at Hornsea Project One. All habitats affected are predicted to recover quickly following disturbance, with no long term effects anticipated.

7.2.2 Effects on water quality and the hydrodynamic regime of the estuary are also not expected to be adversely affected, with any potential effects (e.g., increased suspended sediment concentrations) likely to be limited both spatially and temporally, with no long term effects on this feature.

7.2.3 In-combination effects are also not predicted to result in an adverse effect on this habitat feature, with the majority of the in-combination habitat loss being short lived (i.e., temporary habitat loss) and any long term habitat loss (i.e., as a result of the AMEP development) mitigated by the creation of intertidal habitats.

7.2.4 No adverse effects on this feature of the Humber Estuary SAC are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Priority Habitats of the Humber Estuary SAC

7.2.5 No LSE, either alone or in-combination, is predicted for the two priority habitats within the Humber Estuary SAC (i.e., Fixed dunes with herbaceous vegetation, or \`grey dunes\` and Coastal lagoons). For grey dunes this was due to their absence in the Horseshoe Project One study area. Although coastal lagoons were present in the Project One study area, these will be avoided during cable installation, through the use of HDD operations under the sea wall, and therefore no direct or indirect effects are predicted on these habitats.

Mudflats and Sandflats not Covered by Seawater at Low Tide

7.2.6 A small proportion of the extent of this habitat within the Humber Estuary SAC (1.68%) is predicted to be temporarily affected by installation of Project One export cables. Recovery of this habitat and its associated communities is expected to occur quickly following cable burial, with no long term effects anticipated.

7.2.7 In-combination effects are not predicted to result in an adverse effect on this habitat feature, with the majority of the in-combination habitat loss being short lived (i.e., temporary habitat loss) and any long term habitat loss (i.e., as a result of the AMEP development) mitigated by the creation of intertidal habitats.

7.2.8 No adverse effects on this feature are therefore of the Humber Estuary SAC predicted as a result of Hornsea Project One either alone or in-combination with other projects.

***Salicornia* and Other Annuals Colonising Mud and Sand**

7.2.9 Although a relatively large proportion of the extent of this habitat within the Humber Estuary SAC is predicted to be affected by cable installation from Project One (i.e., approximately 7.8%), recovery of this habitat and its component species is expected to be rapid (see paragraphs 6.2.15 and Annex E, Section 1.2) with full recovery expected within one year. It is also likely that the baseline used to estimate the area of this habitat within the SAC is an underestimate, with a greater area of this habitat mapped during site specific surveys.

7.2.10 Mitigation measures will be employed to reduce the area of this habitat affected and also increase the recovery rate of this habitat by smoothing sediments to increase the chance of seed capture and germination. Pre and post construction monitoring will also be undertaken to assess the success of the mitigation measures employed.

7.2.11 In-combination effects on this habitat are expected as a result of cable installation for Project Two. This will result in further loss of this habitat, though the area affected by repeat disturbance from Project One and Project Two is likely to be limited to access routes (approximately 2,500 m^2; see paragraph 6.2.15), and recovery rates following cable installation would be expected to be rapid.

7.2.12 Although an area of this habitat may be affected in the short term, due to the expected high recovery rates and the mitigation measures employed to encourage recolonisation, no adverse effects on this feature of the Humber Estuary SAC are predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

7.2.13 Based on the area of saltmarsh habitat mapped at Horseshoe Point in 2011 and assuming all cable laying operations will occur within the convergence route corridor, cable laying during Project One will not result in any loss of this Annex I habitat feature. Indirect effects (e.g., sediment deposition or fuel spillages) on this habitat are also not expected to occur as a result of cable installation activities as plume modelling showed that sedimentation would not be expected in these habitats and the potential for fuel spillages would be minimised through the use of good working practices (i.e., CoCP).

7.2.14 In-combination effects are predicted to result in loss of a small proportion of this habitat within the SAC(i.e., <0.001% of this habitat within the SAC), with none of this habitat loss as a result of Project One or Project Two.

7.2.15 No adverse effects on this features of the Humber Estuary SAC are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Embryonic Shifting Dunes and Shifting Dunes Along the Shoreline with *Ammophila arenaria* ('White Dunes')

7.2.16 A small proportion of the extent of these habitats within the Humber Estuary SAC (0.03%) is predicted to be affected by access arrangements to the intertidal. In-combination effects are predicted to increase this proportion slightly, though the area affected is likely to be small and all habitats will be reinstated following completion of development works (i.e., for Project One and other projects considered in-combination, including future access arrangements at Horseshoe Point).

7.2.17 Measures to reduce ground pressures in the vicinity of these habitats are to be considered prior to cable installation in order to aid natural recovery of these habitats. Fencing off of these habitats to prevent further disturbance will also aid recovery and the speed and success of natural regeneration will be also be monitored post cable burial operations.

7.2.18 No adverse effects on this feature of the Humber Estuary SAC are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Sea and River Lamprey

7.2.19 Installation of export cables for Project One is not predicted to create artificial barriers to lamprey species (i.e., through sediment plume effects during construction or EMF during operation) on migration to spawning grounds in the rivers flowing to the Humber Estuary, including the River Derwent SAC. In-combination effects on migration are also not expected from other projects in the Humber Estuary. Furthermore, as discussed in paragraph 4.3.46 *et seq*., no LSE was predicted on these species as a result of Project One offshore construction, operation or decommissioning, either alone or in-combination

7.2.20 No adverse effects on these features of the Humber Estuary SAC and River Derwent SAC are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Grey Seal

7.2.21 The assessment conclusions presented in Sections 5 and 6 and below have been drawn based on the appropriate reference populations for the Humber Estuary SAC and Ramsar site (i.e., the Donna Nook population), the Berwickshire and North Northumberland SAC and the Dutch Dogger Bank and Klaverbank pSCIs. The assessment conclusions given below have been drawn based on the appropriate reference population for these SACs/SCIs, however, the assessment has been undertaken for the southern North Sea grey seal population as a whole, in the absence of site specific tagging data.

7.2.22 The offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance) are also not predicted to affect grey seal conservation objectives for the Humber Estuary and Berwick and North Northumberland Coast SACs assessed within this HRA. The zone of noise disturbance for grey seal does not extend as far as their haul-out locations, the closest of which (Donna Nook) lies over 100 km from Subzone 1. Furthermore, installation of export cables for Project One is also not predicted to affect accessibility of the Donna Nook breeding site to adult seals in the Humber Estuary SAC. Grey seal is also a feature of two transboundary Natura 2000 sites within the southern North Sea. It is possible that grey seal from Doggersbank and Klaverbank pSCIs may occur within the Project One offshore wind farm areas, either en-route or actively using the sites for foraging and other activities. However, tagging studies of grey seals in the Netherlands indicate that there is relatively low usage of the area compared to nearshore Dutch waters (Jak *et al*., 2009). The risk of grey seals from occurring within Project One is therefore low.

7.2.23 Due to grey seal exploiting a range of prey resources and ranging widely to forage, effects will be localised and unlikely to result in a significant effect on prey species (fish and shellfish assemblages). There may also be a potential for the operational wind farm to provide benefits to fish and shellfish may also indirectly benefit grey seal populations. Therefore, given the large extent of available alternative foraging habitat that would not be subjected to noise levels likely to give rise to a behavioural response, highly localised nature of the predicted impacts, and the small numbers affected, it is concluded that there will be no adverse effects, it is predicted that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for the grey seal North Sea population or as a feature of Humber

Estuary SAC and Ramsar site, the Berwickshire and North Northumberland SAC and the Dutch Dogger Bank and Klaverbank pSCIs.

7.2.24 Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Harbour Seal

7.2.25 Harbour seal is a primary reason for designation of The Wash and North Norfolk Coast SAC (94 km from Subzone 1). In addition, harbour seal is a qualifying feature for the Klaverbank pSCI (44 km from Subzone 1) and Dutch Dogger Bank pSCI (64 km from Subzone 1) in Dutch waters. The assessment conclusions given below have been drawn based on the appropriate reference population for these SACs/SCIs, however, the assessment has been undertaken for the southern North Sea harbour seal population as a whole, in the absence of site specific tagging data.

7.2.26 The offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance) are also not predicted to affect harbour seal conservation objectives for The Wash and North Norfolk Coast SAC and the Dutch Dogger Bank and Klaverbank pSCIs. It is possible that harbour seal from these designated sites may occur within the Project One offshore wind farm areas, either on-route or actively using the sites for foraging and other activities. The zone of noise disturbance for grey seal does not extend as far as their haul-out locations for these sites.

7.2.27 Disturbance effects that could occur as a result of construction, operation and maintenance and decommissioning activities would be temporary, short-term, and negligible for individuals and would not be expected to influence or result in a decrease in the population of harbour seals for at designated sites. Furthermore, where individuals may be temporarily affected, they have a low to medium sensitivity to the disturbance impact (due to likely habituation to noise and vessel movements), and the areas over which disturbance effects may occur are not a high density areas for prey species and therefore foraging for harbour seal (paragraph 5.2.126). With regard to behavioural effects, seals that may be present in the vicinity of piling would be able to relocate to adjacent areas in order to continue foraging and avoid exposure to underwater noise levels. There may also be a potential for the operational wind farm to provide benefits to fish and shellfish may also indirectly benefit harbour seal populations.

7.2.28 Therefore, due to the highly localised nature of the predicted impacts, the large extent of available alternative foraging habitat in undisturbed areas and the small numbers affected, it is concluded that there will be no adverse effects on harbour seal as a feature of The Wash and North Norfolk Coast SAC and the Dutch Dogger Bank and Klaverbank pSCIs as a result of the Project One development alone or in-combination with other plans and projects. Although no adverse effect on conservation objectives has been identified, due to the uncertainties highlighted, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see Section 5.6).

Harbour Porpoise

7.2.29 Harbour porpoise is listed as a qualifying feature for 26 transboundary Natura 2000 sites within the southern North Sea marine mammal study area that have been screened into the appropriate assessment as having the potential for LSE (Table 4.14). The assessment conclusions given below have been drawn based on the southern North Sea harbour porpoise population as a whole due to limited information available on the connectivity between Natura 2000 sites and Project One for this species, and in the absence of site specific tagging data.

7.2.30 Piling has the potential to result in a medium-term (more than five years), cumulative, negative effect on harbour porpoise. However, due to the distance to Subzone 1 from the harbour porpoise Natura 2000 sites screened into this assessment, the local spatial extent and intermittent nature of the impact from construction piling noise, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of piling (paragraph 5.2.192 *et seq.*), no adverse effects are predicted on harbour porpoise at a population level or as a feature of these Natura 2000 sites. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (Section 5.6).

7.2.31 It is possible that harbour porpoise from Natura 2000 sites may occur within Subzone 1, either enroute or actively using the site for foraging, however, the effects of disturbance, (as a result of non-piling noise (i.e., from vessels) during the construction/operation/decommissioning phases, collision risk from increased vessel traffic, or changes to prey species availability), are predicted to be highly localised and temporary. Given the localised spatial extent of increased vessel activity, the intermittent risk of collision with vessels, potential temporary loss of only a small area of available foraging habitat and the large extent of available habitat outside of disturbed areas, no adverse effects are predicted from Project One, alone or in-combination, on the harbour porpoise at the southern North Sea population level or as a feature of Natura 2000 sites for which it is a qualifying feature.

7.2.32 Although no adverse effects are concluded for the harbour porpoise southern North Sea population, the Developer will continue to monitor the emerging research on harbour porpoise sensitivity to collision risk with ducted propellers and, should any evidence be published to suggest that there is a significant risk to harbour porpoises, will consider appropriate best practice the detail of which would be set out within the MMMP.

7.3 SPA/Ramsar Features

Gannet

7.3.1 Gannets were present within the offshore area of Project One throughout the year, with the closest breeding colony at Flamborough Head and Bempton Cliffs SPA within mean maximum foraging range. Annual mortality estimates for both collisions and operational displacement were very small in comparison to the overall SPA breeding population, with a similarly small increase in baseline mortality which would not affect the conservation objectives of the SPA (particularly since the population has grown greatly in recent years). This conclusion was supported by population modelling.

7.3.2 The Firth of Forth Islands SPA population was also considered at the appropriate assessment stage, and again it was shown that increases in baseline mortality rates due to collisions or operational displacement (this time only in the non-breeding period since Project One is outside of foraging range) were very small and not significant.

7.3.3 No adverse effects on this feature of the Flamborough Head and Bempton Cliffs SPA and Firth of Forth Islands SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Kittiwake

7.3.4 Kittiwakes were present within the offshore area of Project One throughout the year, but peaked during the post-breeding period when passage movements of birds from northern colonies were likely recorded. The closest breeding colony is at Flamborough Head and Bempton Cliffs SPA, which is within maximum foraging range.

7.3.5 Annual mortality estimates for both collisions and operational displacement were very small in comparison to the overall SPA breeding population, with a similarly small increase in baseline mortality which would not affect the conservation objectives of the SPA. Despite decreases in the population over recent years, this conclusion was supported by population modelling.

7.3.6 No adverse effects on this feature of the Flamborough Head and Bempton Cliffs SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Herring gull

7.3.7 The closest herring gull breeding colony to Project One turbines is at Flamborough Head and Bempton Cliffs SPA, which is outside of the currently recognised maximum foraging range. As a result, few (if any) collisions are predicted during the breeding season, with at most two adults being lost. Higher populations were estimated during the non-breeding season, reflecting movements from UK and continental birds during winter. Based on the very small proportion of Flamborough Head and Bempton Cliffs SPA birds that is from the east coast population, no losses to this SPA were predicted to occur in winter, assuming intermixing of populations.

7.3.8 No adverse effects on this feature of the Flamborough Head and Bempton Cliffs SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Guillemot

7.3.9 Guillemots were present within the offshore area of Project One throughout the year, but peaked during the non-breeding, and particularly the post-breeding periods when passage movements of birds from northern colonies were likely recorded. The closest breeding colony is at Flamborough Head and Bempton Cliffs SPA, which is within maximum foraging range.

7.3.10 Annual mortality estimates as a result of operational displacement were small in comparison to the overall SPA breeding population. The resultant increase in baseline mortality was shown not to affect the conservation objectives of the SPA, through population modelling.

7.3.11 No adverse effects on this feature of the Flamborough Head and Bempton Cliffs SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Razorbill

7.3.12 Similar to guillemots, razorbills were present within the offshore area of Project One throughout the year, peaking in the non-breeding season, albeit in lower numbers. The closest breeding colony at Flamborough Head and Bempton Cliffs SPA is outside recognised maximum foraging range of Subzone 1, but some connectivity was assumed.

7.3.13 Annual mortality estimates as a result of operational displacement were small in comparison to the overall SPA breeding population. The resultant increase in baseline mortality was shown not to affect the conservation objectives of the SPA, through population modelling.

7.3.14 No adverse effects on this feature of the Flamborough Head and Bempton Cliffs SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Puffin

7.3.15 Puffin numbers were generally higher within Subzone 1 of Project One and the wider Hornsea Zone during winter months. An unusually high peak was however estimated in June of Year 1 baseline surveys, which indicated that birds present were likely to be not just from the Flamborough Head and Bempton Cliffs SPA population (the only one within currently recognised maximum foraging range), but also from those further north. From apportioning of these birds between colonies based on distance and size, only a small number of deaths due to operational displacement were attributable to the Flamborough Head and Bempton Cliffs SPA population, which has undergone a large decline in recent years, and is much smaller than other nearby colonies.

7.3.16 The annual mortality estimates were still however small in comparison to the overall SPA breeding population and the resultant increase in baseline mortality was shown not to affect the conservation objectives of the SPA, through population modelling.

7.3.17 No adverse effects on this feature of the Flamborough Head and Bempton Cliffs SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Bar-tailed godwit

7.3.18 Bar-tailed godwits are mainly present at Horseshoe Point (within the Humber Estuary SAC) between September and May, although numbers are very low before and after peak migration periods in October and March respectively (Figure 6.4 and Figure F.6 of Annex F). During the April to September period, peak counts reached up to around 4% of the current SPA population at the end and start of the autumn and spring migratory periods respectively, which is low compared to 13% in November when around 800 birds were present. This was similar to the seasonality recorded in the wider WeBS low tide count sectors (MSE2, MSF) within this period.

7.3.19 The species was recorded widely across the Horseshoe Point mudflats and the wider WeBS sectors during low and rising tides (Figures F.7 and F.77 to F.80 of Annex F), suggesting that available habitat will not be a limiting factor if any displacement were to occur. Disturbance to birds within 100 m of source (i.e., excavators working within the convergence corridor) will therefore not be significant on bird survival at an SPA level.

7.3.20 No adverse effects on this feature of the Humber Estuary SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects, with a seasonal restriction limiting cable installation to between April and September (i.e., when the species is either absent or present in relatively low numbers at Horseshoe Point) reducing the potential for effects on this species.

Golden plover

7.3.21 The area around Horseshoe Point (within the Humber Estuary SAC) appears to be used by golden plover in significant numbers on autumn passage only (Figure 6.4, and Figure F.10 of Annex F). Surveys in 2011 to 12 showed that this movement occurred in October and November, with very small numbers in the context of the SPA population (<1%) in all other months. Birds that were recorded between April and September were predominantly located in the saltmarsh area to the south, well away from the working area (Figure F.11 of Annex F).

7.3.22 Even if any displacement or reductions in water quality were to occur during works between April and September at Horseshoe Point, golden plovers show significant diurnal movements within the estuary and there is considerable interchange between flocks within different areas (Catley, 2000), suggesting that alternative habitat is widely available.

7.3.23 No adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Dunlin

7.3.24 Dunlin may be present at Horseshoe Point (within the Humber Estuary SAC) between mid-September and May (Figure F.18 of Annex F), although numbers apparently peak during autumn passage in November (2,050 birds), with a smaller passage peak recorded in early April. During the April to September period, peak counts within the whole Horseshoe Point survey sector reached up to 6% of the current SPA population around the peak of passage periods (Figure 6.4). Most commonly, birds were recorded above mean high water mark on muddy substrates, although outside of the convergence zone and temporary working area (Figures F.18 and F.77 to F.80 of Annex F)

7.3.25 Despite a potential overlap of cable installation activity with some passage movement, the widespread availability of potential alternative habitat locally, and across the estuary suggests that any birds displaced would likely find suitable sites elsewhere without any significant impacts on survival at an SPA level. The site specific survey data indicate that the site does not form an important high tide roost , which is supported by the information in the SPA species accounts (Annex F) which reported that the important roost sites were at Cleethorpes (to the northwest) and Skidbrooke (to the southeast). With limitations to the spatial extent of installation activities (i.e., within the convergence corridor), fewer birds than these peak population estimates are likely to be affected.

7.3.26 No adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Knot

7.3.27 The main influx of knot into the Humber Estuary occurs between September and November, and numbers at Horseshoe Point peaked in late November (3,000 birds, Figure F.21 of Annex F). Between April and September numbers were much lower, peaking at around 2% of the current SPA population within the entire survey area in mid-September (around 420 birds, Figure 6.4). Birds were absent during the main breeding period.

7.3.28 Although birds were recorded at high tide, close to the area affected by Phase 1 of the cable installation (i.e., HDD operations), a significant disturbance effect at an SPA level is unlikely. Even if some individuals are displaced, knot are highly mobile, and in the outer estuary large intertidal movements occur between feeding and roosting areas on the north and south shores (Catley, 2000), suggesting that alternative habitat would be available.

7.3.29 No adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Redshank

7.3.30 Redshanks are widespread across the Humber Estuary although saltmarshes are a particularly important habitat. The saltmarshes at Tetney and Grainthorpe Havens provide an important communal roosting site for redshank, but despite this potential importance, a peak count of only 1% of the SPA population was recorded during Horseshoe Point surveys in October 2011. Between April and September, numbers were particularly low, mainly in single figures but with a peak of 34 birds in late September (Figure 6.4), which is 0.5% of the SPA population.

7.3.31 Individuals were recorded widely at Horseshoe Point, but particularly within the creeks in the cockle beds, and saltmarsh habitats, which are outside of the temporary working areas (Figure F.30 of Annex F). Despite the species' sensitivity, any disturbance effects are unlikely to be significant at an SPA level. In addition, any localised water quality reductions (e.g. resuspension of contaminated sediments) would not be significant. In addition, disturbance effects would be limited due to the extensive areas of alternative saltmarsh and cockle bed habitats in the wider area (particularly to the south of the convergence corridor) which would be available for the duration of impact.

7.3.32 No adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Dark-bellied brent goose

7.3.33 The main passage arrivals of dark-bellied brent goose take place in October and November with peak numbers usually present from December to February. Numbers fall rapidly by March, and the species was generally recorded as absent at Horseshoe Point between mid-April and September (Figure 6.4, and Figure F.42 of Annex F).

7.3.34 Although in early April, a peak of 6% of the current SPA population was recorded, birds were present within the saltmarsh areas well outside of the cable route corridor and temporary work areas (Figure F.43 of Annex F). With the SPA population in favourable condition, no adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Sanderling

7.3.35 There are two peaks per year in the number of sanderling which coincide with spring and autumn passage. Spring passage occurs in April and May and is less pronounced because the northward migration is predominantly along the west coast of Britain (Allen *et al*., 2003). In general numbers at Horseshoe Point were relatively low, apart from clear influxes in October and January (up to 150 birds, Figure F.46 of Annex F). Numbers between April and September peaked at around 3% of the current SPA population within the whole Horseshoe Point survey area, with a peak of 21 birds in August (Figure 6.4). The species was often absent from the survey area during April to September, and even then, was mostly recorded within *Salicornia* habitat outside of the convergence zone and temporary working area.

7.3.36 Only very low numbers of sanderling may therefore be disturbed by construction activities, and it is very unlikely that any effects would occur on the survival of the population at the SPA level.

7.3.37 With the population in favourable condition, no adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Ringed plover

7.3.38 Ringed plover use the Humber Estuary in large numbers during migration periods, with a smaller wintering population and only a few breeding pairs (Allen *et al*., 2003). Between April and September the species was largely absent or recorded in very small numbers at Horseshoe Point, although there was a peak of 120 birds in mid-September during passage, which equates to around 7% of the SPA population (Figure 6.4, and Figure F.50 of Annex F).

7.3.39 Disturbance effects on ringed plover have been identified within 100 to 200 m from the source which suggests that although a number of birds may be disturbed during autumn passage (particularly during Phase 1 activities), it will likely be far less than the peak numbers recorded, particularly if construction is restricted within a limited area (i.e., within the convergence corridor).

7.3.40 No adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

Oystercatcher

7.3.41 Oystercatchers were recorded in relatively high numbers at Horseshoe Point and the wider WeBS low tide count sectors within the context of the Humber Estuary SPA population. At Horseshoe Point the species is particularly attracted to creeks within the cockle beds (i.e., outside of the convergence zone and temporary working area – see Figure F.55 of Annex F) where birds may roost.

7.3.42 On the Humber Estuary an increase in numbers of oystercatcher occurs during September with a large influx arriving from the Wash (Allen *et al*., 2003). During the cable landfall site surveys in 2011/12, the species was recorded in much lower numbers from mid-March through the breeding season, compared to winter, with peak flocks of up to 436 individuals in early July (around 12% of the cited and current SPA populations), and mid-September (850 birds, 24% of the SPA population) (Figure 6.4, and Figure F.54 of Annex F).

7.3.43 Despite this apparent importance of Horseshoe Point for oystercatcher, spatial distribution of the species, shown in Figure F.55 of Annex F, demonstrates there is a strong attraction to the creeks and cockle beds outside of the cable route corridor, and therefore away from most disturbance. Small numbers of oystercatchers may still have feeding rates reduced due to disturbance at Horseshoe Point, although evidence suggests this is likely to be compensated by shifting to other areas, and habituation (Goss-Custard and Verboven, 1993). Stillman *et al*. (2005) reported that oystercatcher survival rates are likely to be higher than other similarly-sized waders as they consume larger prey items.

7.3.44 Therefore although the area around Horseshoe Point may be of some significance for the species, the cable convergence zone avoids preferred feeding and roosting sites reducing the potential for disturbance to this species. As such, no adverse effects on this feature of the Humber Estuary SPA are predicted as a result of Hornsea Project One either alone or in-combination with other projects, with a seasonal restriction limiting cable installation to between April and September (i.e., when the species is present in relatively low numbers at Horseshoe Point) reducing the potential for effects on this species.

Grey plover

7.3.45 Grey plover numbers tend to peak in the Humber Estuary on autumn and spring passage, although are largely absent in summer months (Figures F.65 to F.67 of Annex F). At Horseshoe Point, surveys in 2011-12 showed small numbers in summer and autumn passage (Figure 6.4, and Figure F.67 of Annex F). In April 2012 however, a brief peak of 885 birds was recorded on spring passage which represents around 50% of the SPA population (Figure 6.4).

7.3.46 If construction activities and peak passage is coincidental, a sizeable amount of birds may therefore be temporarily displaced. The species is however found on tidal mudflats across the outer estuary, and locally based on tidal state (Figures F.77 to F.80 of Annex F), and so available habitat is unlikely to be a limiting factor, either due to disturbance or a localised reduction in water quality. Even though most records were outside of the convergence zone or temporary working areas (Figure F.68 of Annex F), reaction distances are likely to be similar to golden plover, where in a worst-case situation a significant number of roosting or feeding SPA birds may be displaced if within 100 m of human movements (as predicted from Smit and Visser, 1993).

7.3.47 The most recent five year peak mean WeBS core count of 2,879 individuals represents a 69% increase over the cited SPA population, showing that the population continues to be in favourable condition.

7.3.48 Due to the restricted area predicted to be affected by cable installation (i.e., within the cable convergence corridor), no adverse effects on this feature of the Humber Estuary SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects, with a seasonal restriction limiting cable installation to between April and September (i.e., when the species is either absent or present in relatively low numbers at Horseshoe Point) reducing the potential for effects on this species.

Common tern

7.3.49 No individuals were recorded during breeding bird surveys of the cable route survey area in 2011, and only two individuals were recorded in July 2012 during the 2011/12 surveys at the Horseshoe Point cable landfall site within the Humber Estuary. Although the local area may still on occasion act as a roost site in late summer, it appears that the species' presence would be brief and intermittent between April and September. Most impacts may therefore take place during the post-breeding season, after juveniles have fledged, and so impacts on productivity are unlikely. With evidence suggesting that low tide roosts occur at dusk and into the night, disturbance will be negligible as this is outside the hours of planned intertidal works in Phase 2.

7.3.50 No adverse effects on this feature of the Coquet Island SPA and Farne Islands SPA are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects.

7.4 Natura 2000 Conclusions

Humber Estuary SAC and Ramsar

7.4.1 No adverse effects on the integrity of the Humber Estuary SAC and Ramsar site were predicted as a result of construction, operation or decommissioning of the Project One components (offshore, within the Humber Estuary and onshore) alone or in-combination with other projects. The only feature of the Humber Estuary SAC where LSEs were predicted as a result of both the offshore project components and project components within the Humber Estuary was grey seal and as discussed in paragraphs 7.2.21 *et seq*. no adverse effects were predicted on this feature. No LSEs were predicted for the Annex II fish and Annex I habitat features of this site (see Section 4.3), and therefore no adverse effects were therefore predicted on these features or the integrity of the SAC and Ramsar site.

River Derwent SAC

7.4.2 No adverse effects on the integrity of the River Derwent SAC were predicted as a result of construction, operation or decommissioning of the Project One components (offshore, within the Humber Estuary and onshore) alone or in-combination with other projects. No LSEs were predicted for the Annex II fish features of the River Derwent SAC as a result of offshore project components (see Section 4.3) and as discussed above (see paragraph 7.2.19 *et seq*.), no adverse effects were predicted on Annex II fish features of the River Derwent SAC as a result of project components within the Humber Estuary and onshore and therefore no adverse effects on the integrity of the SAC were predicted.

Berwickshire and North Northumberland Coast SAC

7.4.3 No adverse effect on the integrity of the Berwickshire and North Northumberland Coast SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in grey seal prey species distribution and/or abundance), either alone or in-combination with other plans and projects. This SAC is situated 208 km from Project One and significantly beyond the zone of potential direct impact. The distance of Project One from the SAC and results of grey seal tagging studies indicate a very low risk of any grey seal from this SAC occurring within the Subzone 1 or the zone of potential impact as identified by the underwater noise modelling. Furthermore, due to grey seal exploiting a range of prey resources and ranging widely to forage, effects will be localised and unlikely to result in a significant effect on prey species. Potential beneficial effects of the operational offshore wind farm to fish and shellfish may also indirectly benefit grey seal populations.

7.4.4 As discussed in paragraphs 7.2.21 *et seq*., given the distance of the SAC to Project One, the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered, the large extent of available alternative foraging habitat outside of areas of disturbance and the small numbers of grey seal affected; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for grey seal at a population level or as a feature of the Berwickshire and North Northumberland Coast SAC. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors.

The Wash and North Norfolk Coast SAC

7.4.5 No adverse effect on the integrity of The Wash and North Norfolk Coast SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. The SAC lies 94 km from Subzone 1 and 40 km from Project One and significantly beyond the zone of potential direct impact identified by the underwater noise modelling. Due to harbour seal exploiting a range of prey resources able to range up to 120 km from haul-outs, effects will be localised and unlikely to result in a significant effect on prey species. Potential beneficial effects of the operational offshore wind farm to fish and shellfish may also indirectly benefit harbour seal populations.

7.4.6 As discussed in paragraphs 7.2.25 *et seq*., given the distance of the SAC to Project One, the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered, the large extent of available alternative foraging habitat and the small numbers of harbour seal affected; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors.

Transboundary SACs / SCIs

7.4.7 Grey and harbour seals are listed as a qualifying feature for the marine European sites Klaverbank pSCI and the Dutch Doggersbank pSCI. Harbour porpoise are a qualifying feature of 26 transboundary SACs/SCIs identified in Table 4.14. No LSEs and no adverse effects are predicted for grey seal, harbour seal or harbour porpoise populations as features of these sites. No adverse effects on the integrity of the transboundary sites for which grey seal, harbour seal and harbour porpoise are qualifying features were predicted as a result of construction, operation or decommissioning of the Project One components alone or in-combination with other projects.

Flamborough Head and Bempton Cliffs SPA

7.4.8 No adverse effects on the integrity of the Flamborough Head and Bempton Cliffs SPA were predicted as a result of construction, operation or decommissioning of the Project One components (offshore) alone or in-combination with other projects. No LSEs were predicted on the features of the SPA as a result of offshore project components, and therefore no adverse effects on the integrity of the SPA were predicted.

Firth of Forth Islands SPA

7.4.9 There were no adverse effects on the integrity of the Firth of Forth Islands SPA predicted as a result of construction, operation or decommissioning of the Project One components (offshore) alone or in-combination with other projects. No LSEs were predicted on the features of the SPA as a result of offshore project components, and therefore no adverse effects on the integrity of the SPA were predicted.

Humber Estuary SPA

7.4.10 No adverse effects on the integrity of the Humber Estuary SPA were predicted as a result of construction, operation or decommissioning of the Project One components (offshore, within the Humber Estuary and onshore) alone or in-combination with other projects. No LSEs were predicted on the features of the SPA as a result of offshore project components (see Section 4.3). As discussed in paragraphs 7.3.18 *et seq*., no adverse effects were predicted on the features of the Humber Estuary SPA as a result of project components within the Humber Estuary and onshore, particularly when considering the mitigation measures detailed in Section 6.4 (specifically undertaking all cable installation in the intertidal between April and September, inclusive), and therefore no adverse effects on the integrity of the SPA were predicted.

Coquet Islands SPA and Farne Islands SPA

7.4.11 No adverse effects on the integrity of the Coquet Islands SPA and the Farne Islands SPA were predicted as a result of construction, operation or decommissioning of the Project One components (offshore, within the Humber Estuary and onshore) alone or in-combination with other projects. No LSEs were predicted on the features of these SPAs as a result of offshore project components (see Section 4.3). As discussed in paragraphs 7.3.49 *et seq*., no adverse effects were predicted on the features of these SPAs (specifically common tern) as a result of project components within the Humber Estuary and onshore, particularly when considering the mitigation measures detailed in Section 6.4 (specifically undertaking all cable installation in the intertidal between April and September, inclusive), and therefore no adverse effects on the integrity of these SPAs were predicted.

REFERENCES

Able UK Ltd. (2011) *Able Marine Energy Park: Habitats Regulations Assessment Information*. December 2011. 469pp.

Able Humber Ports Ltd., Marine Management Organisation and Natural England (2012) *Proposed Able Marine Energy Park: Statement of Common Ground on Shadow Habitats Regulations Assessment*. 24 August 2012

ALAB (2009) *Able Humber Ports Facility Northern Area Environmental Statement Non Technical Summary*. ALAB Environmental Services Ltd.

Allen, J. Boyes, S. Burdon, D. Cutts, N. Hawthorne, E. Hemingway, K. Jarvis, S. Jennings, K. Mander, L. Murby, P. Proctor, N. Thomson, S. and Waters, R. (2003) *The Humber Estuary: A comprehensive review of its nature conservation interest.* English Nature Report Number 547, Peterborough.

APEM (2012) *Migration modelling and collision risk modelling in relation to Hornsea Subzone 1 Development*.

Arcus (2012) *Newton Marsh Extension Windfarm Environmental Statement.* ASC Renewables.

Bakker, J.P and Stahl, J. (2004) *Changes in land use and their consequences for saltmarsh communities. Wader Study Group Bulletin 105*. http://www.waderstudygroup.org/conf/previous/IWSGconference2004-abstracts.pdf

Band, B. (2000) *Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming no Avoiding Action.*

Band B. (2012) Using a collision risk model to assess bird collision risks for offshore windfarms. *The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02*. BTO and the Crown Estate. British Trust for Ornithology, Norfolk.

Band W., Madders M., and Whitfield D.P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In: de Lucas M., Janss G.F.E. and Ferrer M. (eds.) *Birds and Wind Farms: Risk Assessment and Mitigation*. Quercus, Madrid. p. 259-275.

Barton, C. and Pollock, C (2009) *Study to evaluate the significance of impact of UK offshore installations on migratory birds.* Cork Ecology.

Barton, C. Pollock, C & Harding, N. (2010) *Arklow Bank Seabird and Marine Monitoring Programme*. Year 9 Final report. A report to Airtricity.

Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F. (2011) Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191.

BERR (2008) *Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry – Technical Report*. Available: http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43527.pdf

BirdLife International (2012) http://seabird.wikispaces.com/ Accessed February 2012.

Blake, B. F. Dixon, T. J. Jones, P. H. and Tasker, M. L. (1985) *Seasonal changes in the feeding ecology of guillemots Uria aalge off north and east Scotland*. Estuarine, Coastal and Shelf Science, 20: 559–568

Bodznick, D. and Northcutt, R.G. (1981) Electro*reception in Lampreys: Evidence that the Earliest Vertebrates were Electroreceptive.* Science, 212, 465-467.

Bodznick, D. and Preston, D.G. (1983) Physiological Characterization of Electroreceptors in the Lampreys. *Ichthyomyzon uniscuspis and Petromyzon marinus*. Journal of Comparative Physiology 152, 209-217.

Bonner, W.N. (1982) Seals and man: A study of interactions. University Washington Press, Seattle, WA. 170p.

BOW (2008) *Results from Walney Island Bird Survey, Autumn 2007*. Appendix 4 to Barrow Offshore Wind Farm – First post construction monitoring report. BOWind, NIRAS A/S, Aarhus, Report for DONG Energy and Centrica.

Beatrice Offshore Wind Farm Limited (BOWL) (2012) *Beatrice Offshore Wind Farm Environmental Statement*. Section 12 Marine Mammals. April 2012.

Brandt, M.J., Höschle, C., Diederichs, A., Betke, K., Matuschek, R., Nehls, G. (2013) *Seal scarers as a tool to deter harbour porpoises from offshore construction sites*. Marine Ecology Progress Series. 475: 291-302.

Brasseur, S., Reijnders, E. and Meesters, E. (2006) *Baseline data on harbour seals Phoca vitulina, in relation to the intended wind farm site OWEZ, in the Netherlands*. Report No. OWEZ R 252 20061020. Wageningen IMARES Institute for Marine Resources & Ecosystem Studies. Report commissioned by NoordzeeWind.

Brasseur, S, Petel, T, P. Meesters, G.A.E. Dijkman, E. & Reijnders, P. (2010) *Grey Seals*. IMARES. LNV. Noordzewind.

British Standard (BS) 5228-1:2009, *Code of practice for noise and vibration control on construction and open sites*.

Bruinzeel, L.W. Belle J. van. and Davids, L. (2009) *The impact of conventional illumination of offshore platforms in the North Sea on migratory bird populations.* A&W rapport 1227. Altenburg & Wymenga ecologisch onderzoek Feanwalden.

Bryan, G.W. and Gibbs, P.E. (1983) *Heavy metals from the Fal estuary, Cornwall: a study of long-term contamination by mining waste and its effects on estuarine organisms.* Plymouth: Marine Biological Association of the United Kingdom [Occasional Publication, no. 2.].

BTO (2012) *Online ringing reports, Species recoveries*. http://www.bto.org/volunteer-surveys/ringing/publications/online-ringing-reports. Accessed October 2012.

BTO (2013) Bird Facts. http://www.bto.org/about-birds/birdfacts. Last accessed May 2013.

Budd, G.C. (2008b) *Barren coarse sand shores*. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 26/10/2012]. Available from: http://www.marlin.ac.uk/habitatsbasicinfo.php?habitatid=16&code=2004.

Burger, J. (1988) *Effects of demolition and beach clean-up operations on birds on a coastal mudflat in New Jersey*. Estuarine, Coastal and Shelf Science. 27: 95-108.

Burger, J. and Gochfeld, M. (1991) *Human activity influence and diurnal and nocturnal foraging of sanderlings (Calidris alba)* The Condor. 93(2): 259-265.

Burton, N.H.K. Evans, P.R. & Robinson, M.A. (1996) *Effects on shorebird numbers of disturbance, the loss of a roost site and its replacement by an artificial island at Hartlepool, Cleveland*. Biological Conservation 77: 193-201.

Burton, N. H. K. Armitage, M. J. S. Musgrove, A. J. & Rehfisch, M. M. (2002a) *Impacts of man-made landscape features on numbers of estuarine waterbirds at low tide.* Environmental Management, 30, 857-864.

Burton, N.H.K. Rehfisch, M.M. and Clark, N.A. (2002b) *Impacts of disturbance from construction work on the densities and feeding behaviour of waterbirds using the intertidal mudflats of Cardiff Bay, UK.* Environmental Management 30: 865-871.

Burton, N.H.K. Rehfisch, M.M. Clark, N.A. & Dodd, S.G. (2006*) Impacts of sudden winter habitat loss on the body condition and survival of Redshank Tringa totanus*. Journal of Applied Ecology 43: 464-473.

Camphuysen, C.J. Calvo, B. Durinck, J. Ensor, K. Follestad, A. Furness, R.W. Garthe, S. Leaper, G. Skov, H. Tasker, M.L. and Winter, C.J.N. (1995) *Consumption of discards by seabirds in the North Sea.* Final Report EC DG XIV, research con- tract BIOECO/93/10. NIOZ report 1995.

Camphuysen, C. J. and Garthe, S. (1997) *An evaluation of the distribution and scavenging habits of northern fulmars (Fulmarus glacialis) in the North Sea.* – ICES Journal of Marine Science, 54: 654–683.

Camphuysen C.J. & Siemensma, M.L. (2011) *Conservation plan for the Harbour Porpoise Phocoena phocoena in The Netherlands: towards a favourable conservation status*. NIOZ Report 2011-07, Royal Netherlands Institute for Sea Research, Texel.

Carney, K.M. & Sydeman, W.J. (1999) *A review of human disturbance effects on nesting colonial waterbirds*. Waterbirds, 22, 68–79.

Carter, D, Lead Adviser, Land Use Operations Team, Natural England. (2012) *Roosecote Power Station, Barrow-in-Furness, Cumbria: Bird Disturbance Guidelines and Reference Documents*. Letter to RPS, 20 January 2012.

Catley, G. (2000) *Humber Estuary wetland bird survey*. Twelve months of high and low tide counts September 1998 to August 1999. Peterborough: English Nature Research Reports, No. 339.

Centrica Energy (2009) *Race Bank Offshore Wind Farm*. Environmental Statement, Chapter 6 Biological Environment. 213pp.

Cetaceans Strandings Investigation Programme (CSIP) (2011) *UK Cetacean Strandings Investigation Programme*. Final Report for the period 1st January 2005 – 31st December 2010. 98pp.

Chung-Davidson. Y. Bryan, M.B. Teeter, J. Bedore, C.N. and Li, W. (2008) *Neuroendocrine and Behavioural Responses to Weak Electric Fields in Adult Sea Lampreys (Petromyzon marinus)*. Hormones and Behaviour, 54(1), 34-40.

CMACS (Centre for Marine and coastal studies) (2003) *A Baseline Assessment of Electromagnetic fields Generated by Offshore Wind farm Cables*. Report No. COWRIE EMF-01-2002, 66. Centre for Marine and Coastal Studies, Birkenhead, UK.

Cook, A,S,C.P, Johnstone, A. Wright, L.J. and Burton, N.H.K. (2012) *A review of methods to estimate the risk of bird collisions with offshore wind farms*. Strategic Ornithological Support Services. Project SOSS-02. BTO Report for The Crown Estate. December 2011.

Coull, K. A., Johnstone, R and Rogers, S. I. (1998) *Fishery Sensitivity Maps in British Waters*. Published and distributed by UKOOA Ltd.

Cruickshanks, K. Liley, D. Fearnley, H. Stillman, R. Harvell, P. Hoskin, R. and Underhill-Day, J. (2010) *Desk Based Study on Recreational Disturbance to birds on the Humber Estuary*. Footprint Ecology / Humber Management Scheme.

Cutts, N. and Allen, J. (1999) *Avifaunal Disturbance Assessment: Flood Defence Work, Saltend.* Institute of Estuarine and Coastal Studies, University of Hull, Report to Environment Agency.

Cutts, N; Phelps, A; Burdon, D. (2009) *Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance.* Report to Humber INCA. Institute of Estuarine and Coastal Studies, University of Hull.

DCLG (2012) *National Planning Policy Framework*. Department of Communities and Local Government, March 2012.

DECC, (2013) *Record of the Habitats Regulations Assessment undertaken under Regulation 25 of the Offshore Marine Conservation Regulations 2007 (as amended) for an application under the Planning Act 2008)*.

Dehnhart G, Mauck B, Hanke W and Bleckman H. (2001) *Hydrodynamic trail-following in harbour seal (Phoca vitulina)*. *Science* 293: 102-104

DONG Energy (2009) *Westernmost Rough Offshore Wind Farm*: *Environmental Statement*. October 2009. 230pp.

Doody, J.P. (2004) *'Coastal squeeze' – An historical perspective.* Journal of Coastal Conservation, January 2004, Volume 10, Issue 1, pp 129-138.

Dooling, R.J. and Popper, A.N. (2007) *The effects of highway noise on birds*. Report to California Department of Transportation, Contract No. 43A0139. Environmental Acoustics LLC, Rockville, Maryland, USA.

Duck, C. (2010) *Charting Progress 2 Healthy and Biological Diverse Seas. Feeder Report: Section 3.5: Seals*. Published by Department for Environment Food and Rural Affairs on behalf of UKMMAS. p506-539. In: UKMMAS (2010) Charting Progress 2 Healthy and Biological Diverse Seas Feeder Report (Eds. Frost, M and Hawkridge, J).

E.ON (2008) *Humber Gateway Offshore Wind Farm*. Offshore Environmental Statement, Section 11: The Biological Environments – Assessment of Impacts. 67pp.

East Anglia One Ltd (EAOWL) (2012) *East Anglia Project one Environmental Statement*.

EEA, (2009a) *Habitats Directive Article 17 Reporting – Halichoerus grypus*. Assessments of conservation status at the European level.

EEA, (2009b) *Habitats Directive Article 17 Reporting – Phoca vitulina*. Assessments of conservation status at the European level.

EEA (2009c) *Habitats Directive Article 17 Reporting – Phocoena phocoena*. Assessments of conservation status at the European level

EEA (2013) *Natura 2000 data forms for Natura 2000 sites. Accessed January 2013*

Elliott, M. and Quintino, V. (2007) *The Estuarine Quality Paradox, Environmental Homeostasis and the difficulty of detecting anthropogenic stress in naturally stressed areas*. Marine pollution bulletin, 54(6), pp.640-5.

English Nature (1997) *Habitats Regulations Guidance Note: The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994. English Nature May 1997.*

English Nature (1999) *Habitats Regulations Guidance Note 3: The Determination of Likely Significant Effect under The Conservation (Natural Habitats &c) Regulations 1994. English Nature November 1999.*

English Nature (2003) *The Humber Estuary European Marine Site, English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats & c.) Regulations 1994, Interim advice, April 2003.*

English Nature and Environment Agency (2003) *North Norfolk Coast Coastal Habitat Management Plan Final Report*. Available from: http://www.naturalengland.org.uk/Images/Norfolk%20Final_tcm6-2734.pdf. [Accessed 27 August 2012].

Environment Agency (2011) *Tetney to Saltfleet Tidal Flood Defence Scheme.* Appendix 6.3.5 Information in Support of Habitats Regulations Assessment. June 2011.

Environment Agency (2013) *Grimsby Docks Flood Risk Management Scheme Environmental Statement, April 2013.*

Erwin, R.M. (1989) *Responses to human intruders by birds nesting in colonies: experimental results and management guidelines.* Colonial Waterbirds, 12, No. 1: 104-108

Fitzpatrick, S. and Bouchez, B. (1998) *Effects of recreational disturbance on the foraging behaviour of waders on a rocky beach.* Bird Study Vol. 45(2) pp157-171.

Forewind (2013) *Dogger Bank Creyke Beck Environmental Statement*. Document ref. No. F-OFC-CH-001-Issue 4.

Furness, B. Wade, H. (2012) *Vulnerability of Scottish seabirds to offshore wind turbines*. MacArthur Green Ltd. Glasgow, Scotland.

Galloper Wind Farm Limited (GWFL) (2011) *Galloper Wind Farm Project Environmental Statement*. Chapter 14 Marine Mammals. October 2011.

García-Alonso, J. Greenway, G.M. Munshi, A. Gómez, J.C. Mazik, K. Knight, A.W. Hardege, J.D. and Elliott, M. (2011) *Biological responses to contaminants in the Humber Estuary: Disentangling complex relationships*. Marine Environmental Research, 71(4), pp.295-303.

Gill JA (2007) *Approaches to measuring the effects of human disturbance on birds*. Ibis 149: 9-14.

Gill JA, Norris K, Sutherland WJ (2001) *Why behavioural responses may not reflect the population consequences of human disturbance*. Biol Conserv 97: 265-268

Gill, A. B. Gloyne-Phillips, I. Neal, K. J. and Kimber, J. A. (2005) *The Potential Effects of Electromagnetic Fields Generated by Sub-Sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms – A Review*. COWRIE 1.5 Electromagnetic Fields Review.

Gill, A.B. Huang, Y. Gloyne-Philips, I. Metcalfe, J. Quayle, V. Spencer, J. and Wearmouth, V. (2009) *COWRIE 2.0 Electromagnetic Fields (EMF)* Phase 2: EMF-Sensitive Fish Response to EM Emissions from Sub-Sea Electricity Cables of the Type used by the Offshore Renewable Energy Industry. COWRIE-EMF-1-06.

Gill, J.A. Sutherland, W.J. & Watkinson, A.R. (1996) *A method to quantify the effects of human disturbance on animal populations.* Journal Of Applied Ecology, 33, 786-792.

Gill, J.P. Sales, D. Pinder, S. & Salazar, R. (2008) *Kentish Flats Wind farm fifth ornithological monitoring report*. Report to Kentish Flats Ltd.

Goss-Custard, J. D. & Verboven, N. (1993) *Disturbance and feeding shorebirds on the Exe estuary*. Wader Study Group Bulletin, 68, 59–66.

Goss-Custard, J.D. (2007) *National Cycle Network - Exe Estuary Proposals. Assessment of the Anticipated Effects on the Exe Estuary Special Protection Area*. Devon County Council.

Hamer, K.C. Holt, N. & Wakefield, E. (2011) *The distribution and behaviour of northern gannets in the Firth of Forth and Tay area. A review on behalf of the Forth and Tay Offshore Wind Developers Group. Institute of Integrative & Comparative Biology*, University of Leeds.

Hammond, P.S. (2006) *Small Cetaceans in the European Atlantic and North Sea (SCANS II).* Final Report LIFE04NAT/GB/000245. 31/12/2006.

Hammond, P.S., Gordon, J.D.D., Grellier, K., Hall, A.J., Northrridge, S.P., Thompson, D. and Harwood, J. (2001) *Strategic Environmental Assessment (SEA2) – Technical Report 006 – Marine Mammals*. Produced by the Scottish Marine Research Unit (SMRU) on behalf of the Department for Trade and Industry (Dti). August 2001.

Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O. and Vázquez, J.A. (2013) *Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management, Biological Conservation*, Volume 164, August 2013, Pages 107-122.

Harris, M. Wanless, S. (2011) *The Puffin*. T&D Poyser.

Hassel, A. Knutsen, T. Dalen, J. Skaar, K. Løkkeborg, S. Misund, O. A. Øivind, Ø. Fonn, M. and Haugland, E. K. (2004) *Influence of seismic shooting on the lesser sandeel (Ammodytes marinus)*, ICES Journal of Marine Science, 61, pp. 1165-1173.

Hatch, S. A. (1989) *Diurnal and seasonal patterns of colony attendance in the northern fulmar, Fulmarus glacialis, in Alaska*. Canadian Field-Naturalist, 103: 248–260.

Heintze, N.T. (2006) *The effects of boat disturbance on seabirds off southwestern Vancouver Island, British Columbia*. BSc Thesis. Department of Biology, University of Victoria.

Hirons, G. & Thomas, G. (1993) *Disturbance on estuaries: RSPB nature reserve experience*. Wader Study Group Bulletin, 68, 72-78.

Hockin, D. Ounsted, M. Gorman, M. Hill, D. Keller, V. & Barker, M.A. (1992) *Examination of the effects of Disturbance on birds with reference to its importance in Ecological Assessments.* Journal of Environmental Management, 36, 253-286.

Holt, C.A. Austin, G.E. Calbrade, N.A. Mellan, H.J. Mitchell, C. Stroud, D.A. Wotton, S.R. & Musgrove, A.J. (2011) *Waterbirds in the UK 2009/10: The Wetland Bird Survey*. BTO/RSPB/JNCC, Thetford.

Huang, Y. (2005*) Electromagnetic Simulations of 135-kV Three phase Submarine Power Cables.* Centre for Marine and Coastal Studies, Ltd. Prepared for Sweden Offshore.

Hull City Council (2012) Habitats Regulations Assessment for Green Port Hull. April 2012

IECS (1987) *The Humber Estuary: Environmental Background. Institute of Estuarine and Coastal Studies*, University of Hull. Shell UK Limited, 55pp.

IECS (2007*) Avifaunal Disturbance Assessment: flood defence works, Saltend. Institute of Estuarine and Coastal Studies (IECS*), University of Hull, UK. Report to the Environment Agency.

IPC (2010) *Infrastructure Planning Commission Scoping opinion: Proposed Hornsea Project One Offshore Windfarm.* December 2010.

Jak, R.G. Witbaard, B.R. Lindeboom, H.J. (2009) *Bijlagenrapport bij Instandhoudingsdoelen* Natura 2000-gebieden Noordzee. IMARES report. C065/09.

JNCC (2011) Smart Wind Ltd. *Hornsea Round 3 Zone – Ornithological Year 1 Report. Ref No*. OIA/8171. 21 October 2011.

JNCC (2012) *Guidance for staff advising on the potential risk of seal corkscrew injuries*. April 2012. Joint Nature Conservation Committee.

JNCC (2013) Kittiwake SPA. http://jncc.defra.gov.uk/pdf/UKSPA/UKSPA-A6-95.pdf (accessed May 2013).

Jones, E. & Matthiopoulos, J. (2012) *Grey & harbour seal usage maps for the Hornsea Offshore Development.* SMRU Ltd.

Kastak, B. Southall, B.L. Schusterman, R.J. and Kastak, C.R. (2005) *Underwater temporary threshold shift in pinnipeds: Effects of noise level and duration.* Journal of the Acoustical Society of America.118. (5).

Keller, V.E. (1991) *The effect of disturbance from roads on the distribution of feeding sites of geese (Anser brachyrhynchus, A. anser), wintering in north-east Scotland*. Ardea. 79: 229–232.

Klein, M.L. Humphrey, S.R. Percival, H.F. (1995) *Effects of eco-tourism on distribution of waterbirds in a wildlife refuge.* Conservation Biology 9, 1454±1465.

Kowallik, C. and Borbach-Jaene, J. (2001) *Impact of wind turbines on field utilization by geese in coastal areas in NW Germany.* Vogelkundliche Berichte aus Niedersachen 33: 97-102.

Krijgsveld K.L. Fijn R.C. Japink M. van Horssen P.W. Heunks C. Collier M.P. Poot M.J.M. Beuker D. and Dirksen S. (2011) *Effect studies Offshore Wind Farm Egmond aan Zee: Final report on fluxes, flight altitudes and behaviour of flying birds*. NoordzeeWind report nr OWEZ_R_231_T1_20111114_fluxandflight, Bureau Waardenburg report nr 10-219.

Langston R.H.W. (2010) *Offshore wind farms and birds: Round 3 zones, extensions to Round 1 and 2 sites and Scottish Territorial Waters*. RSPB Research Report No. 39.

Langston R.H.W. and Tueten E. (in prep) *Tracking Gannets from Bempton Cliffs.* Presentation for DECC seminar 23 April 2013.

Langston, R.H.W. and Teuten, E. (2012) *Foraging ranges of northern gannets Morus bassanus in relation to proposed offshore wind farms in the North Sea:* 2011. RSPB Report to DECC.

Leopold, M.F. Dijkman, E.M. Teal, L. & the OWEZ-Team, (2011) *Local Birds in and around the Offshore Wind Farm Egmond aan Zee* (OWEZ) (T-0 & T-1, 2002-2010). A report by IMARES for NoordzeeWind.

Lewis, M. Lye, G. Pendleberry, C. Walls, R. (2012) *Population sizes of seabirds breeding in Scottish SPAs*. Final Report to (Scottish Government (Marine Scotland).

Lindeboom, H.J, Kouwenhoven, M.J, Bergman, M.J.N, Bouma, S. Brasseur, S. Daan, R. Fijn, R.C, de Hann, D. Dirksen, S. van Hal, R. Hille Ris Lambers, R. ter Hofstede, R. Krijgsveld, K.L, Loepold, M. and Scheidat, M. (2011) *Short-term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation.* Environmental Research Letters. 6 13pp.

Lloyd, C. Tasker, M.L. and Partridge, K. (1991) *The Status of Seabirds in Britain and Ireland.* T & A D Poyser, London

Lloyd, C.S. & Perrins, C.M. (1977) *Survival and First Age of Breeding in the Razorbill Alca torda*. Bird-Banding 1977.

Lourenço, P.M. Granadeiro, J.P. and Palmeirim, J.M. (2004) *The importance of drainage channels for waders foraging on tidal flats.* Wader Study Group Bulletin 105. http://www.waderstudygroup.org/conf/previous/IWSGconference2004-abstracts.pdf

Lucke K., Siebert U., Lepper P.A., Blanchet M-A. (2009) *Temporary shift in masked hearing thresholds in a harbour porpoise (Phocoena phocoena) after exposure to seismic airgun stimuli*. Journal of the Acoustical Society of America 125(6), 4060-4070, June 2009.

Lusseau, D., Christiansen, F., Harwood, J, Mendes, S., Thompson, P.M., Smith, K., Hastie, G.D. (unpublished) *Assessing the Risks to Marine Mammal Populations from Renewable Energy Devices – An Interim Approach*. University of Aberdeen, University of St. Andrews, JNCC, CCW, SMRU Ltd.

Mainstream renewable Power (2012) Neart na Gaoithe Offshore Wind Farm Environmental Statement. Chapter 13 Marine Mammals.

Maitland, P.S. (2003) *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Mander, L. and Cutts, N. (2005) *Humber Estuary Low Water Count Programme 2003-2004*. English Nature Report 656.

Marsden, S.J. (2000) *Impact of Disturbance on Waterfowl Wintering in a UK Dockland Redevelopment Area.* Environmental Management, 26, 207-213.

McDonald, C. Searle, K. Wanless, S. & Daunt, F. (2012) *Effects of displacement from marine renewable development on seabirds breeding at SPAs.* Final report to MSS

Miersch, L. Hanke, W. Wieskotten, S. Hanke, F.D. Oeffner, J. Leder, A. Brede, M. Witte, M. and Dehnhardt, G. (2011) *Flow sensing by pinniped whiskers*. Transactions of the Royal Society. B, 366 (1581): 3077-3084.

Miller, L.M., Solangi, M., Kuczaj II, S.A. (2008) *Immediate response of Atlantic bottlenose dolphins to high-speed personal watercraft in the Mississippi Sound*. J. Mar. Biol. Ass. UK, 88(6): 1139-1143.

Mitchell, C.R. & Hearn, R.D. (2004) *Pink-footed Goose Anser brachyrhynchus (Greenland/Iceland population) In Britain 1960/61 – 1999/2000.* Waterbird Review Series, The Wildfowl & Wetlands trust/Joint Nature Conservation Committee, Slimbridge.

Mitchell, P. I. Scott, I. and Evans, P.R. (2000) *Vulnerability to severe weather and regulation of body mass of Icelandic and British Redshank Tringa totanus.* Journal of Avian Biology 31(4): 511-521.

Mitchell, P.I. Newton, S.F. Ratcliffe, N. and Dunn, T.E. (eds.) (2004) *Seabird Populations of Britain and Ireland.* Poyser, London.

Moray Offshore Renewables Limited (MORL) (2012) *Moray Offshore Renewables Limited Environmental Statement*. Telford, Stevenson and MacColl Offshore Wind Farms and Transmission Infrastructure.

Natural England and JNCC (2012) *Joint Natural England and JNCC Interim Advice Note: Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments.*

Newell, R.C. Seiderer, L.J. Simpson, N.M. & Robinson, J.E. (2002) *Impact of Marine Aggregate Dredging and Overboard Screening on Benthic Biological Resources in the Central North Sea: Production License Area 408, Coal Pit.* Marine Ecological Surveys Limited Technical Report No ER1/4/02 to the British Marine Aggregate Producers Association. 72 pp.

Normandeau (Normandeau Associates, Inc.), Exponent Inc. T. Tricas, T. and Gill, A. (2011) *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species*. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA.OCS Study BOEMRE 2011-09. [online] Available at: <http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/5115.pdf.> [Accessed 24 January 2012].

OSPAR (2009) *Assessment of impacts of offshore oil and gas activities in the North-East Atlantic. OSPAR Commission*. ISBN 978-1-906840-93-8. Publication Number: 453/2009.

OSPAR (2012) *Report of the OSPAR workshop on research into possible effects of regular platform lighting on specific nird populations*. OSPAR Secretariate.

Owen, M. (1993) *The UK Shooting and Wildfowl Disturbance Project. Wader Study Group Bull:* 68: 35-46.

Parsons Brinckerhoff (2013) North Killingholme Power Project: Report to Inform Habitats Regulations Assessment. C.GEN Killingholme Ltd. March 2013.

Pegasus Planning Group (2011) *Farm Marsh Farm Environmental Statement*. On behalf of Mr. A. Wielkopolski, December 2011.

Pfister, C. Harrington, B. A. & Lavine, D. M. (1992) *The impact of human disturbance on shorebirds at a migration staging area.* Biological Conservation, 60, 115–126.

Pinn, E (2009) *Threshold for Designation of Special Areas of Conservation for Harbour Porpoise and other Highly Mobile, Wide Ranging Marine Species*. Annex 1 to JNCC Committee paper P10 Sept 2008, amended 13 February 2009.

PINS (2012) Scoping Opinion for Hornsea Project One. [online] Available at: < http://infrastructure.planningportal.gov.uk/wpcontent/ipc/uploads/projects/EN010033/1.%20Pre-Submission/EIA/Scoping/Scoping%20Opinion/120514_EN010033_Hornsea_Project_One_2nd%20Scoping_Opinion.doc.pdf> [Accessed 23 July 2012].

PINS (2013) Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects, Version 4, January 2013, 16pp.

PMSS (2005) *Greater Gabbard Offshore Wind Farm Environmental Statement*. Report for Airtricity and Fluor.

Poot, H. B. J. Ens, H. de Vries, M. A. H. Donners, M. R. Wernand, and J. M. Marquenie. (2008) *Green light for nocturnally migrating birds*. Ecology and Society **13**(2): 47. [online] URL: http://www.ecologyandsociety. org/vol13/iss2/art47

Prater, A.J. (1981) *Estuary Birds of Britain and Ireland*. T & AD. Poyser.

Richardson, W.J., Greene, C.R. Jr., Malme, C.I., and Thomson, D.H. (1995) *Marine Mammals and Noise*. Academic Press, San Diego, CA, USA. 576p.

Reid, J.B., Evans, P.G.H. and Northridge, S.P. (2003) *Atlas of Cetacean distribution in north-west European waters*. Joint Nature Conservation Committee (JNCC), Peterborough.

Robinson, R.A. (2005) *BirdFacts: profiles of birds occurring in Britain and Ireland* (v1.1, Jan 2006). BTO Research Report 407, BTO, Thetford (http://www.bto.org/birdfacts).

Rodgers, Jr. J.A. and Smith, H.T. (1995) *Set-back distances to protect nesting bird colonies from human disturbance in Florida.* Conserv. Biol. 9(1): 89-99

Royal Haskoning (2009) *Dudgeon Offshore Wind Farm: Environmental Statement, Section 10: Marine Ecology*. Prepared on behalf of Dudgeon Offshore Wind Limited. 53pp.

Royal Haskoning (2010) *Saltmarsh recovery monitoring survey Technical Report.* Prepared for Thanet Offshore Wind Ltd*.* Technical Report no. 9T6750/R0021/RK.

RPS (2013) *Tetney Sea Line Replacement Project.* Environmental Impact Assessment Scoping Report, March 2013, 68 pp.

RPS (*in prep.)* Lincs / LID6 Offshore Wind Farm – Boat-based Ornithological Monitoring: Construction Phase. Report for CREL.

RPS (2005) *Environmental Statement Volume 1: Offshore Works*. London Array Limited. June 2005.

RWE (2008) *North Hoyle Final Monitoring Report*. Report to Npower renewables

Santos, M.B. and Pierce, G.J. (2003) The diet of harbour porpoise (Phocoena phocoena) in the Northeast Atlantic. Oceanography and Marine Biology: an Annual Review 2003, 41, 355–390.

Santos, M.B., Pierce, G.J., Learmonth, J.A., Reid, R.J., Ross, H.M., Patterson, I.A.P., Reid, D.G. and Beare, D. (2006) Variability in the diet of harbour porpoises (Phocena phocoena) in Scottish waters 1992-2003. Marine Mammal Science, 20(1), 1-27.

Seagreen Wind Energy (2012) *Environmental Statement Volume 1*. Chapter 13: Marine Mammals. September 2012.

Sea Mammal Research Unit (SMRU) (2004) *SMRU Scientific Report 1999 – 2004. September 2004*. Available from [http://www.smru.st-and.ac.uk/documents/SMRU_Scientific_Report.pdf] Downloaded 31 July 2012.

Sea Mammal Research Unit (SMRU) (2011) *Summary of seal count and telemetry data from the Humber area*. Report to SMart Wind. 14th October 2011.

Seabed Scour Control Systems (2013) How the Frond System Works. Available from http://www.sscsystems.com/scour-control/how-the-frond-system-works. [Accessed 19 April 2013]

SeaonScreen (2012) *Harbour seal.* http://www.zeeinzicht.nl/vleet/index.php?id=4171&template=template-vleeteng&language=2&offline=0&keep_empty_divs=0. (Accessed November 2012).

Senior, B., Bailey, H., Lusseau, D., Foote A.D. and Thompson, P.M. (2008) *Anthropogenic noise in the Moray Firth SAC; potential sources and impacts on bottlenose dolphins*. Scottish Natural Heritage Commissioned Report No. 265 (ROAME No. F05LE02).

SKM (2011) *Onshore Installation Methods to be Adopted for HVDC Cables AH v4*. Technical Note, September 2011.

Skov, H. and Durink, J. (2001) *Seabird attraction to fishing vessels is a local process*. Mar. Ecol. Prog. Ser. 214: 289-298

SMart Wind (2010) *Hornsea Project One Environmental Impact Assessment* Scoping Report. November 2010.

SMart Wind (2012a) *Hornsea Project One Scoping Report* Addendum. 2012.

SMart Wind (2012b) *Hornsea Zonal Environmental Assessment* (ZEA). July 2012.

SMart Wind (2012c). *Hornsea Project One Preliminary Environmental Information Report.*

SMart Wind (2012d) *Hornsea Project Two Environmental Impact Assessment Scoping Report*. October 2012.

Smit, C.J. & Visser, G.J.M. (1993) *Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area*. Wader Study Group Bulletin, 68, 6-19.

Smith J (1998) *UKCS 18th Round Environmental Screening Report: Area IV Southern North Sea*. Report to UKOOA. Cordah, Neyland, Pembrokeshire. Report No. OPRU/6/98

SMP (2012) Seabird Monitoring Programme. JNCC 2012 http://jncc.defra.gov.uk/page-4460.

SNH (2012) Sitelink. http://gateway.snh.gov.uk/sitelink/index.jsp (Accessed October 2012).

Southall, B. L., Bowles, A .E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Darlene, D. K., Miller, J. H., Nachtigall, P. E., Richardson, W. J., Thomas, J. A. and Tyack, P. L. (2007) *Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations*. Aquatic Mammals, 33, pp 411-509.

Sparling, C. Russell, D. Lane, E. Grellier, K. Lonergan, M. Matthiopoulous, J. and Thompson, D. (2011) *Baseline seal information for the FTOWDG area. SMRU report to Forth Tay Offshore Wind Farm Developers Group.*

Special Committee on Seals (SCOS) (2011) *Scientific advice on matters relating to the management of seal populations: 2011*. SCOS Main Advice 2011. Available from [http://www.smru.st-and.ac.uk/documents/678.pdf] Downloaded 8th August 2012.

Stillman, R.A. West, A.D. Goss-Custard, J. McGrorty, S. Frost, N. Morrisey, D.J. Kenny, A.J. & Drewitt, A.L. (2005) *Predicting site quality for shorebird communities: a case study on the Humber estuary, UK*. Mar Ecol Prog Ser 305: 203-217.

Stone C.J. Webb A. Barton C. Ratcliffe N. Redd T.C. Tasker M.L. Camphuysen C.J. and Pienkowski M.W. (1995) *An atlas of seabird distribution in north-west European waters.* Joint Nature Conservation Committee and Nederlands Institute voor Onderzoek der Zee, Peterborough.

Symonds, FL; Langslow, DR; Pienkowski, MW. (1984) *Movements of wintering shorebirds within the Firth of Forth: Species differences in usage of an intertidal complex*. *Biol. Conserv.* 28(3): 187-215

Tasker, M. L. Amundin, M. Andre, M. Hawkins, A. Lang, W. and Merck, T. (2010) Marine Strategy Framework Task Group 11 Report and Other Forms of Energy. *Underwater noise*. Group. doi:10.2788/87079.

The Crown Estate (TCE) (2009) *The Crown Estate Habitats Regulations Assessment of the Round 3 Plan*: Information to Inform an Appropriate Assessment November 2009 Entec UK Limited

Thaxter, C.B. Lascelles, B. Sugar, K. Cook, A.S.C.P. Roos, S. Bolton, M. Langton, R.H.W.and Burton, N.H.K. (2012) *Seabird foraging ranges as a tool for identifying candidate marine protected areas.*

Thaxter, C.B. Ross-Smith, V.H. Clark, N.A. Conway, G.J. Wade, H. Masden, E.A. Rehfisch, M.M. Bouten, W. Burton, N.H.K. (2012) *Measuring the interaction between marine features of Special Protection Areas with offshore wind farm development zones through telemetry: second year report. Report for Department of Energy and Climate Change.*

Thaxter, C.B. Sansom, A. Thewlis, R.M. Calbrade, N.A, Ross-Smith, V.H. Bailey, S. Mellan, H.J. & Austin, G.E. (2010) *Wetland Bird Survey Alerts 2006/2007: Changes in numbers of wintering waterbirds in the Constituent Countries of the United Kingdom, Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs). BTO Research Report 556*. BTO, Thetford.

Thompson, C. Bexton, S. Brownlow, A. Wood, S. Patterson, T. Pye, K. Lonergan, M. and Milne, R. (2010) *Report on recent seal mortalities in UK waters caused by extensive lacerations* October 2010. Sea Mammal Research Unit.

Thompson, D. and Duck, C. (2010) *Berwickshire and North Northumberland Coast European Marine Site: grey seal population status.* Report to Natural England: 20100902-RFQ.

Thompson, P.M, McConnell, B.J., Tollit, D.J., Mackay, A., Hunter, C., and Racey, P.A. (1996) Comparative distribution, movements and diet of harbour and grey seals from the Moray Firth, N.E. Scotland. Journal of Applied Ecology, 33: 1572-1584.

Thompson, D. Sjoberg, M., Bryant, M.E., Lovell, P., Bjorge, A. (1998) *Behavioural and physiological responses of harbour (Phoca vitulina) and grey (Halichoreus grypus) seals to seismic surveys*. Report to European Commission of BROMMAD Project. MAS2C7940098.

Thompson, D. Bexton, S. Brownlow, A. Wood, D. Patterson, T. Pye, K. Lonergan, M. Milne, R. (2010) *Report on recent seal mortalities in UK waters caused by extensive lacerations*. SMRU, October 2010.

Thompson, P., Hastie, G., Nedwell, J., Barham, R., Brooker, A., Brookes, K., Cordes, L., Bailey, H. and McLean, N. (2011) *Framework for assessing the impacts of pile driving noise from offshore wind farm construction on Moray Firth harbour seal populations*. Report to support two offshore wind farms applications in the Moray Firth, on behalf of BOWL and MORL.

Thompson, P.M. and Hastie, G. (*in prep*) *Proposed revision of noise exposure criteria for auditory injury in pinnipeds*. University of Aberdeen.

Tougaard, J., Carstensen, J., Henriksen, O.D., Skov, H. and Teilmann, J. (2003) *Short-term effects of the construction of wind turbines on harbour porpoises at Horns Reef*. Technical report to TechWise A/S. HME/362-02662, Hedeselskabet, Roskilde.

Tougaard, J. and Henriksen, O. D. (2009) *Underwater noise form three types of offshore wind turbines: Estimation of impact zones for harbour porpoises and harbour seals.* J. Acoust. Soc. Am. 125: 3766-3773.

Townshend, D. & O'Connor, D. (1993) *Some effects of disturbance to waterfowl from bait digging and wildfowling at Lindisfarne National Nature Reserve, north-east England.* Wader Study Group Bulletin, 68, 47-52.

Triton Knoll Offshore Wind Farm Limited (TKOWFL) (2012a) *Trion Knoll Offshore Wind Farm Environmental Statement, Annex H Bird Ecology.* Prepared on behalf of Triton Knoll Offshore Wind Farm Limited. January 2012.

Triton Knoll Offshore Wind Farm Limited (TKOWFL) (2012b) *Trion Knoll Offshore Wind Farm Environmental Statement, Volume 2: Chapter 5 – Marine Mammals*. Prepared on behalf of Triton Knoll Offshore Wind Farm Limited. January 2012. 37pp.

Tubbs, C. R. Tubbs, J. M. and Kirby, J. S. (1992) *Dunlin Calidris alpina in the Solent, southern England.* Biological Conservation 60(1): 15-24.

Turpie, J.K. (1995) *Non-breeding territoriality: causes and consequences of seasonal and individual variation in Grey Plover Pluvialis squatarola*. Journal of Animal Ecology, 64, 429-438

Tyler-Walters, H. & Marshall, C. (2008) *Muddy sand shores. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth*: Marine Biological Association of the United Kingdom. Cited 30/01/2012. Available from: http://www.marlin.ac.uk/habitatbenchmarks.php?habitatid=21&code=2004

Tyler-Walters, H. (2008) *Pioneer saltmarsh. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth*: Marine Biological Association of the United Kingdom. [cited 18/10/2012]. Available from: http://www.marlin.ac.uk/habitatbenchmarks.php?habitatid=25&code=2004.

URS (2012a) *Port of Hull Local Development Order, Integrated Environmental Assessment Report*. Hull City Council, February 2012.

URS (2012b) *Paull Local Development Order, Habitats Regulations Screening report*. East Riding of Yorkshire Council, December 2012.

URS Scott Wilson (2011) Green Port Hull: Environmental Statement. Prepared for Associated British Ports, November 2011.

Vattenfall (2011a) *Kentish Flats Offshore Wind Farm Extension Environmental Statement*. Section 11: Marine Mammals. October 2011.

Vattenfall (2011b) European Offshore Wind Deployment Centre Environmental Statement. Aberdeen Offshore Wind Farm Limited. Volume 2 of 4. July 2011.

Wakefield, E.D. et al. (2013) Space Partitioning Without Territoriality in Gannets. Science, 341 (6141), 68-70. [DOI:10.1126/science.1236077]

Wanless, S. Frederiksen, M. Duant, F. Scott, B.E. & Harris, M.P. (2007) *Black-legged kittiwakes as indicators of environmental change in the North Sea*: Evidence from long-term studies. Progress in Oceanography 72:1 pp 30 – 38.

Wanless, S. Harris, M.P. & Greenstreet, S.P.R. (1998) *Summer sandeel consumption by seabirds breeding in the Firth of Forth, south-east Scotland*. ICES Journal of Marine Science 55, 1141–1151.

Wanless, S. Harris, M.P. Redman, P. & Speakman, J.R. (2005) *Low energy values of fish as a probable cause of a major seabird breeding failure in the North Sea*. Mar. Eco. Prog. Ser. Vol 294 1-8 2005.

Webb A. Tasker M.L. and Greenstreet S.P.R. (1985) *The distribution of guillemots (Uria aalge), razorbills (Alca torda) and puffins (Fratercula arctica) at sea around Flamborough Head*, June 1984. Nature Conservancy Council, CSD Report No. 590.

Wellock, S.D. (2003) *Tetney Marshes Nature Reserve 2002/03 Annual Report*. The Royal Society for the Protection of Birds.

Wernham, C.V. Toms, M.P. Marchant, J.H. Clark, J.A. Sirwardena, G.M. and Baillie, S.R. (Eds) (2002) *The Migration Atlas: movement of the birds of Britain and Ireland.* T & AD Poyser.

West, A.D. Goss-Custard, J.D. Stillman, R.A. Caldow, R.W.G. Durell, S.E.A. le V. dit & McGrorty, S. (2002a) *Predicting the impacts of disturbance on shorebird mortality using a behaviour-based model*. Biol. Conserv. 106: 319–328.

Westerberg, H. and Langenfelt, I. (2008) Sub-Sea Power Cables and the Migration Behaviour of the European eel. *Fisheries Management and Ecology*, 15, 369-375.

Wieskotten, S., Mauck, B., Miersch, L., Dehnhardt, G. and Hanke, W. (2011) *Hydrodynamic discrimination of wakes caused by objects of different size or shape in harbour seal*. J. Expt. Biol. 214, 1922-1930.

Winkelman JE, (1992) De invloed van de Sep-proefwindcentrale te Oosterbierum (Fr.)op vogels, 1: aanvaringsslachtoffers, RIN-rapport 92/2, DLO Instituut voor Bos- en Natuuronderzoek, Arnhem, Nederlands, 71p + Appendices. (Dutch with Engl Summ), Winkelman JE 1995, Bird/wind turbine investigations in Europe, In: Proc Nat Avian – Wind Power Plan Meet, Denver, CO, July 1994, p. 110-40.

Wright, MD; Goodman, P; and Cameron, TC. (2010) *Exploring behavioural responses of shorebirds to impulsive noise.* Journal: Wildfowl (2010) 60: pp 150 -167. Wildfowl and Wetlands Trust.

Wright, P. J. and Begg, G. S. (1997) *A spatial comparison of common guillemots and sandeels in Scottish waters*. – ICES Journal of Marine Science, 54: 578–592.

WWT (2011) *SOSS-04 Gannet Population Viability Analysis.* Demographic Data, Population Model and Outputs, Report to The Crown Estate SOSS.

Yochem, P.K., Stewart, B.S., DeLong, R.L., DeMaster, D.P. (1987) *Diel Haul-out patterns and site fidelity of harbour seals (Phoca vitulina) on San Miguel Island, California, in Autumn*. Marine Mammal Science 3(4): 323 – 332.

Zucco, C. Wende, W. Merck, T. Kochling, I. and Koppel, J. (2006) *Ecological research on Offshore Wind Farms: International Exchange of Experiences. Part B: Literature Review of Ecological Impacts.* BfN-Skripten 186.

ANNEX A – SPECIAL PROTECTION AREAS (SPA) SCREENING ASSESMENT

The tables below present the likely significant effect (LSE) test information. These are supported by tables in Annex B which draw on further quantitative evidence to help reach a conclusion of LSE.

<table>
<tr><th colspan="2">A1</th><th colspan="3">Hermaness Saxa Vord and Valla Field SPA and Ramsar</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">6,833.04 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">771.8 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding
Red-throated Diver Gavia stellata</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Breeding
Gannet Morus bassanus
Great Skua Catharacta skua
Puffin Fratercula arctica</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Guillemot Uria aalge, Kittiwake Rissa tridactyla, Shag Phalacrocorax aristotelis, Fulmar Fulmarus glacialis, Puffin Fratercula arctica, Great Skua Catharacta skua, Gannet Morus bassanus.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Red-throated diver</td><td rowspan="3">Br</td><td>Collision</td><td>Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.</td><td>No LSE</td></tr>
<tr><td rowspan="2">Gannet</td><td rowspan="2">Mi (br)/As</td><td>Collision</td><td>A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season. Therefore birds at this site will not likely regularly occur in the area. Outwith the breeding season gannets from this SPA may disperse widely.</td><td>No LSE
See Annex B</td></tr>
<tr><td>Barrier</td><td>The SPA is outwith the mean maximum foraging range and the maximum range for gannet during the breeding season and therefore barrier effects will not occur during the breeding season. Outwith the breeding season gannets are highly pelagic and the incremental increases in flight caused by the barrier effect will be insignificant.</td><td>No LSE</td></tr>
</table>

A1		Hermaness Saxa Vord and Valla Field SPA and Ramsar		
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that Project One is not proportionally of greater importance to gannet compared to elsewhere.	No LSE See Annex B
Great skua	Mi (br)/As	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates no one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Puffin	Mi (br)	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B

A1		Hermaness Saxa Vord and Valla Field SPA and Ramsar		
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Zone 1 (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments might increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regular barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not likely to be displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Shag	As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A2		Fetlar SPA and Ramsar		
Area		16,962.16 ha		
Distance from Project One		755.1 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea* Red-necked Phalarope *Phalaropus lobatus*		
Article 4.2 – Migratory Species		**Breeding** Dunlin *Calidris alpina schinzii* Great Skua *Catharacta skua* Whimbrel *Numenius phaeopus*		
Article 4.2 – Assemblage		Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Great Skua *Catharacta skua*, Arctic Tern *Sterna paradisaea*, Red-necked Phalarope *Phalaropus lobatus*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Red-necked phalarope	Br/As	Collision	No red-necked phalaropes were recorded.	No LSE
		Barrier	No red-necked phalaropes were recorded.	No LSE
		Displacement	No red-necked phalaropes were recorded.	No LSE
Dunlin	Mi (br)	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Great skua	Mi (br)/As	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE

A2		Fetlar SPA and Ramsar		
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Whimbrel	Mi (br)	Collision	Eleven out of a total of 49 whimbrel recorded were in Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.	No LSE
		Barrier	Migrating whimbrel may fly around Project One but the incremental increase in flight of an estimated 36 km to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No whimbrel were recorded using Project One and no displacement effects are predicted.	No LSE
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A3		Ronas Hill – North Roe and Tingon SPA and Ramsar		
Area		5,470.2 ha		
Distance from Project One		751.8 km		
Article 4.1		**Breeding** Great Skua *Catharacta skua* Merlin *Falco columbarius* Red-throated diver *Gavia stellata*		
Article 4.2 – Migratory Species		-		
Article 4.2 – Assemblage		-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Great skua	Br	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Merlin	Br	Collision	No merlins were recorded.	No LSE
		Barrier	No merlins were recorded.	No LSE
		Displacement	No merlins were recorded.	No LSE
Red-throated diver	Br	Collision	Within the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A4	Papa Stour SPA		
Area	569.03 ha		
Distance from Project One	736.6 km		
Article 4.1	**Breeding** Arctic Tern *Sterna paradisaea*		
Article 4.2 – Migratory Species	Ringed Plover *Charadrius hiaticula*		
Article 4.2 – Assemblage	-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			
Qualifying Feature	**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern Br	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
	Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
	Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Ringed plover Mi (br)	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
	Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
	Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter			

A5	Noss SPA			
Area	3338.34 ha			
Distance from Project One	702.5 km			
Article 4.1	**Breeding** Gannet *Morus bassanus* Great Skua *Catharacta skua* Guillemot *Uria aalge*			
Article 4.2 – Migratory Species	-			
Article 4.2 – Assemblage	Gannet *Morus bassanus*, Great Skua *Catharacta skua*, Guillemot *Uria aalge*, Puffin *Fratercula arctica*, Kittiwake *Rissa tridactyla*, Fulmar *Fulmarus glacialis*			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Gannet	Br/Mi (br)	Collision	A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect does occur, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that Project One is not proportionally of greater importance to gannet compared to elsewhere.	No LSE See Annex B
Great skua	Br/Mi (br)	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE

A5		Noss SPA		
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Guillemot	Br/Mi (br)	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Puffin	Mi (br)	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Kittiwake	Mi (br)	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B

A5		Noss SPA		
Fulmar	Mi (br)	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A6		Foula SPA		
Area		7985.49 ha		
Distance from Project One		712.7 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea* Leach's Storm-petrel *Oceanodroma leucorhoa* Red-throated Diver *Gavia stellate*		
Article 4.2 – Migratory Species		**Breeding** Great Skua *Catharacta skua* Guillemot *Uria aalge* Puffin *Fratercula arctica* Shag *Phalacrocorax aristotelis*		
Article 4.2 – Assemblage		Leach's Storm-petrel *Oceanodroma leucorhoa*, Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Puffin *Fratercula arctica*, Guillemot *Uria aalge*, Great Skua *Catharacta skua*, Shag *Phalacrocorax aristotelis*, Arctic Tern *Sterna paradisaea*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/Mi (br)	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Leach's petrel	Br/Mi (br)	Collision	Leach's petrel is a scarce to rare migrant off the Yorkshire coast (Thomas 2011). Two Leach's petrels were recorded in Year 1 and three in Year 2. All were recorded flying below 2.5 m and therefore not at risk of collision	No LSE
		Barrier	There's no evidence of whether or not Leach's petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.	No LSE
		Displacement	There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence, based on the low number of observations, that the area is a favoured foraging location for this species.	No LSE

A6		Foula SPA		
Red-throated diver	Br/Mi (br)	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts are likely to be negligible.	No LSE
Arctic skua	Mi (br)	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*., 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Kittiwake	Mi (br)	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B

A6		Foula SPA		
Fulmar	Mi (br)	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Guillemot	Mi (br)	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Puffin	Mi (br)	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Razorbill	Mi (br)	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B

A6		Foula SPA		
Shag	Mi (br)	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A7		Mousa SPA		
Area		197.98 ha		
Distance from Project One		697.6 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea* Storm Petrel *Hydrobates pelagicus*		
Article 4.2 – Migratory Species		-		
Article 4.2 – Assemblage		-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Storm petrel	Br	Collision	Storm petrels are an uncommon to scarce migrant off the Yorkshire coast (Thomas 2011). A total of 29 storm petrels were recorded across both years and all were recorded flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	There's no evidence of whether or not storm petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.	No LSE
		Displacement	There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence based on the low number of observations that the area is a favoured foraging location for this species.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A8		Sumburgh Head SPA		
Area		2,477.91 ha		
Distance from Project One		679.2 km		
Article 4.1		**Breeding** Arctic tern *Sterna paradisaea*		
Article 4.2 – Migratory Species		-		
Article 4.2 – Assemblage		**Seabirds** Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Fulmar *Fulmarus glacialis*, Arctic tern *Sterna paradisaea*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE

A8		Sumburgh Head SPA		
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A9	Fair Isle SPA		
Area	6,824.4 ha		
Distance from Project One	645.9 km		
Article 4.1	**Breeding** Arctic Tern *Sterna paradisaea* Fair Isle Wren *Troglodytes troglodytes fridariensis*		
Article 4.2 – Migratory Species	**Breeding** Guillemot *Uria aalge*		
Article 4.2 – Assemblage	**Seabirds** Puffin *Fratercula arctica*, Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Great Skua *Catharacta skua*, Arctic Skua *Stercorarius parasiticus*, Shag *Phalacrocorax aristotelis*, Gannet *Morus bassanus*, Fulmar *Fulmarus glacialis*, Guillemot *Uria aalge*, Arctic Tern *Sterna paradisaea*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			

Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Fair Isle Wren	Br	Collision	Four wrens were recorded.	No LSE
		Barrier	Four wrens were recorded.	No LSE
		Displacement	Four wrens were recorded.	No LSE
Guillemot	Mi (br)/As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B

A9		Fair Isle SPA		
Puffin	As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Great skua	As	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE

A9		Fair Isle SPA		
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Shag	As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Gannet	As	Collision	A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect does occur, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE

A9		Fair Isle SPA		
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that Project One is not proportionally of greater importance to gannet compared to elsewhere.	No LSE See Annex B
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A10		Papa Westray SPA		
Area		245.71 ha		
Distance from Project One		654 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea*		
Article 4.2 – Migratory Species		Arctic Skua *Stercorarius parasiticus*		
Article 4.2 – Assemblage		-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic skua	Mi (br)	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A11	East Sanday Coast SPA and Ramsar			
Area	1,515.23 ha			
Distance from Project One	640.3 km			
Article 4.1	**Winter** Bar-tailed godwit *Limosa lapponica*			
Article 4.2 – Migratory Species	**Winter** Purple Sandpiper *Calidris maritime* Turnstone *Arenaria interpres*			
Article 4.2 – Assemblage	-			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Bar-tailed godwit	Wi	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Turnstone	As (wi)	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Purple Sandpiper	As (wi)	Collision	Only one purple sandpiper was recorded during two years of surveys.	No LSE
		Barrier	Only one purple sandpiper was recorded during two years of surveys.	No LSE
		Displacement	Only one purple sandpiper was recorded during two years of surveys.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A12		West Westray SPA		
Area		3781.29 ha		
Distance from Project One		646.7 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea*		
Article 4.2 – Migratory Species		**Breeding** Guillemot *Uria aalge*		
Article 4.2 – Assemblage		**Seabirds** Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Guillemot *Uria aalge*, Arctic Tern *Sterna paradisaea*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Guillemot	Mi (br)/As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B

A12		West Westray SPA		
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE

A12		West Westray SPA		
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A13		Marwick Head SPA		
Area		475.58 ha		
Distance from Project One		634.8 km		
Article 4.1		**Breeding;** Guillemot *Uria aalge*		
Article 4.2 – Migratory Species		**-**		
Article 4.2 – Assemblage		**Seabirds;** Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Guillemot	Br/As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A14	Calf of Eday SPA			
Area	2,668.91 ha			
Distance from Project One	643.7 km			
Article 4.1	-			
Article 4.2 – Migratory Species	**-**			
Article 4.2 – Assemblage	**Seabirds** Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Great Black-backed Gull *Larus marinus*, Cormorant *Phalacrocorax carbo*, Fulmar *Fulmarus glacialis.*			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B
Great black-backed gull	As	Collision	A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and will therefore unlikely to occur in Project One.	No LSE

A14		Calf of Eday SPA		
		Barrier	The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A15	Rousay SPA			
Area	5,483.37 ha			
Distance from Project One	635.8 km			
Article 4.1	**Breeding** Arctic Tern *Sterna paradisaea*			
Article 4.2 – Migratory Species	-			
Article 4.2 – Assemblage	**Seabirds** Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Arctic Tern *Sterna paradisaea*.			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE

A15		Rousay SPA		
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A16		Auskerry SPA		
Area		101.97 ha		
Distance from Project One		235.8 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea* Storm petrel *Hydrobates pelagicus*		
Article 4.2 – Migratory Species		**-**		
Article 4.2 – Assemblage		-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006*,* Pettersson 2005).	No LSE
Storm petrel	Br	Collision	Storm petrels are an uncommon to scarce migrant off the Yorkshire coast (Thomas 2011). A total of 29 storm petrels were recorded across both years and all were recorded flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	There's no evidence of whether or not storm petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.	No LSE
		Displacement	There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence based on the low number of observations that the area is a favoured foraging location for this species.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A17		Orkney Mainland Moors SPA		
Area		5342.19 ha		
Distance from Project One		614.6 km		
Article 4.1		**Breeding** Hen Harrier *Circus cyaneus* Red-throated Diver *Gavia stellata* Short-eared Owl *Asio flammeus* **Over winter** Hen Harrier *Circus cyaneus*		
Article 4.2 – Migratory Species		**-**		
Article 4.2 – Assemblage		-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Hen harrier	Br	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Red-throated diver	Br	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Short-eared owl	Br	Collision	Only two short-eared owls were recorded in Project One in September and November of Year 1. One was flying at rotor height. The very low numbers recorded indicate that there is negligible risk of an effect.	No LSE
		Barrier	Migrating short-eared owls may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No short-eared owls were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A18		Copinsay SPA	
Area	3,607.7 ha		
Distance from Project One	614.3 km		
Article 4.1	-		
Article 4.2 – Migratory Species	**-**		
Article 4.2 – Assemblage	**Seabirds** Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Great Black-backed Gull *Larus marinus*, Fulmar *Fulmarus glacialis*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			
Qualifying Feature	**Potential Impact**	**Details**	**LSE Test Result**
Guillemot As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
	Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
	Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
	Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
	Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B
Great black-backed gull As	Collision	A total of 3,151 great black-backed gulls were recorded in Year 1 with peak numbers occurring in January. Of those in flight 76.7% were below rotor height. Collision risk modelling predicts up to 306 collisions per year (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and will therefore unlikely to occur in Project One.	No LSE

A18		Copinsay SPA		
		Barrier	The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A19	Hoy SPA		
Area	18122.17 ha		
Distance from Project One	600.4 km		
Article 4.1	**Breeding** Peregrine *Falco peregrinus* Red-throated Diver *Gavia stellata*		
Article 4.2 – Migratory Species	Great Skua *Catharacta skua*		
Article 4.2 – Assemblage	**Seabirds** Puffin *Fratercula arctica*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Great Black-backed Gull *Larus marinus*, Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Great Skua *Catharacta skua*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			

Qualifying Feature		Potential Impact	Details	LSE Test Result
Peregrine	Br	Collision	No peregrines were recorded.	No LSE
		Barrier	No peregrines were recorded.	No LSE
		Displacement	No peregrines were recorded.	No LSE
Red-throated diver	Br	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Great skua	Mi (br)/As	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE

A19		Hoy SPA		
Puffin	As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B
Great black-backed gull	As	Collision	A total of 3,151 great black-backed gulls were recorded in Year 1 with peak numbers occurring in January. Of those in flight 76.7% were below rotor height. Collision risk modelling predicts up to 306 collisions per year (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.	No LSE

A19		Hoy SPA		
		Barrier	The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*., 2006).	No LSE
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE

A19		Hoy SPA		
		Displacement	Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A20		Pentland Firth Islands SPA		
Area		170.51 ha		
Distance from Project One		584.7 km		
Article 4.1		**Breeding** Arctic Tern *Sterna paradisaea*		
Article 4.2 – Migratory Species		-		
Article 4.2 – Assemblage		**-**		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A21		North Caithness Cliffs SPA		
Area		14,621.1 ha		
Distance from Project One		574.1 km		
Article 4.1		**Breeding** Peregrine *Falco peregrinus*		
Article 4.2 – Migratory Species		**Breeding** Guillemot *Uria aalge*		
Article 4.2 – Assemblage		**Seabirds** Puffin *Fratercula arctica*, Fulmar *Fulmarus glacialis*, Razorbill *Alca torda*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Peregrine	Br	Collision	No peregrines were recorded.	No LSE
		Barrier	No peregrines were recorded.	No LSE
		Displacement	No peregrines were recorded.	No LSE
Guillemot	Mi (br)/As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicate that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al*. 2006).	No LSE See Annex B

A21		North Caithness Cliffs SPA		
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B
Puffin	As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A22</th><th colspan="3">East Caithness Cliffs SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">11,690.92 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">540.1 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding
Peregrine Falco peregrinus</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Breeding
Guillemot Uria aalge
Herring Gull Larus argentatus
Kittiwake Rissa tridactyla
Razorbill Alca torda
Shag Phalacrocorax aristotelis</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Seabirds
Puffin Fratercula arctica, Great Black-backed Gull Larus marinus, Cormorant Phalacrocorax carbo, Fulmar Fulmarus glacialis, Razorbill Alca torda, Guillemot Uria aalge, Kittiwake Rissa tridactyla, Herring Gull Larus argentatus, Shag Phalacrocorax aristotelis.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Peregrine</td><td rowspan="3">Br</td><td>Collision</td><td>No peregrines were recorded.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No peregrines were recorded.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No peregrines were recorded.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Guillemot</td><td rowspan="3">Mi (br)/As</td><td>Collision</td><td>46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen et al. 2006).</td><td>No LSE
See Annex B</td></tr>
<tr><td rowspan="3">Herring gull</td><td rowspan="3">Mi (br)/As</td><td>Collision</td><td>A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.</td><td>No LSE
See Annex B</td></tr>
<tr><td>Barrier</td><td>The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen et al. 2006).</td><td>No LSE</td></tr>
</table>

A22		East Caithness Cliffs SPA		
Kittiwake	Mi (br)/As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Shag	Mi (br)/As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Razorbill	Mi (br)/As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B
Great black-backed gull	As	Collision	A total of 3,151 great black-backed gulls were recorded in Year 1 with peak numbers occurring in January. Of those in flight 76.7% were below rotor height. Collision risk modelling predicts up to 353 collisions per year (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.	No LSE

A22		East Caithness Cliffs SPA		
		Barrier	The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Puffin	As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A23		Dornoch Firth and Loch Fleet SPA and Ramsar		
Area		7,836.33 ha		
Distance from Project One		517.4 km		
Article 4.1		**Breeding** Osprey *Pandion haliaetus* **Winter** Bar-tailed Godwit *Limosa lapponica*		
Article 4.2 – Migratory Species		**Over winter** Greylag Goose Wigeon *Anas penelope*		
Article 4.2 – Assemblage		**Assemblage** Curlew *Numenius arquata*, Dunlin *Calidris alpina alpina*, Oystercatcher *Haematopus ostralegus*, Teal *Anas crecca*, Wigeon *Anas penelope*, Greylag Goose *Anser anser,* Bar-tailed Godwit *Limosa lapponica*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Osprey	Br	Collision	No ospreys were recorded.	No LSE
		Barrier	No ospreys were recorded.	No LSE
		Displacement	No ospreys were recorded.	No LSE
Bar-tailed godwit	Wi	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Greylag goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE

A23		Dornoch Firth and Loch Fleet SPA and Ramsar		
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A24		Cromarty Firth SPA and Ramsar		
Area		3,746.95 ha		
Distance from Project One		507.1 km		
Article 4.1		**Breeding** Common Tern *Sterna hirundo* Osprey *Pandion haliaetus* **Winter;** Bar-tailed Godwit *Limosa lapponica* Whooper Swan *Cygnus cygnus*		
Article 4.2 – Migratory Species		**Over winter** Greylag Goose		
Article 4.2 – Assemblage		**Assemblage** Redshank *Tringa totanus*, Curlew *Numenius arquata*, Dunlin *Calidris alpina alpina*, Knot *Calidris canutus*, Oystercatcher *Haematopus ostralegus*, Red-breasted Merganser *Mergus serrator*, Scaup *Aythya marila*, Pintail *Anas acuta*, Wigeon *Anas penelope*, Greylag Goose *Anser anser,* Bar-tailed Godwit *Limosa lapponica*, Whooper Swan *Cygnus Cygnus.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Osprey	Br	Collision	No ospreys were recorded.	No LSE
		Barrier	No ospreys were recorded.	No LSE
		Displacement	No ospreys were recorded.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE

A24		Cromarty Firth SPA and Ramsar		
Whooper swan	Wi/As	Collision	No whooper swans were recorded.	No LSE
		Barrier	No whooper swans were recorded.	No LSE
		Displacement	No whooper swans were recorded.	No LSE
Greylag goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Redshank	As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Red-breasted	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE

A24		Cromarty Firth SPA and Ramsar		
merganser		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Scaup	As	Collision	No scaup were recorded.	No LSE
		Barrier	No scaup were recorded.	No LSE
		Displacement	No scaup were recorded.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A25</th><th colspan="3">Inner Moray Firth SPA and Ramsar</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">2,339.23 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">495.1 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding
Common Tern Sterna hirundo
Osprey Pandion haliaetus
Over winter;
Bar-tailed Godwit Limosa lapponica</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Over winter
Greylag Goose Anser anser
Red-breasted Merganser Mergus serrator
Redshank Tringa totanus
Scaup Aythya marila</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Assemblage
Scaup Aythya marila, Curlew Numenius arquata, Oystercatcher Haematopus ostralegus, Goosander Mergus merganser, Goldeneye Bucephala clangula, Teal Anas crecca, Wigeon Anas penelope, Cormorant Phalacrocorax carbo, Redshank Tringa totanus, Red-breasted Merganser Mergus serrator, Greylag Goose Anser anser, Bar-tailed Godwit Limosa lapponica.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Common tern</td><td rowspan="3">Br</td><td>Collision</td><td>A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco et al. 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco et al. 2006, Pettersson 2005).</td><td>No LSE</td></tr>
<tr><td rowspan="3">Osprey</td><td rowspan="3">Br</td><td>Collision</td><td>No ospreys were recorded.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No ospreys were recorded.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No ospreys were recorded.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Bar-tailed godwit</td><td rowspan="3">Wi/As</td><td>Collision</td><td>A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.</td><td>No LSE</td></tr>
</table>

A25		Inner Moray Firth SPA and Ramsar		
Greylag goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Red-breasted merganser	Mi (wi)/As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Scaup	Mi (wi)/As	Collision	No scaup were recorded.	No LSE
		Barrier	No scaup were recorded.	No LSE
		Displacement	No scaup were recorded.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Goosander	As	Collision	Three goosander were recorded outwith Project One in Year 2.	No LSE
		Barrier	Three goosander were recorded outwith Project One in Year 2.	No LSE
		Displacement	Three goosander were recorded outwith Project One in Year 2.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE

A25		Inner Moray Firth SPA and Ramsar		
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A26	Moray and Nairn Coast SPA and Ramsar
Area	2,410.25 ha
Distance from Project One	476.8 km
Article 4.1	**Breeding** Osprey *Pandion haliaetus* **Over winter;** Bar-tailed Godwit *Limosa lapponica*
Article 4.2 – Migratory Species	**Over winter** Greylag Goose *Anser anser* Pink-footed Goose *Anser brachyrhynchus* Redshank *Tringa tetanus*
Article 4.2 – Assemblage	**Assemblage** Pink-footed Goose *Anser brachyrhynchus*, Dunlin *Calidris alpina alpina*, Oystercatcher *Haematopus ostralegus*, Red-breasted Merganser *Mergus serrator*, Velvet Scoter *Melanitta fusca*, Common Scoter *Melanitta nigra*, Long-tailed duck *Clangula hyemalis*, Wigeon *Anas penelope*, Redshank *Tringa totanus*, Greylag Goose *Anser anser,* Bar-tailed Godwit *Limosa lapponica.*

Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites

Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Osprey	Br	Collision	No ospreys were recorded.	No LSE
		Barrier	No ospreys were recorded.	No LSE
		Displacement	No ospreys were recorded.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Greylag goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE

A26		Moray and Nairn Coast SPA and Ramsar		
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Common scoter	As	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE

A26		Moray and Nairn Coast SPA and Ramsar		
Velvet scoter	As	Collision	No velvet scoter were recorded during two years of surveys.	No LSE
		Barrier	No velvet scoter were recorded during two years of surveys.	No LSE
		Displacement	No velvet scoter were recorded during two years of surveys.	No LSE
Long-tailed duck	As	Collision	No long-tailed duck were recorded.	No LSE
		Barrier	No long-tailed duck were recorded.	No LSE
		Displacement	No long-tailed duck were recorded.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A27	Troup Penan and Lion's Heads SPA		
Area	3,367.21 ha		
Distance from Project One	464.9 km		
Article 4.1	**Breeding** Guillemot *Uria aalge*		
Article 4.2 – Migratory Species	-		
Article 4.2 – Assemblage	**Assemblage** Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Fulmar *Fulmarus glacialis*, Guillemot *Uria aalge.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			
Qualifying Feature	**Potential Impact**	**Details**	**LSE Test Result**
Guillemot Br/As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
	Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
	Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Fulmar As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
	Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
	Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Herring gull As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B

A27		Troup Penan and Lion's Heads SPA		
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A28</th><th colspan="3">Loch of Strathbeg SPA and Ramsar</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">615.94 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">462.2 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding
Sandwich Tern Sterna sandvicensis
Winter;
Barnacle Goose Branta leucopsis
Whooper Swan Cygnus cygnus</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Winter;
Greylag Goose Anser anser
Pink-footed Goose Anser brachyrhynchus</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Assemblage
Teal Anas crecca, Greylag Goose Anser anser, Pink-footed Goose Anser brachyrhynchus, Barnacle Goose Branta leucopsis, Whooper Swan Cygnus cygnus.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Sandwich tern</td><td rowspan="3">Br</td><td>Collision</td><td>One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen et al. 2006).</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen et al. 2006).</td><td>No LSE</td></tr>
<tr><td rowspan="3">Whooper swan</td><td rowspan="3">Wi/As</td><td>Collision</td><td>No whooper swans were recorded.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No whooper swans were recorded.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No whooper swans were recorded.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Barnacle goose</td><td rowspan="3">Wi/As</td><td>Collision</td><td>No barnacle geese were recorded.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No barnacle geese were recorded.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No barnacle geese were recorded.</td><td>No LSE</td></tr>
<tr><td rowspan="2">Pink-footed goose</td><td rowspan="2">Mi (wi)/As</td><td>Collision</td><td>Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional c. 32 km is considered negligible.</td><td>No LSE</td></tr>
</table>

A28		Loch of Strathbeg SPA and Ramsar		
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Greylag goose	Mi (wi)	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A29		Buchan Ness to Collieston Coast SPA		
Area		5,400.94 ha		
Distance from Project One		421.8 km		
Article 4.1		-		
Article 4.2 – Migratory Species		-		
Article 4.2 – Assemblage		**Assemblage** Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Shag *Phalacrocorax aristotelis*, Fulmar *Fulmarus glacialis*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Herring gull	As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE

A29		Buchan Ness to Collieston Coast SPA		
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Shag	As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A30		Ythan Estuary, Sands of Forvie and Meikle Loch SPA and Ramsar		
Area		1,016.24 ha		
Distance from Project One		437.4 km		
Article 4.1		**Breeding;** Common Tern *Sterna hirundo* Little Tern *Sterna albifrons* Sandwich Tern *Sterna sandvicensis*		
Article 4.2 – Migratory Species		**Winter;** Pink-footed Goose *Anser brachyrhynchus*		
Article 4.2 – Assemblage		**Assemblage** Redshank *Tringa totanus*, Lapwing *Vanellus vanellus*, Eider *Somateria mollissima*, Pink-footed Goose *Anser brachyrhynchus*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE

A30		Ythan Estuary, Sands of Forvie and Meikle Loch SPA and Ramsar		
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Redshank	As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Eider	As	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A31</th><th colspan="3">Fowlsheugh SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">1,303.54 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">380.3 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding;
-</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Breeding;
Guillemot Uria aalge
Kittiwake Rissa tridactyla</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Assemblage
Razorbill Alca torda, Herring Gull Larus argentatus, Fulmar Fulmarus glacialis, Guillemot Uria aalge, Kittiwake Rissa tridactyla.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Guillemot</td><td rowspan="3">Mi (br)/As</td><td>Collision</td><td>46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen et al. 2006).</td><td>No LSE
See Annex B</td></tr>
<tr><td rowspan="3">Kittiwake</td><td rowspan="3">Mi (br)/As</td><td>Collision</td><td>A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.</td><td>No LSE
See Annex B</td></tr>
<tr><td>Barrier</td><td>The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen et al. 2006).</td><td>No LSE
See Annex B</td></tr>
<tr><td rowspan="2">Razorbill</td><td rowspan="2">As</td><td>Collision</td><td>A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to</td><td>No LSE</td></tr>
</table>

A31		Fowlsheugh SPA		
			fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B
Herring gull	As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A32		Montrose Basin SPA and Ramsar		
Area		984.61 ha		
Distance from Project One		367.4 km		
Article 4.1		-		
Article 4.2 – Migratory Species		**Winter;** Greylag Goose *Anser anser* Knot *Calidris canutus* Pink-footed Goose *Anser brachyrhynchus* Redshank *Tringa totanus*		
Article 4.2 – Assemblage		**Assemblage** Dunlin *Calidris alpina alpina*, Oystercatcher *Haematopus ostralegus*, Eider *Somateria mollissima*, Wigeon *Anas penelope*, Shelduck *Tadorna tadorna*, Redshank *Tringa totanus*, Knot *Calidris canutus*, Greylag Goose *Anser anser,* Pink-footed Goose *Anser brachyrhynchus*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Greylag goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	Mi (wi)/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE

A32		Montrose Basin SPA and Ramsar		
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Eider	As	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A33		Firth of Tay and Eden Estuary SPA and Ramsar		
Area		6,923.29 ha		
Distance from Project One		275.8 km		
Article 4.1		**Breeding;** Little Tern *Sterna albifrons* Marsh Harrier *Circus aeruginosus* **Winter;** Bar-tailed Godwit *Limosa lapponica*		
Article 4.2 – Migratory Species		**Winter;** Greylag Goose *Anser anser* Pink-footed Goose *Anser brachyrhynchus* Redshank *Tringa totanus*		
Article 4.2 – Assemblage		**Assemblage** Velvet Scoter *Melanitta fusca*, Pink-footed Goose *Anser brachyrhynchus*, Greylag Goose *Anser anser,* Redshank *Tringa totanus*, Cormorant *Phalacrocorax carbo*, Shelduck *Tadorna tadorna*, Eider *Somateria mollissima*, Bar-tailed Godwit *Limosa lapponica*, Common Scoter *Melanitta nigra*, Black-tailed Godwit *Limosa limosa islandica*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Goosander *Mergus merganser*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Sanderling *Calidris alba*, Dunlin *Calidris alpina alpina*, Long-tailed duck *Clangula hyemalis*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE

A33		Firth of Tay and Eden Estuary SPA and Ramsar		
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Greylag goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Velvet scoter	As	Collision	No velvet scoter were recorded during two years of surveys.	No LSE
		Barrier	No velvet scoter were recorded during two years of surveys.	No LSE
		Displacement	No velvet scoter were recorded during two years of surveys.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Eider	As	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE

A33		Firth of Tay and Eden Estuary SPA and Ramsar		
Common scoter	As	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Sanderling	As	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Grey plover	As	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE

A33		Firth of Tay and Eden Estuary SPA and Ramsar		
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Long-tailed duck	As	Collision	No long-tailed duck were recorded.	No LSE
		Barrier	No long-tailed duck were recorded.	No LSE
		Displacement	No long-tailed duck were recorded.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A34</th><th colspan="3">Forth Islands SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">9,796.98 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">308 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding;
Arctic Tern Sterna paradisaea
Common Tern Sterna hirundo
Roseate Tern Sterna dougallii
Sandwich Tern Sterna sandvicensis</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Breeding;
Gannet Morus bassanus
Lesser Black-backed Gull Larus fuscus
Puffin Fratercula arctica
Shag Phalacrocorax aristotelis</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Assemblage
Razorbill Alca torda, Guillemot Uria aalge, Kittiwake Rissa tridactyla, Herring Gull Larus argentatus, Cormorant Phalacrocorax carbo, Fulmar Fulmarus glacialis, Puffin Fratercula arctica, Lesser Black-backed Gull Larus fuscus, Shag Phalacrocorax aristotelis, Gannet Morus bassanus, Arctic Tern Sterna paradisaea, Common Tern Sterna hirundo, Roseate Tern Sterna dougallii, Sandwich Tern Sterna sandvicensis.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Arctic tern</td><td rowspan="3">Br/As</td><td>Collision</td><td>A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco et al. 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco et al. 2006, Pettersson 2005).</td><td>No LSE</td></tr>
<tr><td rowspan="2">Common tern</td><td rowspan="2">Br/As</td><td>Collision</td><td>A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco et al. 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
</table>

A34		Forth Islands SPA		
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Roseate tern	Br/As	Collision	No roseate terns were recorded.	No LSE
		Barrier	No roseate terns were recorded.	No LSE
		Displacement	No roseate terns were recorded.	No LSE
Sandwich tern	Br/As	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Gannet	Mi (br)/As	Collision	A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely. Collision risk modelling predicted on average up to 94 collisions of adult gannets per year for Project One, of which 38 may be from the Forth Islands SPA and therefore, there is the potential for a significant impact alone and in-combination.	Potential for LSE (alone and/or in-combination) See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect does occur, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that Project One is not proportionally of greater importance to gannet compared to elsewhere.	Potential for LSE (alone and/or in-combination) See Annex B
Lesser black-backed gull	Mi (br)/As	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE

A34		Forth Islands SPA		
Puffin	Mi (br)/As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Shag	Mi (br)/As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE See Annex B
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B

A34		Forth Islands SPA		
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Herring gull	As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE

A34		Forth Islands SPA		
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A35		Firth of Forth SPA and Ramsar		
Area		6,313.72 ha		
Distance from Project One		299.3 km		
Article 4.1		**Passage;** Sandwich Tern *Sterna sandvicensis* **Winter;** Bar-tailed Godwit *Limosa lapponica* Golden Plover *Pluvialis apricaria* Red-throated Diver *Gavia stellata* Slavonian Grebe *Podiceps auritus*		
Article 4.2 – Migratory Species		**Winter;** Knot *Calidris canutus* Pink-footed Goose *Anser brachyrhynchus* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Turnstone *Arenaria interpres*		
Article 4.2 – Assemblage		**Assemblage** Scaup *Aythya marila*, Slavonian Grebe *Podiceps auritus*, Golden Plover *Pluvialis apricaria*, Bar-tailed Godwit *Limosa lapponica*, Pink-footed Goose *Anser brachyrhynchus*, Shelduck *Tadorna tadorna*, Knot *Calidris canutus*, Redshank *Tringa totanus*, Turnstone *Arenaria interpres*, Great Crested Grebe *Podiceps cristatus*, Cormorant *Phalacrocorax carbo*, Red-throated Diver *Gavia stellata*, Mallard *Anas platyrhynchos*, Curlew *Numenius arquata*, Eider *Somateria mollissima*, Long-tailed duck *Clangula hyemalis*, Common Scoter *Melanitta nigra*, Velvet Scoter *Melanitta fusca*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Oystercatcher *Haematopus ostralegus*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Lapwing *Vanellus vanellus*, Dunlin *Calidris alpina alpina*, Wigeon *Anas penelope*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Sandwich tern	Pa	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE

A35		Firth of Forth SPA and Ramsar		
		Displacement	No bar-tailed godwits were recorded using Project One and no displacement effects are predicted.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Red-throated diver	Wi/As	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Slavonian grebe	Wi/As	Collision	Only one Slavonian grebe was recorded flying below turbine height.	No LSE
		Barrier	Only one Slavonian grebe was recorded.	No LSE
		Displacement	Only one Slavonian grebe was recorded.	No LSE
Knot	Mi (wi)/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE

A35		Firth of Forth SPA and Ramsar		
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Shelduck	Mi (wi)/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Turnstone	Mi (wi)/As	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Scaup	As	Collision	No scaup were recorded.	No LSE
		Barrier	No scaup were recorded.	No LSE
		Displacement	No scaup were recorded.	No LSE
Great-crested grebe	As	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Mallard	As	Collision	A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE

A35		Firth of Forth SPA and Ramsar		
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Long-tailed duck	As	Collision	No long-tailed duck were recorded.	No LSE
		Barrier	No long-tailed duck were recorded.	No LSE
		Displacement	No long-tailed duck were recorded.	No LSE
Common scoter	As	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Velvet scoter	As	Collision	No velvet scoter were recorded during two years of surveys.	No LSE
		Barrier	No velvet scoter were recorded during two years of surveys.	No LSE
		Displacement	No velvet scoter were recorded during two years of surveys.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE

A35		Firth of Forth SPA and Ramsar		
Ringed plover	As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	As	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 mand therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A36		Imperial Dock Lock, Leith SPA		
Area		0.11 ha		
Distance from Project One		319.7 km		
Article 4.1		**Breeding;** Common tern *Sterna hirundo*		
Article 4.2 – Migratory Species		**-**		
Article 4.2 – Assemblage		**-**		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A37		St Abb's Head to Fast Castle SPA		
Area		1,736.52 ha		
Distance from Project One		277 km		
Article 4.1		-		
Article 4.2 – Migratory Species		-		
Article 4.2 – Assemblage		**Assemblage** Razorbill *Alca torda*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Shag *Phalacrocorax aristotelis*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Herring gull	As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a	No LSE

A37		St Abb's Head to Fast Castle SPA		
			significant increase in overall distance flown.	
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Shag	As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A38</th><th colspan="3">Lindisfarne SPA and Ramsar</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">3679.2 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">237.9 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding;
Little Tern Sterna albifrons
Over winter;
Bar-tailed Godwit Limosa lapponica
Golden Plover Pluvialis apricaria
Whooper Swan Cygnus cygnus</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">On passage;
Ringed Plover Charadrius hiaticula
Over winter;
Grey Plover Pluvialis squatarola
Greylag Goose Anser anser
Knot Calidris canutus
Light-bellied Brent Goose Branta bernicla hrota
Wigeon Anas Penelope</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Waterfowl:
Pink-footed Goose Anser brachyrhynchus
Golden Plover Pluvialis apricaria
Bar-tailed Godwit Limosa lapponica
Greylag Goose Anser anser
Light-bellied Brent Goose Branta bernicla hrota
Wigeon Anas penelope
Whooper Swan Cygnus cygnus
Knot Calidris canutus
Redshank Tringa totanus
Shelduck Tadorna tadorna
Eider Somateria mollissima
Common Scoter Melanitta nigra
Ringed Plover Charadrius hiaticula
Lapwing Vanellus vanellus
Dunlin Calidris alpina alpina
Grey Plover Pluvialis squatarola</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Little Tern</td><td rowspan="3">Br</td><td>Collision</td><td>Three little terns were recorded, all flying below 5 m.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco et al. 2006).</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco et al. 2006).</td><td>No LSE</td></tr>
</table>

A38		Lindisfarne SPA and Ramsar		
Bar-tailed Godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Golden Plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Whooper Swan	Wi/As	Collision	No whooper swans were recorded.	No LSE
		Barrier	No whooper swans were recorded.	No LSE
		Displacement	No whooper swans were recorded.	No LSE
Ringed Plover	Mi/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Grey Plover	Mi (wi)	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Greylag Goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE

A38		Lindisfarne SPA and Ramsar		
Knot	Mi (wi)/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
(Light-bellied) Brent Goose	Mi (wi)/As	Collision	No light bellied brent geese were recorded in Year 1.	No LSE
		Barrier	No light bellied brent geese were recorded in Year 1.	No LSE
		Displacement	No light bellied brent geese were recorded in Year 1.	No LSE
Wigeon	Mi (wi)/As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Pink-footed Goose	As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Redshank	As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Eider	As	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE

A38		Lindisfarne SPA and Ramsar		
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Common scoter	As	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Grey Plover	As	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A39		Farne Islands SPA		
Area		101.86 ha		
Distance from Project One		235.8 km		
Article 4.1		**Breeding;** Arctic Tern *Sterna paradisaea* Common Tern *Sterna hirundo* Roseate Tern *Sterna dougallii* Sandwich Tern *Sterna sandvicensis*		
Article 4.2 – Migratory Species		**Breeding;** Guillemot *Uria aalge* Puffin *Fratercula arctica*		
Article 4.2 – Assemblage		Kittiwake *Rissa tridactyla*, Shag *Phalacrocorax aristotelis*, Cormorant *Phalacrocorax carbo*, Puffin *Fratercula arctica*, Guillemot *Uria aalge*, Arctic Tern *Sterna paradisaea*, Common Tern *Sterna hirundo*, Roseate Tern *Sterna dougallii*, Sandwich Tern *Sterna sandvicensis*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Roseate tern	Br/As	Collision	No roseate terns were recorded.	No LSE
		Barrier	No roseate terns were recorded.	No LSE
		Displacement	No roseate terns were recorded.	No LSE
Sandwich tern	Br/As	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE

A39		Farne Islands SPA		
Common tern	Br/As	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Puffin	Mi (br)/As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Guillemot	Mi (br)/As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Shag	As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE

A39		Farne Islands SPA		
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Kittiwake	As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Petersen *et al*. 2006).	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A40		Coquet Islands SPA	
Area		22.28 ha	
Distance from Project One		204.3 km	
Article 4.1		**Breeding;** Arctic Tern *Sterna paradisaea* Common Tern *Sterna hirundo* Roseate Tern *Sterna dougallii* Sandwich Tern *Sterna sandvicensis*	
Article 4.2 – Migratory Species		**Breeding;** Puffin *Fratercula arctica*	
Article 4.2 – Assemblage		**Seabirds:** Black-headed Gull *Larus ridibundus*, Puffin *Fratercula arctica*, Arctic Tern *Sterna paradisaea*, Common Tern *Sterna hirundo*, Roseate Tern *Sterna dougallii*, Sandwich Tern *Sterna sandvicensis*.	
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			
Subject to natural change to maintain, in favourable condition the habitats for the breeding seabird assemblage of European importance, with particular reference to: Offshore Islands.			

Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Arctic tern	Br/As	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Common tern	Br/As	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Roseate tern	Br/As	Collision	No roseate terns were recorded.	No LSE

A40		Coquet Islands SPA		
		Barrier	No roseate terns were recorded.	No LSE
		Displacement	No roseate terns were recorded.	No LSE
Sandwich tern	Br/As	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Puffin	Mi (br)/As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not.	No LSE See Annex B
Black-headed gull	As	Collision	A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from Project One and the low usage of the site indicates low risk of a significant impact	No LSE
		Barrier	The SPA is outwith the maximum foraging range for black-headed gull during the breeding season and therefore no barrier effects will occur during the breeding season. Birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in energetic costs during migration.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that black-headed gulls are not displaced by wind farms (Zucco *et al*. 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A41		Northumbria Coast SPA and Ramsar		
Area		1,107.98 ha		
Distance from Project One		136.2 km		
Article 4.1		Little Tern *Sterna albifrons*		
Article 4.2 – Migratory Species		Purple Sandpiper *Calidris maritima* Turnstone *Arenaria interpres*		
Article 4.2 – Assemblage		-		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Purple sandpiper	Wi	Collision	Only one purple sandpiper was recorded during two years of surveys.	No LSE
		Barrier	Only one purple sandpiper was recorded during two years of surveys.	No LSE
		Displacement	Only one purple sandpiper was recorded during two years of surveys.	No LSE
Turnstone	Wi	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstone were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A42	Teesmouth and Cleveland SPA			
Area	1,247.31 ha			
Distance from Project One	119.1 km			
Article 4.1	**During the breeding season:** Little Tern *Sterna albifrons* **On passage:** Sandwich Tern *Sterna sandvicensis*			
Article 4.2 – Migratory Species	**On passage:** Ringed Plover *Charadrius hiaticula* **Over winter:** Knot *Calidris canutus* Redshank *Tringa tetanus*			
Article 4.2 – Assemblage	**Waterfowl:** Sanderling *Calidris alba*, Lapwing *Vanellus vanellus*, Shelduck *Tadorna tadorna*, Cormorant *Phalacrocorax carbo*, Redshank *Tringa totanus*, Knot *Calidris canutus*.			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Ringed plover	Mi	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	Mi/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE

A42		Teesmouth and Cleveland SPA		
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Redshank	Mi/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Sanderling	As	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A43		Flamborough Head and Bempton Cliffs SPA and Ramsar		
Area		212.17 ha		
Distance from Project One		51.2 km		
Article 4.1		-		
Article 4.2 – Migratory Species		**Breeding:** Kittiwake *Rissa tridactyla*		
Article 4.2 – Assemblage		**Seabirds:** Puffin *Fratercula arctica* Razorbill *Alca torda* Fulmar Fulmaris glacialis Guillemot *Uria aalge* Herring Gull *Larus argentatus* Gannet *Morus bassanus* Kittiwake *Rissa tridactyla*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Kittiwake	Mi (br)/As	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the mean maximum foraging range for kittiwake but within the maximum foraging range during the breeding season and therefore birds at this site may occur within Project One. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	Potential for LSE (alone and/or in-combination) See Annex B
		Barrier	The SPA is within the maximum foraging range for kittiwake during the breeding season and therefore regularly barrier effects may occur during this period. However, the distance from the breeding colony is at the far end of reported foraging range (Thaxter *et al.* 2012) and therefore barrier effects are not predicted to be significant. Furthermore, evidence from existing wind farms have not reported any barrier effects on kittiwakes (e.g. Zucco *et al*. 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Zucco *et al*. 2006).However, due to high peak counts recorded within Project One, and the proximity to this SPA, a LSE cannot be discounted.	Potential for LSE (alone and/or in-combination) See Annex B
Puffin	As	Collision	A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.	No LSE

A43		Flamborough Head and Bempton Cliffs SPA and Ramsar		
		Barrier	The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. However, should it occur there is the potential for a LSE in the non-breeding season.	Potential for LSE (alone and/or in-combination) See Annex B
Razorbill	As	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). There is therefore the potential for a LSE from displacement in the non-breeding season.	Potential for LSE (alone and/or in-combination) See Annex B
Guillemot	As	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). There is therefore the potential for a LSE in the non-breeding season.	Potential for LSE (alone and/or in-combination) See Annex B
Herring gull	As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Birds from this SPA may be at risk of a significant impact either alone or in-combination with other potential future developments.	Potential for LSE (alone and/or in-combination) See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE

A43		Flamborough Head and Bempton Cliffs SPA and Ramsar		
Fulmar	As	Collision	A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species. Nevertheless, due to the proximity of this SPA population to Project One, this cannot be ruled out.	Potential for LSE (alone and/or in-combination) See Annex B
Gannet	As	Collision	A total of 13,034 gannets were recorded; with peak numbers between August and November. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely. Collision risk modelling predicted on average up to 94 collisions per year for Project One, of which 31 may be from this SPA. Therefore, there is the potential for a significant impact alone and in-combination.	Potential for LSE (alone and/or in-combination) See Annex B
		Barrier	The SPA is within the mean maximum foraging range for gannet during the breeding season and therefore barrier effects may occur. The additional estimated distance of up to 36 km will, if a barrier effect does occur, be a very small incremental increase in overall distance flown and therefore not cause an increase in energetic costs.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that Project One is not proportionally of greater importance to gannet compared to elsewhere. However, the proximity of this SPA to Project One indicates that there may be the potential for a significant effect.	Potential for LSE (alone and/or in-combination) See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A44</th><th colspan="3">Hornsea Mere SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">231.2 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">28.8 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">-</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Over winter:
Gadwall Anas strepera</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">-</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Gadwall</td><td rowspan="3">Mi (wi)</td><td>Collision</td><td>Only one gadwall was recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Only one gadwall was recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Only one gadwall was recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td colspan="5">Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter</td></tr>
</table>

A45		Humber Estuary SPA and Ramsar		
Area		37,360 ha		
Distance from Project One		0 km (export cable route crosses the SPA/Ramsar); 102 km from Subzone 1		
Article 4.1		**Breeding:** Little Tern *Sterna albifrons* Bittern *Botaurus stellaris* Avocet *Recurvirostra avosetta* Marsh Harrier *Circus aeruginosus* **Over winter:** Bar-tailed Godwit *Limosa lapponica* Bittern *Botaurus stellaris* Golden Plover *Pluvialis apricaria* Hen Harrier *Circus cyaneus* Avocet *Recurvirostra avosetta* **On passage:** Ruff *Philomachus pugnax*		
Article 4.2 – Migratory Species		**On passage:** Dunlin *Calidris alpina alpine* Knot *Calidris canutus* Black-tailed Godwit *Limosa limosa islandica* Redshank *Tringa totanus* **Over winter:** Knot *Calidris canutus* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Dunlin *Calidris alpina alpina* Black-tailed Godwit *Limosa limosa islandica*		
Article 4.2 – Assemblage		**Waterfowl:** Teal *Anas crecca,* Wigeon *Anas penelope,* Mallard *Anas platyrhynchos,* Pochard *Aythya ferina,* Bittern *Botaurus stellaris,* Dark-bellied Brent Goose *Branta bernicla bernicla,* Sanderling *Calidris alba,* Dunlin *Calidris alpina alpina,* Knot *Calidris canutus,* Ringer Plover *Charadrius hiaticula,* Oystercatcher *Haematopus ostralegus,* Bar-tailed Godwit *Limosa lapponica,* Black-tailed Godwit *Limosa limosa islandica,* Curlew *Numenius arquata,* Whimbrel *Numenius phaeopus,* Ruff *Philomachus pugnax,* Golden Plover *Pluvialis apricaria,* Grey Plover *Pluvialis squatarola,* Avocet *Recurvirostra avosetta,* Shelduck *Tadorna tadorna,* Redshank *Tringa totanus,* Lapwing *Vanellus vanellus.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE

A45		Humber Estuary SPA and Ramsar		
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Bittern	Br/Wi/As	Collision	No bitterns were recorded.	No LSE
		Barrier	No bitterns were recorded.	No LSE
		Displacement	No bitterns were recorded.	No LSE
Avocet	Br/Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Ruff	Pa/As	Collision	No ruff were recorded.	No LSE
		Barrier	No ruff were recorded.	No LSE
		Displacement	No ruff were recorded.	No LSE
Dunlin	Mi (pa) Mi (wi)/As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE

A45		Humber Estuary SPA and Ramsar		
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	Mi (pa) Mi (wi)/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	Mi (pa) Mi(wi)/As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Redshank	Mi (pa) Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Shelduck	Mi (wi)/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Mallard	As	Collision	A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Pochard	As	Collision	Three pochard were recorded flying at 10 m in height in Project One but outwith Project One in Year 1 and two birds were recorded in Year 2. Therefore, at very low risk of collision.	No LSE

A45		Humber Estuary SPA and Ramsar		
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
(Dark-bellied) brent goose	As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Sanderling	As	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Ringed plover	As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	As	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at	No LSE

A45	Humber Estuary SPA and Ramsar			
			risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, Pa = passage, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A46	Gibraltar Point SPA and Ramsar			
Area	414 Ha			
Distance from Project One	39.6 km			
Article 4.1	**Breeding;** Little Tern *Sterna albifrons* **Over winter;** Bar-tailed Godwit *Limosa lapponica*			
Article 4.2 – Migratory Species	**Over winter;** Grey Plover *Pluvialis squatarola* Knot *Calidris canutus*			
Article 4.2 – Assemblage	**Waterfowl:** Oystercatcher *Haematopus ostralegus* Knot *Calidris canutus* Grey Plover *Pluvialis squatarola* Bar-tailed Godwit *Limosa lapponica*			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Bar-tailed godwit	Wi/Mi	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Wi/Mi	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	Wi/Mi	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE

A46		Gibraltar Point SPA and Ramsar		
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	Mi	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A47		The Wash SPA and Ramsar	
Area	62,211.7 ha		
Distance from Project One	42.7 km		
Article 4.1	**Breeding:** Common Tern *Sterna hirundo* Little Tern *Sterna albifrons* Marsh Harrier *Circus aeruginosus* **Over winter:** Avocet *Recurvirostra avosetta* Bar-tailed Godwit *Limosa lapponica* Golden Plover *Pluvialis apricaria* Whooper Swan *Cygnus cygnus*		
Article 4.2 – Migratory Species	**On passage:** Ringed Plover *Charadrius hiaticula* Sanderling *Calidris alba* **Over winter:** Black-tailed Godwit *Limosa limosa islandica* Curlew *Numenius arquata* Dark-bellied Brent Goose *Branta bernicla bernicla* Dunlin *Calidris alpina alpina* Grey Plover *Pluvialis squatarola* Knot *Calidris canutus* Oystercatcher *Haematopus ostralegus* Pink-footed Goose *Anser brachyrhynchus* Pintail *Anas acuta* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Turnstone *Arenaria interpres*		
Article 4.2 – Assemblage	**Waterfowl:** Black-tailed Godwit *Limosa limosa islandica*, Avocet *Recurvirostra avosetta*, Golden Plover *Pluvialis apricaria*, Bar-tailed Godwit *Limosa lapponica*, Pink-footed Goose *Anser brachyrhynchus*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Shelduck *Tadorna tadorna*, Pintail *Anas acuta*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Whooper Swan *Cygnus cygnus,* Dunlin *Calidris alpina alpina*, Sanderling *Calidris alba*, Curlew *Numenius arquata*, Redshank *Tringa totanus*, Turnstone *Arenaria interpres*, Little Grebe *Tachybaptus ruficollis*, Cormorant *Phalacrocorax carbo*, White-fronted Goose *Anser albifrons albifrons,* Wigeon *Anas penelope*, Mallard *Anas platyrhynchos*, Ringed Plover *Charadrius hiaticula*, Lapwing *Vanellus vanellus*, Knot *Calidris canutus*, Whimbrel *Numenius phaeopus.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites			
Qualifying Feature	**Potential Impact**	**Details**	**LSE Test Result**
Common tern Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE

A47		The Wash SPA and Ramsar		
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Avocet	Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Whooper swan	Wi/As	Collision	No whooper swans were recorded.	No LSE
		Barrier	No whooper swans were recorded.	No LSE
		Displacement	No whooper swans were recorded.	No LSE

A47		The Wash SPA and Ramsar		
Ringed plover	Mi (pa)/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Sanderling	Mi (pa)/As	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Black-tailed godwit	Mi (wi)/As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Curlew	Mi (wi)/As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
(Dark-bellied) brent goose	Mi (wi)/As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	Mi (wi)/As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Mi (wi)/As	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE

A47		The Wash SPA and Ramsar		
Knot	Mi (wi)/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	Mi (wi)/As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Pintail	Mi (wi)/As	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Shelduck	Mi (wi)/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Turnstone	Mi (wi)/As	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstone were recorded using Project One and no displacement effects are predicted.	No LSE
Little grebe	As	Collision	No little grebes were recorded.	No LSE

A47		The Wash SPA and Ramsar		
		Barrier	No little grebes were recorded.	No LSE
		Displacement	No little grebes were recorded.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Mallard	As	Collision	A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Whimbrel	As	Collision	Eleven out of a total of 49 whimbrel recorded were in Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the Project One was low and therefore at low risk of a significant effect.	No LSE

A47		The Wash SPA and Ramsar		
		Barrier	Migrating whimbrel may fly around Project One but the incremental increase of an estimated 36 km in flight to the SPA is likely negligible compared to the distance flown during migration.	No LSE
		Displacement	No whimbrel were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, Pa = passage, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A48</th><th colspan="3">North Norfolk Coast SPA and Ramsar</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">7,886.79 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">57.9 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding:
Avocet Recurvirostra avosetta
Bittern Botaurus stellaris
Common Tern Sterna hirundo
Little Tern Sterna albifrons
Marsh Harrier Circus aeruginosus
Mediterranean Gull Larus melanocephalus
Roseate Tern Sterna dougallii
Sandwich Tern Sterna sandvicensis
Over winter:
Avocet Recurvirostra avosetta
Bar-tailed Godwit Limosa lapponica
Bittern Botaurus stellaris
Golden Plover Pluvialis apricaria
Hen Harrier Circus cyaneus
Ruff Philomachus pugnax</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">Breeding:
Redshank Tringa totanus
Ringed Plover Charadrius hiaticula
On passage:
Ringed Plover Charadrius hiaticula
Over winter:
Dark-bellied Brent Goose Branta bernicla bernicla
Knot Calidris canutus
Pink-footed Goose Anser brachyrhynchus
Pintail Anas acuta
Redshank Tringa totanus
Wigeon Anas penelope</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Waterfowl:
Shelduck Tadorna tadorna, Avocet Recurvirostra avosetta, Golden Plover Pluvialis apricaria, Ruff Philomachus pugnax, Bar-tailed Godwit Limosa lapponica, Pink-footed Goose Anser brachyrhynchus, Dark-bellied Brent Goose Branta bernicla bernicla, Wigeon Anas penelope, Pintail Anas acuta, Knot Calidris canutus, Redshank Tringa totanus, Bittern Botaurus stellaris, White-fronted Goose Anser albifrons albifrons, Dunlin Calidris alpina alpina, Gadwall Anas strepera, Teal Anas crecca, Shoveler Anas clypeata, Common Scoter Melanitta nigra, Velvet Scoter Melanitta fusca, Oystercatcher Haematopus ostralegus, Ringed Plover Charadrius hiaticula, Grey Plover Pluvialis squatarola, Lapwing Vanellus vanellus, Sanderling Calidris alba, Cormorant Phalacrocorax carbo.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="2">Avocet</td><td rowspan="2">Br/Wi/As</td><td>Collision</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
</table>

A48		North Norfolk Coast SPA and Ramsar		
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Bittern	Br/Wi/As	Collision	No bitterns were recorded.	No LSE
		Barrier	No bitterns were recorded.	No LSE
		Displacement	No bitterns were recorded.	No LSE
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Mediterranean gulls	Br	Collision	No Mediterranean gulls were recorded.	No LSE
		Barrier	No Mediterranean gulls were recorded.	No LSE
		Displacement	No Mediterranean gulls were recorded.	No LSE
Roseate tern	Br	Collision	No roseate terns were recorded.	No LSE
		Barrier	No roseate terns were recorded.	No LSE
		Displacement	No roseate terns were recorded.	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE

A48		North Norfolk Coast SPA and Ramsar		
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. None were recorded flying above 22.5 m and therefore at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Ruff	Wi/As	Collision	No ruff were recorded.	No LSE
		Barrier	No ruff were recorded.	No LSE
		Displacement	No ruff were recorded.	No LSE
Redshank	Mi(Br)	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Ringed plover	Mi (br)/Mi (pa)/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
(Dark-bellied) brent goose	Mi (wi)/As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	(Mi (wi)	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE

A48		North Norfolk Coast SPA and Ramsar		
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Pintail	Mi (wi)	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Wigeon	Mi (wi)/As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Knot	As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE

A48		North Norfolk Coast SPA and Ramsar		
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Gadwall	As	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Shoveler	As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Common scoter	As	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Velvet scoter	As	Collision	No velvet scoter were recorded during two years of surveys.	No LSE
		Barrier	No velvet scoter were recorded during two years of surveys.	No LSE
		Displacement	No velvet scoter were recorded during two years of surveys.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Grey Plover	As	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE

A48		North Norfolk Coast SPA and Ramsar		
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Sanderling	As	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A49</th><th colspan="3">Breydon Water SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">1,202 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">120.7 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding;
Common Tern Sterna hirundo
Over winter;
Avocet Recurvirostra avosetta
Bewick's Swan Cygnus columbianus bewickii
Golden Plover Pluvialis apricaria</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">-</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Waterfowl:
Black-tailed Godwit Limosa limosa islandica, Dunlin Calidris alpina alpina, Lapwing Vanellus vanellus, Shoveler Anas clypeata, Wigeon Anas penelope, White-fronted Goose Anser albifrons albifrons, Cormorant Phalacrocorax carbo, Golden Plover Pluvialis apricaria, Avocet Recurvirostra avosetta, Bewick's Swan Cygnus columbianus bewickii.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Common tern</td><td rowspan="3">Br</td><td>Collision</td><td>A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco et al. 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco et al. 2006, Pettersson 2005).</td><td>No LSE</td></tr>
<tr><td rowspan="3">Avocet</td><td rowspan="3">Wi/As</td><td>Collision</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Bewick’s swan</td><td rowspan="3">Wi/As</td><td>Collision</td><td>No Bewick’s swans were recorded.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No Bewick’s swans were recorded.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No Bewick’s swans were recorded.</td><td>No LSE</td></tr>
</table>

A49		Breydon Water SPA		
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No goldenplover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Shoveler	As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE

A49		Breydon Water SPA		
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A50		Great Yarmouth and North Denes SPA		
Area		149.1 ha		
Distance from Project One		107 km		
Article 4.1		**Breeding;** Little tern *Sterna albifrons*		
Article 4.2 – Migratory Species		**-**		
Article 4.2 – Assemblage		**-**		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A51	Broadland SPA and Ramsar
Area	5,462.4 ha
Distance from Project One	99.1 km
Article 4.1	**Breeding;** Bittern *Botaurus stellaris* Marsh Harrier *Circus aeruginosus* **Over winter;** Bewick's Swan *Cygnus columbianus bewickii* Bittern *Botaurus stellaris* Hen Harrier *Circus cyaneus* Ruff *Philomachus pugnax* Whooper Swan *Cygnus cygnus*
Article 4.2 – Migratory Species	**Over winter**; Gadwall *Anas strepera*, Pink-footed Goose *Anser brachyrhynchus*, Shoveler *Anas clypeata*,
Article 4.2 – Assemblage	**Waterfowl:** Cormorant *Phalacrocorax carbo*, Bewick's Swan *Cygnus columbianus bewickii*, Whooper Swan *Cygnus cygnus,* Ruff *Philomachus pugnax*, Pink-footed Goose *Anser brachyrhynchus*, Gadwall *Anas strepera*, Bittern *Botaurus stellaris*, Great Crested Grebe *Podiceps cristatus*, Coot *Fulica atra*, Bean Goose *Anser fabalis*, White-fronted Goose *Anser albifrons albifrons,* Wigeon *Anas penelope*, Teal *Anas crecca*, Pochard *Aythya ferina*, Tufted Duck *Aythya fuligula*, Shoveler *Anas clypeata*.

Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites

Qualifying Feature		Potential Impact	Details	LSE Test Result
Bittern	Br/Wi/As	Collision	No bitterns were recorded.	No LSE
		Barrier	No bitterns were recorded.	No LSE
		Displacement	No bitterns were recorded.	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Bewick’s swan	Wi/As	Collision	No Bewick’s swans were recorded.	No LSE
		Barrier	No Bewick’s swans were recorded.	No LSE
		Displacement	No Bewick’s swans were recorded.	No LSE
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Ruff	Wi	Collision	No ruff were recorded.	No LSE

A51		Broadland SPA and Ramsar		
		Barrier	No ruff were recorded.	No LSE
		Displacement	No ruff were recorded.	No LSE
Whooper swan	Wi/As	Collision	No whooper swan were recorded.	No LSE
		Barrier	No whooper swan were recorded.	No LSE
		Displacement	No whooper swan were recorded.	No LSE
Gadwall	Mi (wi)/As	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Shoveler	Mi (wi)/As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Pink-footed goose	Mi (wi)/As	Collision	Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell and Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.	No LSE
		Barrier	Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.	No LSE
		Displacement	No pink-footed geese were recorded using Project One and therefore no displacement effects are predicted to occur.	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Coot	As	Collision	No coot were recorded.	No LSE
		Barrier	No coot were recorded.	No LSE
		Displacement	No coot were recorded.	No LSE
Bean goose	As	Collision	Three bean geese were recorded in year 2, one of which was in Project One.	No LSE
		Barrier	The incremental increase in flight distance will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	All records of bean geese were of birds flying through the area and not using it. No displacement effects will occur.	No LSE

A51		Broadland SPA and Ramsar		
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Pochard	As	Collision	Three pochard were recorded flying at 10 m in height in Project One but outwith Project One in Year 1 and two birds were recorded in Year 2. Therefore, at very low risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Tufted duck	As	Collision	Only seven tufted duck were recorded during two years of surveys.	No LSE
		Barrier	Only seven tufted duck were recorded during two years of surveys.	No LSE
		Displacement	Only seven tufted duck were recorded during two years of surveys.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A52	Minsmere and Walberswick SPA and Ramsar			
Area	2,018.92 ha			
Distance from Project One	147 km			
Article 4.1	**Breeding;** Avocet *Recurvirostra avosetta* Bittern *Botaurus stellarius* Little Tern *Sterna albifrons* Marsh Harrier *Circus aeruginosus* Nightjar *Camprimulgus europaeus* Woodlark *Lullula arborea* Gadwall *Anas strepera* Shoveler *Anas clypeata* Teal *Anas crecca* **Winter;** Avocet *Recurvirostra avosetta* Bittern *Botaurus stellarius* Hen harrier *Circus cyaneus* Gadwall *Anas strepera* Shoveler *Anas clypeata* White-fronted goose *Anser albifrons albifrons*			
Article 4.2 – Migratory Species	**-**			
Article 4.2 – Assemblage	-			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Marsh Harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Avocet	Br	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE

A52		Minsmere and Walberswick SPA and Ramsar		
Bittern	Br	Collision	No bitterns were recorded.	No LSE
		Barrier	No bitterns were recorded.	No LSE
		Displacement	No bitterns were recorded.	No LSE
Nightjar	Br	Collision	No nightjars were recorded.	No LSE
		Barrier	No nightjars were recorded.	No LSE
		Displacement	No nightjars were recorded.	No LSE
Gadwall	Br/Wi	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Shoveler	Br/Wi	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Teal	Br/Wi	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
White-fronted goose	Wi	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A53	Alde Ore Estuary SPA and Ramsar			
Area	2,146.87 ha			
Distance from Project One	161.8 km			
Article 4.1	**Breeding;** Avocet *Recurvirostra avosetta* Little Tern *Sterna albifrons* Marsh Harrier *Circus aeruginosus* Sandwich Tern *Sterna sandvicensis* **Winter;** Avocet *Recurvirostra avosetta*			
Article 4.2 – Migratory Species	**Breeding;** Lesser Black-backed Gull *Larus fuscus* **Winter** Redshank *Tringa totanus*			
Article 4.2 – Assemblage	**Seabirds:** Herring Gull *Larus argentatus*, Black-headed Gull *Larus ridibundus*, Lesser Black-backed Gull *Larus fuscus*, Little Tern *Sterna albifrons*, Sandwich Tern *Sterna sandvicensis*. **Waterbirds:** Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Shoveler *Anas clypeata*, Teal *Anas crecca*, Wigeon *Anas penelope*, Shelduck *Tadorna tadorna*, White-fronted Goose *Anser albifrons albifrons,* Redshank *Tringa totanus*, Avocet *Recurvirostra avosetta*.			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Marsh Harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Avocet	Br/Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Little tern	Br/As	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Sandwich tern	Br/As	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE

A53		Alde Ore Estuary SPA and Ramsar		
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Lesser black-backed gull	Mi (br)/As	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and so birds at this SPA are at low risk of impact. During the non-breeding period no collisions are predicted to be of birds from this SPA (see Annex B).	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that this gull are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Herring gull	As	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of impact. In the non-breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Black-headed gull	As	Collision	A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from Project One and the low usage of the site indicates low risk of a significant impact	No LSE
		Barrier	The SPA is outwith the maximum foraging range for black-headed gull during the breeding season and therefore no barrier effects will occur during the breeding season. Birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in energetic costs during migration.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that black-headed gulls are not displaced by wind farms (Zucco *et al*. 2006).	No LSE

A53		Alde Ore Estuary SPA and Ramsar		
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded in Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Shoveler	As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers in Project One (37 in Year 1 and one in Year 2). All birds recorded were below rotor height and not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A54		Stour and Orwell Estuaries SPA and Ramsar		
Area		3,323.23 ha		
Distance from Project One		169.5 km		
Article 4.1		**Winter;** Hen Harrier *Circus cyaneus*,		
Article 4.2 – Migratory Species		**Winter** Black-tailed Godwit *Limosa limosa islandica* Dunlin *Calidris alpina alpina* Grey Plover *Pluvialis squatarola* Pintail *Anas acuta* Redshank *Tringa totanus* Ringed Plover *Charadrius hiaticula* Shelduck *Tadorna tadorna* Turnstone *Arenaria interpres*		
Article 4.2 – Assemblage		**Winter** Cormorant *Phalacrocorax carbo*, Pintail *Anas acuta*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Dunlin *Calidris alpina alpina*, Black-tailed Godwit *Limosa limosa islandica*, Redshank *Tringa totanus*, Shelduck *Tadorna tadorna*, Great Crested Grebe *Podiceps cristatus*, Curlew *Numenius arquata*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Wigeon *Anas penelope*, Goldeneye *Bucephala clangula*, Oystercatcher *Haematopus ostralegus*, Lapwing *Vanellus vanellus*, Knot *Calidris canutus*, Turnstone *Arenaria interpres*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Black-tailed godwit	Wi/As	Collision	No black-tailed godwits recorded in Year 1.	No LSE
		Barrier	No black-tailed godwits recorded in Year 1.	No LSE
		Displacement	No black-tailed godwits recorded in Year 1.	No LSE
Dunlin	Wi/as	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Wi/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE

A54		Stour and Orwell Estuaries SPA and Ramsar		
		Displacement	No grey plover were recorded.	No LSE
Pintail	Wi/As	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Redshank	Wi/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Ringed plover	Wi/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Shelduck	Wi/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Turnstone	Wi/As	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE

A54		Stour and Orwell Estuaries SPA and Ramsar		
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Dark-bellied brent goose	As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE

A54		Stour and Orwell Estuaries SPA and Ramsar		
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A55	Hamford Water SPA and Ramsar			
Area	2,187.21 ha			
Distance from Project One	183.3 km			
Article 4.1	**Breeding;** Little Tern *Sterna albifrons* **Winter** Avocet *Recurvirostra avosetta* Golden Plover *Pluvialis apricaria* Ruff *Philomachus pugnax*			
Article 4.2 – Migratory Species	**Winter** **On passage;** Ringed Plover *Charadrius hiaticula* **Over winter;** Black-tailed Godwit *Limosa limosa islandica* Dark-bellied Brent Goose *Branta bernicla bernicla* Grey Plover *Pluvialis squatarola* Ringed Plover *Charadrius hiaticula* Teal *Anas crecca*			
Article 4.2 – Assemblage	**Winter** Redshank *Tringa totanus*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Wigeon *Anas penelope*, Shelduck *Tadorna tadorna*, Black-tailed Godwit *Limosa limosa islandica*, Grey Plover *Pluvialis squatarola*, Ringed Plover *Charadrius hiaticula*, Teal *Anas crecca*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Ruff *Philomachus pugnax*, Golden Plover *Pluvialis apricaria*, Avocet *Recurvirostra avosetta.*			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Avocet	Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Golden plover	Wi/as	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE

A55		Hamford Water SPA and Ramsar		
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Ruff	Wi/As	Collision	No ruff were recorded.	No LSE
		Barrier	No ruff were recorded.	No LSE
		Displacement	No ruff were recorded.	No LSE
Ringed plover	Pa/Wi/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	Wi/As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Dark-bellied brent goose	Wi/As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Wi/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Teal	Wi/As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE

A55		Hamford Water SPA and Ramsar		
Redshank	As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision.	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A56	Colne Estuary SPA and Ramsar			
Area	2,701.43 ha			
Distance from Project One	185.9 km			
Article 4.1	**Breeding;** Little Tern *Sterna albifrons* **Winter** Avocet *Recurvirostra avosetta* Golden Plover *Pluvialis apricaria* Hen Harrier *Circus cyaneus*			
Article 4.2 – Migratory Species	**Winter;** Dark-bellied Brent Goose *Branta bernicla bernicla* Redshank *Tringa totanus*			
Article 4.2 – Assemblage	**Winter;** Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Grey Plover *Pluvialis squatarola*, Ringed Plover *Charadrius hiaticula*, Shelduck *Tadorna tadorna*, Cormorant *Phalacrocorax carbo*, Great Crested Grebe *Podiceps cristatus*, Redshank *Tringa totanus*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Golden Plover *Pluvialis apricaria*, Avocet *Recurvirostra avosetta*.			
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Avocet	Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE

A56		Colne Estuary SPA and Ramsar		
Dark-bellied brent goose	Mi (wi)/As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Redshank	Mi (wi)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Grey plover	Wi/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Ringed plover	Pa/Wi/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE

A56		Colne Estuary SPA and Ramsar		
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A57		Foulness SPA and Ramsar		
Area		10,968.9 ha		
Distance from Project One		208.4 km		
Article 4.1		**Breeding;** Avocet *Recurvirostra avosetta* Common Tern *Sterna hirundo* Little Tern *Sterna albifrons* Sandwich Tern *Sterna sandvicensis* **Winter** Avocet *Recurvirostra avosetta* Bar-tailed Godwit *Limosa lapponica* Golden Plover *Pluvialis apricaria* Hen Harrier *Circus cyaneus*		
Article 4.2 – Migratory Species		**Winter** **On passage;** Redshank *Tringa totanus* **Over winter;** Dark-bellied Brent Goose *Branta bernicla bernicla* Grey Plover *Pluvialis squatarola* Knot *Calidris canutus* Oystercatcher *Haematopus ostralegus*		
Article 4.2 – Assemblage		**Winter** Redshank *Tringa totanus*, Curlew *Numenius arquata*, Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Wigeon *Anas penelope*, Shelduck *Tadorna tadorna*, Little Grebe *Tachybaptus ruficollis*, Knot *Calidris canutus*, Grey Plover *Pluvialis squatarola*, Oystercatcher *Haematopus ostralegus*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Bar-tailed Godwit *Limosa lapponica*, Golden Plover *Pluvialis apricaria*, Avocet *Recurvirostra avosetta.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE

A57		Foulness SPA and Ramsar		
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Avocet	Br/Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Hen harrier	Wi/As	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Redshank	Mi (pa)/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE

A57		Foulness SPA and Ramsar		
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Dark-bellied brent goose	Mi (wi)/As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Mi (wi) /As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Knot	Wi/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	Mi(wi)/As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	Wi/As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE

A57		Foulness SPA and Ramsar		
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Little grebe	As	Collision	No little grebe were recorded.	No LSE
		Barrier	No little grebe were recorded.	No LSE
		Displacement	No little grebe were recorded.	No LSE
Shelduck	As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision.	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A58		Abberton Reservoir SPA and Ramsar		
Area		726.2 ha		
Distance from Project One		185.6 km		
Article 4.1		**Winter** Golden Plover *Pluvialis apricaria*,		
Article 4.2 – Migratory Species		**Breeding;** Cormorant *Phalacrocorax carbo* **Winter;** Gadwall *Anas strepera* Shoveler *Anas clypeata* Teal *Anas crecca*		
Article 4.2 – Assemblage		**Winter;** Black-tailed Godwit *Limosa limosa islandica*, Lapwing *Vanellus vanellus*, Coot *Fulica atra*, Goldeneye *Bucephala clangula*, Tufted Duck *Aythya fuligula*, Pochard *Aythya ferina*, Pintail *Anas acuta*, Wigeon *Anas penelope*, Cormorant *Phalacrocorax carbo*, Great Crested Grebe *Podiceps cristatus*, Shoveler *Anas clypeata*, Teal *Anas crecca*, Gadwall *Anas strepera*, Golden Plover *Pluvialis apricaria*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	Mi(br)/As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Gadwall	Mi(br)/As	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE

A58		Abberton Reservoir SPA and Ramsar		
Shoveler	Mi(br)/As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Teal	Wi/As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Coot	As	Collision	No coot were recorded.	No LSE
		Barrier	No coot were recorded.	No LSE
		Displacement	No coot were recorded.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Tufted duck	As	Collision	Only seven tufted duck were recorded during two years of surveys.	No LSE
		Barrier	Only seven tufted duck were recorded during two years of surveys.	No LSE
		Displacement	Only seven tufted duck were recorded during two years of surveys.	No LSE
Pochard	As	Collision	Three pochard were recorded flying at 10 m in height in Project One but outwith Project One in Year 1 and two birds were recorded in Year 2. Therefore, at very low risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Pintail	As	Collision	No pintail were recorded.	No LSE

A58		Abberton Reservoir SPA and Ramsar		
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A59</th><th colspan="3">Blackwater Estuary SPA and Ramsar</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">4,395.15 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">190 km</td></tr>
<tr><td colspan="2">Article 4.1</td><td colspan="3">Breeding
Little tern Sterna albifrons
Winter;
Avocet Recurvirostra avosetta
Golden Plover Pluvialis apricaria
Hen Harrier Circus cyaneus
Ruff Philomachus pugnax</td></tr>
<tr><td colspan="2">Article 4.2 – Migratory Species</td><td colspan="3">On passage;
Ringed Plover Charadrius hiaticula
Winter
Black-tailed Godwit Limosa limosa islandica
Dark-bellied Brent Goose Branta bernicla bernicla
Dunlin Calidris alpina alpina
Grey Plover Pluvialis squatarola
Redshank Tringa totanus
Ringed Plover Charadrius hiaticula
Shelduck Tadorna tadorna</td></tr>
<tr><td colspan="2">Article 4.2 – Assemblage</td><td colspan="3">Winter
Great Crested Grebe Podiceps cristatus, Golden Plover Pluvialis apricaria, Ruff Philomachus pugnax, Dark-bellied Brent Goose Branta bernicla bernicla, Shelduck Tadorna tadorna, Ringed Plover Charadrius hiaticula, Grey Plover Pluvialis squatarola, Dunlin Calidris alpina alpina, Avocet Recurvirostra avosetta, Redshank Tringa totanus, Curlew Numenius arquata, Cormorant Phalacrocorax carbo, Wigeon Anas penelope, Teal Anas crecca, Pintail Anas acuta, Shoveler Anas clypeata, Goldeneye Bucephala clangula, Red-breasted Merganser Mergus serrator, Lapwing Vanellus vanellus, Black-tailed Godwit Limosa limosa islandica.</td></tr>
<tr><td colspan="5">Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Little tern</td><td rowspan="3">Br</td><td>Collision</td><td>Three little terns were recorded, all flying below 5 m.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco et al. 2006).</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco et al. 2006).</td><td>No LSE</td></tr>
<tr><td rowspan="3">Hen harrier</td><td rowspan="3">Wi</td><td>Collision</td><td>No hen harriers were recorded.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>No hen harriers were recorded.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>No hen harriers were recorded.</td><td>No LSE</td></tr>
<tr><td rowspan="2">Avocet</td><td rowspan="2">Wi/As</td><td>Collision</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Only two avocets were recorded during two years of surveys.</td><td>No LSE</td></tr>
</table>

A59		Blackwater Estuary SPA and Ramsar		
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Ruff	Wi/As	Collision	No ruff were recorded.	No LSE
		Barrier	No ruff were recorded.	No LSE
		Displacement	No ruff were recorded.	No LSE
Ringed plover	Pa/Wi/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Dark-bellied brent goose	As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	Wi/As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Wi/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Redshank	Wi/As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE

A59		Blackwater Estuary SPA and Ramsar		
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Shelduck	Wi/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Pintail	Wi/As	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE

A59		Blackwater Estuary SPA and Ramsar		
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A60		Dengie Marshes SPA and Ramsar		
Area		4,395.15 ha		
Distance from Project One		196.5 km		
Article 4.1		**Winter;** Bar-tailed Godwit *Limosa lapponica* Hen Harrier *Circus cyaneus*		
Article 4.2 – Migratory Species		**Winter** Grey Plover *Pluvialis squatarola* Knot *Calidris canutus*		
Article 4.2 – Assemblage		**Winter** Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Oystercatcher *Haematopus ostralegus*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Cormorant *Phalacrocorax carbo*, Great Crested Grebe *Podiceps cristatus*, Knot *Calidris canutus*, Grey Plover *Pluvialis squatarola*, Bar-tailed Godwit *Limosa lapponica*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Bar-tailed godwit	Wi/As	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Wi/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Knot	Wi/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE

A60		Dengie Marshes SPA and Ramsar		
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Dark-bellied brent goose	As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Great-crested grebe	As	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE

A60		Dengie Marshes SPA and Ramsar		
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A61		Benfleet and Southend Marshes SPA and Ramsar		
Area		2,251.31 ha		
Distance from Project One		215.9 km		
Article 4.1		-		
Article 4.2 – Migratory Species		**Passage** Ringed Plover *Charadrius hiaticula* **Winter** Dark-bellied Brent Goose *Branta bernicla bernicla* Knot *Calidris canutus* Grey Plover *Pluvialis squatarola*		
Article 4.2 – Assemblage		**Winter** Dunlin *Calidris alpina alpina*, Ringed Plover *Charadrius hiaticula*, Oystercatcher *Haematopus ostralegus*, Knot *Calidris canutus*, Grey Plover *Pluvialis squatarola*, Dark-bellied Brent Goose *Branta bernicla bernicla*.		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Ringed plover	Mi (pa)/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Dark-bellied brent goose	Mi(wi)/As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Mi (wi)/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Knot	Mi(wi)/As	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE

A61		Benfleet and Southend Marshes SPA and Ramsar		
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A62		Thames Estuary Marshes SPA		
Area		4,838.94 ha		
Distance from Project One		219.4 km		
Article 4.1		**Winter;** Avocet *Recurvirostra avosetta* Hen Harrier *Circus cyaneus*		
Article 4.2 – Migratory Species		**On passage;** Ringed Plover *Charadrius hiaticula* **Winter** Ringed Plover *Charadrius hiaticula*		
Article 4.2 – Assemblage		**Winter** Redshank *Tringa totanus*, Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Grey Plover *Pluvialis squatarola*, Shoveler *Anas clypeata*, Pintail *Anas acuta*, Gadwall *Anas strepera*, Shelduck *Tadorna tadorna*, White-fronted Goose *Anser albifrons albifrons,* Little Grebe *Tachybaptus ruficollis*, Ringed Plover *Charadrius hiaticula*, Avocet *Recurvirostra avosetta*, Whimbrel *Numenius phaeopus.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Avocet	Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Ringed plover	Mi (Pa) /Mi(wi)/ As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Redshank	As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Black-tailed godwit	As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Dunlin	As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE

A62		Thames Estuary Marshes SPA		
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Grey plover	Wi/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Pintail	Wi/As	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Shoveler	As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Gadwall	Mi (wi)	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Shelduck	Wi/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Little grebe	As	Collision	No little grebe were recorded.	No LSE
		Barrier	No little grebe were recorded.	No LSE
		Displacement	No little grebe were recorded.	No LSE

A62		Thames Estuary Marshes SPA		
Whimbrel	Mi	Collision	Eleven out of a total of 49 whimbrel recorded were in Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.	No LSE
		Barrier	Migrating whimbrel may fly around Project One but the incremental increase in flight of an estimated 36 km to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No whimbrel were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A63		Medway Estuary SPA and Ramsar		
Area		4,395.15 ha		
Distance from Project One		227.5 km		
Article 4.1		**Breeding** Little tern *Sterna albifrons* **Winter;** Avocet *Recurvirostra avosetta* Golden Plover *Pluvialis apricaria* Hen Harrier *Circus cyaneus* Ruff *Philomachus pugnax*		
Article 4.2 – Migratory Species		**On passage;** Ringed Plover *Charadrius hiaticula* **Winter** Black-tailed Godwit *Limosa limosa islandica* Dark-bellied Brent Goose *Branta bernicla bernicla* Dunlin *Calidris alpina alpina* Grey Plover *Pluvialis squatarola* Redshank *Tringa totanus* Ringed Plover *Charadrius hiaticula* Shelduck *Tadorna tadorna*		
Article 4.2 – Assemblage		**Winter** Great Crested Grebe *Podiceps cristatus*, Golden Plover *Pluvialis apricaria*, Ruff *Philomachus pugnax*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Shelduck *Tadorna tadorna*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Dunlin *Calidris alpina alpina*, Avocet *Recurvirostra avosetta*, Redshank *Tringa totanus*, Curlew *Numenius arquata*, Cormorant *Phalacrocorax carbo*, Wigeon *Anas penelope*, Teal *Anas crecca*, Pintail *Anas acuta*, Shoveler *Anas clypeata*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Lapwing *Vanellus vanellus*, Black-tailed Godwit *Limosa limosa islandica.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Avocet	Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE

A63		Medway Estuary SPA and Ramsar		
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Ruff	Wi/As	Collision	No ruff were recorded.	No LSE
		Barrier	No ruff were recorded.	No LSE
		Displacement	No ruff were recorded.	No LSE
Ringed plover	Mi (Pa)/ Mi (wi)/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	Mi (wi) As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Dark-bellied brent goose	Mi (wi) As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	Mi (wi)/As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Grey plover	Mi (wi)/As	Collision	No grey plover were recorded.	No LSE

A63		Medway Estuary SPA and Ramsar		
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Redshank	Mi (wi) /As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Shelduck	Mi (wi)/As	Collision	Only one shelduck was recorded during two years of surveys.	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Pintail	Wi/As	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE

A63		Medway Estuary SPA and Ramsar		
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Goldeneye	As	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A64		Swale Estuary SPA and Ramsar		
Area		6,154.71 ha		
Distance from Project One		285.1 km		
Article 4.1		**Breeding** Avocet *Recurvirostra avosetta* Marsh Harrier *Circus aeruginosus* Mediterranean Gull *Larus melanocephalus* **Winter;** Avocet *Recurvirostra avosetta* Bar-tailed Godwit *Limosa lapponica* Golden Plover *Pluvialis apricaria* Hen Harrier *Circus cyaneus*		
Article 4.2 – Migratory Species		**On passage;** Ringed Plover *Charadrius hiaticula* **Winter** Black-tailed Godwit *Limosa limosa islandica* Grey Plover *Pluvialis squatarola* Knot *Calidris canutus* Pintail *Anas acuta* Redshank *Tringa totanus* Shoveler *Anas clypeata*		
Article 4.2 – Assemblage		**Winter** White-fronted Goose *Anser albifrons albifrons,* Golden Plover *Pluvialis apricaria*, Bar-tailed Godwit *Limosa lapponica*, Pintail *Anas acuta*, Shoveler *Anas clypeata*, Grey Plover *Pluvialis squatarola*, Knot *Calidris canutus*, Black-tailed Godwit *Limosa limosa islandica*, Redshank *Tringa totanus*, Avocet *Recurvirostra avosetta*, Cormorant *Phalacrocorax carbo*, Curlew *Numenius arquata*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Shelduck *Tadorna tadorna*, Wigeon *Anas penelope*, Gadwall *Anas strepera*, Teal *Anas crecca*, Oystercatcher *Haematopus ostralegus*, Lapwing *Vanellus vanellus*, Dunlin *Calidris alpina alpina*, Little Grebe *Tachybaptus ruficollis.*		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Mediterranean gull	Br	Collision	No Mediterranean gulls were recorded.	No LSE
		Barrier	No Mediterranean gulls were recorded.	No LSE
		Displacement	No Mediterranean gulls were recorded.	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Avocet	Br/Wi/As	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE

A64		Swale Estuary SPA and Ramsar		
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Golden plover	Wi/As	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Hen harrier	Wi	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE
Bar-tailed godwit	Wi	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Ringed plover	Mi (Pa)/ Mi (wi)/As	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Black-tailed godwit	Mi (wi) As	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Grey plover	Mi (wi)/As	Collision	No grey plover were recorded.	No LSE
		Barrier	No grey plover were recorded.	No LSE
		Displacement	No grey plover were recorded.	No LSE
Pintail	Wi/As	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE

A64		Swale Estuary SPA and Ramsar		
Redshank	Mi (wi) /As	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Knot	Wi/Mi	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Shoveler	As	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
White-fronted goose	As	Collision	No white-fronted geese were recorded.	No LSE
		Barrier	No white-fronted geese were recorded.	No LSE
		Displacement	No white-fronted geese were recorded.	No LSE
Cormorant	As	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Dark-bellied brent goose	Mi (wi) As	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Curlew	As	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE

A64		Swale Estuary SPA and Ramsar		
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Shelduck	Mi (wi)/As	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Wigeon	As	Collision	A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Gadwall	As	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Teal	As	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Dunlin	Mi (wi)/As	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE

A64		Swale Estuary SPA and Ramsar		
Little grebe	As	Collision	No little grebe were recorded.	No LSE
		Barrier	No little grebe were recorded.	No LSE
		Displacement	No little grebe were recorded.	No LSE
Lapwing	As	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A65		Thanet Coast and Sandwich Bay SPA and Ramsar		
Area		1,870.16 ha		
Distance from Project One		239.3 km		
Article 4.1		**-**		
Article 4.2 – Migratory Species		**Winter** Turnstone *Arenaria interpres*		
Article 4.2 – Assemblage		**-**		
Conservation Objectives: See Annex I: Conservation Objectives for Natura 2000 sites				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Turnstone	Mi (wi)	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 22.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A66	Outer Thames Estuary SPA				
Area	379,268.14 ha				
Distance from Project One	121.2 km				
Article 4.1	**Winter;** Red-throated diver *Gavia stellata*				
Article 4.2 – Migratory Species	**-**				
Article 4.2 – Assemblage	**-**				
Conservation Objectives: See Section 4					
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**	
Red-throated diver	Wi	Collision	All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE	
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA which is 430 km away is negligible.	No LSE	
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently, any potential impacts will be negligible.	No LSE	
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter					

A67	Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete
Area	463,907 ha
Distance from Project One	430 km
Breeding	Sedge warbler, skylark, pintail, shoveler, garganey, gadwall, meadow pipit, short-eared owl, bittern, dunlin, Kentish plover, ringed plover, black tern, marsh harrier, hen harrier, Montagu's harrier, corncrake, Peregrine, snipe, gull billed tern, oystercatcher, white-tailed eagle, black-winged stilt, herring gull, common gull, lesser black-backed gull, great black backed gull, Mediterranean gull, black-headed gull, black-tailed godwit, bluethroat, red-breasted merganser, yellow wagtail, bearded tit, ruff, spoonbill, black-necked grebe, spotted crake, avocet, stonechat, eider, little tern, common tern, Arctic tern, Sandwich tern, shelduck, redshank, lapwing.
Winter	Razorbill, pintail, shoveler, wigeon, mallard, gadwall, grey heron, turnstone, brent goose, barnacle goose, buzzard, sanderling, dunlin, knot, twite, hen harrier, shorelark, kestrel, peregrine, fulmar, snipe, black-throated diver, red-throated diver, oystercatcher, white-tailed eagle, herring gull, common gull, great black backed gull, little gull, black-headed gull, bar-tailed godwit, common scoter, bearded tit, snow bunting, golden plover, grey plover, red-necked grebe, avocet, eider, shelduck, redshank, guillemot, lapwing.
Staging	Pintail, shoveler, wigeon, mallard, gadwall, grey heron, turnstone, brent goose, barnacle goose, sanderling, dunlin, knot, curlew sandpiper, Kentish plover, ringed plover, Bewick's swan, whooper swan, snipe, oystercatcher, herring gull, common gull, lesser black-backed gull, great black backed gull, little gull, black-headed gull, bar-tailed godwit, whimbrel, cormorant, ruff, golden plover, grey plover, eider, Arctic tern, shelduck, spotted redshank, redshank, greenshank, lapwing.

Note: Source EEA 2011. It is not possible to determine which Articles the species listed are designated under.

Those underlined have been recorded and are therefore assessed.

Conservation Objectives:

It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).

Qualifying Feature		Potential Impact	Details	LSE Test Result
Shoveler	Br/Wi/Mi	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Gadwall	Br/Wi/Mi	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Dunlin	Br/Wi/Mi	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	As	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE

A67		Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete		
Herring gull	Br/Wi/Mi	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Common gull	Br/Wi/Mi	Collision	A total of 741 common gulls were recorded during the two years of surveys. Of which 93.3% were recorded flying below 22.5 m. Collision risk modelling predicts on average up to six collisions per year in Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. However, collision risk modelling predicts a low number of mortalities that would not cause an adverse effect.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range for common gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Lesser black-backed gull	Br/Mi	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. During the non-breeding period one collision may be of a bird from this site out of a population of 7,285 pairs (see Annex B).	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE

A67		Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete		
Great black-backed gull	Br/Wi/Mi	Collision	A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Black-headed gull	Br/Mi	Collision	A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from Project One and the low usage of the site indicates low risk of a significant impact	No LSE
		Barrier	The SPA is outwith the maximum foraging range for black-headed gull during the breeding season and therefore no barrier effects will occur during the breeding season. Birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in energetic costs during migration.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that black-headed gulls are not displaced by wind farms (Zucco *et al*. 2006).	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Snipe	Br/Wi/Mi	Collision	Only two snipe were recorded during two years of surveys.	No LSE
		Barrier	Only two snipe were recorded during two years of surveys.	No LSE
		Displacement	Only two snipe were recorded during two years of surveys.	No LSE
Avocet	Br/Wi	Collision	Only two avocets were recorded during two years of surveys.	No LSE
		Barrier	Only two avocets were recorded during two years of surveys.	No LSE
		Displacement	Only two avocets were recorded during two years of surveys.	No LSE
Black-necked grebe	Wi	Collision	One black-necked grebe was recorded.	No LSE
		Barrier	One black-necked grebe was recorded.	No LSE
		Displacement	One black-necked grebe was recorded.	No LSE
Eider	Br/Wi	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE

A67		Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete		
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Common tern	Br	Collision	collision risk modelling predicts up to one common tern collision per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding birds from this SPA may disperse widely and some may occur in Project One. However, the predicted number of collisions is very low and there is a very low risk of a significant impact.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One, which is estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic tern	Br/Mi	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE

A67		Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete		
Razorbill	Wi	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	During migration razorbills will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). However, the site is 430 km away and therefore at very low risk of displacement effects.	No LSE
Shelduck	Br	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Grey heron	Wi	Collision	A total of two grey herons were recorded in the Project One ornithology study area.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance relative to the distance migrating is negligible.	No LSE
		Displacement	No grey heron were recorded using Project One and no displacement effects are predicted.	No LSE
Turnstone	Wi/Mi	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 22.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	Wi/Mi	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Greenshank	Mi	Collision	Only one greenshank was recorded during two years of surveys.	No LSE
		Barrier	Only one greenshank was recorded during two years of surveys.	No LSE
		Displacement	Only one greenshank was recorded during two years of surveys.	No LSE
Black tern	Br	Collision	Only one black tern was recorded during two years of surveys.	No LSE
		Barrier	Only one black tern was recorded during two years of surveys.	No LSE
		Displacement	Only one black tern was recorded during two years of surveys.	No LSE
Mallard	Wi/Mi	Collision	A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.	No LSE

A67		Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete		
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Ringed plover	Wi/Mi	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Fulmar	Wi	Collision	Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.	No LSE
		Barrier	The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE
Red-throated diver	Wi	Collision	All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA which is 430 km away is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently, any potential impacts will be negligible.	No LSE
Little gull	Wi/Mi	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 430 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Common scoter	Wi	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE

A67		Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete		
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Guillemot	Wi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	During migration guillemots will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, the SPA is 430 km away and therefore the potential for a LSE is very remote.	No LSE
Grey plover	Wi/Mi	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	Mi	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Whimbrel	Mi	Collision	Eleven out of a total of 49 whimbrel recorded were in Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.	No LSE
		Barrier	Migrating whimbrel may fly around Project One but the incremental increase in flight of an estimated 36 km to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No whimbrel were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A68</th><th colspan="3">Östliche Deutsche Bucht (Eastern German Bight) SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">313,513 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">347 km</td></tr>
<tr><td colspan="2">Annex 1 species</td><td colspan="3">Winter;
Red-throated diver, Black-throated diver, Little gull.
Passage;
Common tern, Arctic tern, Sandwich tern.</td></tr>
<tr><td colspan="2">Non Annex I species</td><td colspan="3">Winter;
Razorbill, Fulmar, Herring gull, Common gull, Great black-backed gull, Common scoter, Guillemot.
Passage;
Lesser black-backed gull, Black-headed gull, Gannet, Kittiwake, Great-crested grebe.</td></tr>
<tr><td colspan="5">Conservation Objectives</td></tr>
<tr><td colspan="5">To ensure that the listed bird species survive and grow in number, and to safeguard their habitats, it is necessary to maintain and restore:
The population size and population quality of the bird species, with the aim of attaining good conservation status taking into account natural population dynamics and population trends; species whose biogeographic population is shrinking are given special attention.
The birds’ main direct and indirect food sources, and in particular the natural population densities, age range distributions and geographical distribution patterns of organisms serving the bird species as food sources.
The site’s characteristic, heightened biological productivity at vertical fronts in the water, and its geo-hydromorphology with the related species-specific ecological functions and effects.
Unfragmented habitats in the area, each with their own species-specific ecological functions and spatial interrelationships, along with unrestricted access between these habitats and neighbouring marine areas.
The natural quality of habitats, and in particular their protection from pollution and harm, and protection of the bird populations from major disturbances.</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Red-throated diver</td><td rowspan="3">Wi</td><td>Collision</td><td>Within the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Black-throated diver</td><td rowspan="3">Wi</td><td>Collision</td><td>A total of 13 black-throated divers were recorded of which nine were within Project One.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>A total of 13 black-throated divers were recorded of which nine were within Project One.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>A total of 13 black-throated divers were recorded of which nine were within Project One.</td><td>No LSE</td></tr>
</table>

A68		Östliche Deutsche Bucht (Eastern German Bight) SPA		
Little gull	Wi	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 347 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Common tern	Pa	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One, which is estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic tern	Pa	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006*,* Pettersson 2005).	No LSE
Sandwich tern	Pa	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Razorbill	Wi	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE

A68		Östliche Deutsche Bucht (Eastern German Bight) SPA		
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). However, this SPA holds relatively few razorbill estimated as being 700 individuals and is 347 km away.	No LSE
Herring gull	Wi	Collision	A total of 590 herring gulls were recorded in Year 1 and 562 in Year 2; with peak numbers during the non-breeding season. Of those in flight 58.6% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely but the site is 347 km away and therefore birds are at very low risk of collision.	No LSE
		Barrier	During migration herring gulls will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Common gull	Wi	Collision	A total of 741 common gulls were recorded during the two years of surveys. Of which 93.3% were recorded flying below 22.5 m. Collision risk modelling predicts on average up to six collisions per year in Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. However, collision risk modelling predicts a low number of mortalities that would not cause an adverse effect.	No LSE
		Barrier	During migration common gulls will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown from an SPA 374 km away.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Great black-backed gull	Wi	Collision	A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown to or from the SPA.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE

A68		Östliche Deutsche Bucht (Eastern German Bight) SPA		
Common scoter	Wi	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Guillemot	Wi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, birds associated with this SPA during the winter will not be impacted and therefore there is no significant effect.	No LSE
Lesser black-backed gull	Pa	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from Project One indicates low risk of a significant impact.	No LSE See Annex B
		Barrier	During migration lesser black-backed gulls will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Black-headed gull	Pa	Collision	A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from Project One and the low usage of Project One indicates low risk of a significant impact	No LSE
		Barrier	The SPA is 347 km away and black-headed gulls will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in energetic costs during migration.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that black-headed gulls are not displaced by wind farms (Zucco *et al*. 2006).	No LSE

A68		Östliche Deutsche Bucht (Eastern German Bight) SPA		
Kittiwake	Pa	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average 183 adults may collide per year with Project One. The SPA is 347 km from Project One and low risk.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Petersen *et al*. 2006). The site is 347 km from Project One and therefore the risk of a potential for LSE is negligible.	No LSE
Gannet	Pa	Collision	Collision risk modelling predicted on average up to 120 collisions per year (based on 98% avoidance rate). The site is 347 km from Project One and holds up to 230 gannets during passage (BFN 2012b). Therefore the risk of a LSE is negligible.	No LSE
		Barrier	If a barrier effect should occur the additional estimated distance of up to 36 km will be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that Project One is not proportionally of greater importance to gannet compared to elsewhere.	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, Pa = passage, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A69		Sylter Außenriff (Sylt Outer Reef) SPA		
Area		531,429 ha		
Distance from Project One		293 km		
Species		Red-throated diver, Black-throated diver, Little gull, Common tern, Arctic tern, Sandwich tern.		
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Red-throated diver	Wi	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Black-throated diver	Wi	Collision	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
		Barrier	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
		Displacement	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
Little gull	Mi	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 293 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Common tern	Mi	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not	No LSE

A69		Sylter Auβenriff (Sylt Outer Reef) SPA		
			displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	
Arctic tern	Mi	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Mi	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A70		Seevogelschutzgebiet Helgoland SPA		
Area		161,333 ha		
Distance from Project One		408 km		
Species		Razorbill, fulmar, Red-throated diver, Black-throated diver, Herring gull, Common gull, Lesser black-backed gull, Little gull, Common scoter, Red-necked grebe, Kittiwake, Eider, Common tern, Arctic tern, Sandwich tern, Gannet, Guillemot.		
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Razorbill	Br/Wi	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). However, this SPA holds relatively few razorbill estimated as being 200 individuals outside the breeding season and is 408 km away.	No LSE
Fulmar	Wi	Collision	Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.	No LSE
		Barrier	The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE
Red-throated diver	Wi	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Black-throated diver	Wi	Collision	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
		Barrier	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
		Displacement	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE

A70		Seevogelschutzgebiet Helgoland SPA		
Herring gull	Br	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This SPA is 408 km away and therefore the risk of collision impacts are remote and no significant impacts will occur.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Common gull	Wi	Collision	A total of 741 common gulls were recorded during the two years of surveys. Of which 93.3% were recorded flying below 22.5 m. Collision risk modelling predicts on average up to six collisions per year in Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. However, collision risk modelling predicts a low number of mortalities that would not cause an adverse effect.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Lesser black-backed gull	Br	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4 % were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from Project One and the small breeding population of 37 pairs indicates low risk of a significant impact alone but may be increased in-combination with potential future developments.	No LSE See Annex B
		Barrier	During migration lesser black-backed gulls will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Little gull	Wi/Pa	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 408 km from Project One and therefore the risk of a significant effect is negligible.	No LSE

A70		Seevogelschutzgebiet Helgoland SPA		
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Common scoter	Wi	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Red-necked grebe	Wi	Collision	Only one red-necked grebe was recorded.	No LSE
		Barrier	Only one red-necked grebe was recorded.	No LSE
		Displacement	Only one red-necked grebe was recorded.	No LSE
Kittiwake	Br/Wi	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Eider	Br/Wi	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE

A70		Seevogelschutzgebiet Helgoland SPA		
Common tern	Pa	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic tern	Pa	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Pa	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Gannet	Pa	Collision	A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely.	No LSE See Annex B
		Barrier	If a barrier effect should occur the additional estimated distance of up to 36 km will be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that Project One is not proportionally of greater importance to gannet compared to elsewhere.	No LSE See Annex B

A70		Seevogelschutzgebiet Helgoland SPA		
Guillemot	Wi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006).	No LSE See Annex B
Notes: Br = breeding, Wi = Winter, Mi = Migrant, Pa = passage, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A71		Borkum-Riffgrund SPA		
Area		62,548 ha		
Distance from Project One		254 km		
Species		Red-throated diver, Black-throated diver, Little gull, Common tern, Arctic tern, Sandwich tern.		
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Red-throated diver	Wi	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Black-throated diver	Wi	Collision	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
		Barrier	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
		Displacement	A total of 13 black-throated divers were recorded of which nine were within Project One.	No LSE
Little gull	Wi	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 254 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Common tern	Mi	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE

A71		Borkum-Riffgrund SPA		
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic tern	Mi	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Mi	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Pa = Passage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A72		Littoral Seino-Marin SPA		
Area		148,907 ha		
Distance from Project One		460 km		
Annex 1 Species		Short-eared owl, Peregrine, Black-throated diver, Great northern diver, Red-throated diver, Gull-billed tern, Storm petrel, Mediterranean gull, Leach's petrel, Little gull, Spoonbill, Slavonian grebe, Balearic shearwater, Little tern, Common tern, Sandwich tern.		
Non-Annex I species		Common sandpiper, Razorbill, White-fronted goose, Greylag goose, Purple sandpiper, Fulmar, Herring gull, Lesser black-backed gull, Great black-backed gull, Sabine's gull, Velvet scoter, Common scoter, Red-breasted merganser, Shag, Cormorant, Great-crested grebe, Red-necked grebe, Black-necked grebe, Manx shearwater, Kittiwake, Eider, Arctic skua, Pomarine skua, Great skua, Shelduck, Guillemot		
Note: Source EEA 2012b. It is not possible to determine which Articles the species listed are designated under. ***Due to the extensive list of species only those underlined that have been recorded are assessed.***				
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Red-throated diver	Wi/Mi	Collision	All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA, which is 460 km away, is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently, any potential impacts will be negligible.	No LSE
Slavonian grebe	Wi/As	Collision	Only one Slavonian grebe was recorded flying below turbine height.	No LSE
		Barrier	Only one Slavonian grebe was recorded.	No LSE
		Displacement	Only one Slavonian grebe was recorded.	No LSE
Storm petrel	Mi	Collision	Storm petrels are an uncommon to scarce migrant off the Yorkshire coast (Thomas 2011). A total of 29 storm petrels were recorded across both years and all were recorded flying below 2.5 m and therefore not at risk of collision.	No LSE
		Barrier	There's no evidence of whether or not storm petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.	No LSE
		Displacement	There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence based on the low number of observations that the area is a favoured foraging location for this species.	No LSE
Leach's petrel	Mi	Collision	Leach's petrel is a scarce to rare migrant off the Yorkshire coast (Thomas 2011). Two Leach's petrels were recorded in Year 1 and three in Year 2. All were recorded flying below 2.5 m and therefore not at risk of collision	No LSE

A72		Littoral Seino-Marin SPA		
		Barrier	There's no evidence of whether or not Leach's petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.	No LSE
		Displacement	There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence, based on the low number of observations, that the area is a favoured foraging location for this species.	No LSE
Little gull	Wi/Mi	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 460 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Balearic shearwater	Mi	Collision	A total of five Balearic shearwaters were recorded. All were flying below 22.5 m in height and therefore not at risk of collision.	No LSE
		Barrier	There is no evidence from existing offshore wind farms as to whether wind farms cause a barrier to Balearic shearwaters. However, should they do so the additional distance of an estimated 36 km will cause a negligible increase in distance flown compared to the overall distance this pelagic species regularly flies.	No LSE
		Displacement	It is not known whether there will be a displacement effect. However only five birds were recorded and therefore there will be no adverse effect should displacement occur.	No LSE
Little tern	Mi	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Common tern	Mi	Collision	Collision risk modelling predicts up to one common tern collision per year (at a 98% avoidance rate). The predicted number of collisions and the distance this SPA is from Project One make the risk of a significant impact negligible.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE

A72		Littoral Seino-Marin SPA		
Arctic tern	Br/Mi	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Razorbill	Wi	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	During migration razorbills will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). However, the site is 460 km away and therefore at very low risk of displacement effects.	No LSE
Fulmar	Wi	Collision	Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.	No LSE
		Barrier	The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE
Herring gull	Wi/Mi	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This SPA is 460 km away and therefore collision risk is very low and no significant impacts will occur.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE

A72		Littoral Seino-Marin SPA		
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Lesser black-backed gull	Br/Mi	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from Project One and the small breeding population of five pairs, indicates low risk of a significant impact alone but may be increased in-combination with potential future developments.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Great black-backed gull	Br/Wi/Mi	Collision	A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Sabine's Gull	Mi	Collision	Two Sabine's gull were recorded in the Project One ornithology study area in Year 1. No flight height data are available for Sabine's gull but the low usage of the site and the distance for the SPA indicate low risk of an adverse effect.	No LSE
		Barrier	There are no data on whether a barrier effect may occur on Sabine's gulls but the low usage of the site and the distance for the SPA indicate low risk of an adverse effect.	No LSE
		Displacement	There are no data on whether a barrier effect may occur on Sabine's gulls but the low usage of the site and the distance for the SPA indicate low risk of an adverse effect.	No LSE
Greylag Goose	Mi (wi)/As	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE

A72		Littoral Seino-Marin SPA		
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Common scoter	Wi	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Eider	Wi	Collision	Two eider were recorded in the 10 km buffer area and outwith Project One Zones, both were flying below 20 m and therefore not at risk of collision. Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Great-crested grebe	Pa	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Red-necked grebe	Wi	Collision	One red-necked grebe was recorded outwith Project One.	No LSE
		Barrier	One red-necked grebe was recorded outwith Project One.	No LSE
		Displacement	One red-necked grebe was recorded outwith Project One.	No LSE
Black-necked grebe	Wi	Collision	One black-necked grebe was recorded.	No LSE

A72		Littoral Seino-Marin SPA		
		Barrier	One black-necked grebe was recorded.	No LSE
		Displacement	One black-necked grebe was recorded.	No LSE
Common sandpiper	Mi	Collision	One common sandpiper was recorded.	No LSE
		Barrier	One common sandpiper was recorded.	No LSE
		Displacement	One common sandpiper was recorded.	No LSE
Cormorant	Mi	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Manx shearwater	Mi	Collision	A total of 184 Manx shearwaters were recorded across both years in the Project One ornithology study area. All were flying below turbine height and therefore not at risk of collision.	No LSE
		Barrier	There is no evidence from existing offshore wind farms as to whether they cause a barrier to Manx shearwaters. However, should they do so, the additional distance of an estimated 36 km will cause a negligible increase in distance flown compared to the overall distance this pelagic species regularly flies.	No LSE
		Displacement	It is not known whether there will be a displacement effect. However, only 44 Manx shearwaters were recorded in Project One and the SPA is 460 km away.	No LSE
Kittiwake	Br/Wi	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE See Annex B
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Arctic skua	As	Collision	A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision because of rapid movements through sites and predominanty low altitude flight heights.	No LSE

A72		Littoral Seino-Marin SPA		
		Barrier	Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al*. 2006).	No LSE
		Displacement	There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Pomarine skua	Mi	Collision	A total of 50 pomarine skuas were recorded in the Project One ornithology study area in Year 1. 85.7% were recorded flying below turbine height. The SPA is 460 km from Project One and the risk of collision for a pomarine skua from this SPA is negligible.	No LSE
		Barrier	There are no data from post-construction monitoring studies to determine whether pomarine skuas avoid entering wind farms. However, should they do so the additional distance flown will not be significant compared to the overall distance flown to or from this SPA.	No LSE
		Displacement	There are no data available from constructed wind farms to determine whether pomarine skuas are displaced but the relatively low usage of Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.	No LSE
Great skua	Mi (br)/As	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates no mortalities associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Guillemot	Wi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	During migration guillemots will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, the SPA is 460 km away and therefore the potential for a LSE is very remote.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A73		Baie de Seine Occidentale SPA		
Area		44,488 ha		
Distance from Project One		509 km		
Annex 1 Species		Black tern, Little egret, Black-throated diver, Great northern diver, Red-throated diver, Mediterranean gull, Little gull, Slavonian grebe, Little tern, Common tern, Arctic tern, Sandwich tern.		
Non-Annex I species		Razorbill, Turnstone, Purple sandpiper, Fulmar, Herring gull, Great black-backed gull, Common scoter, red-breasted merganser, Shag, Cormorant, Great-crested grebe, Kittiwake, Eider, Gannet, Shelduck, Guillemot.		
Note: Source INPN 2012. It is not possible to determine which Articles the species listed are designated under. Due to the extensive list of species only those underlined that have been recorded in surveys are assessed.				
Conservation Objectives: It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Black tern	Br	Collision	Only one black tern was recorded during two years of surveys.	No LSE
		Barrier	Only one black tern was recorded during two years of surveys.	No LSE
		Displacement	Only one black tern was recorded during two years of surveys.	No LSE
Red-throated diver	Wi	Collision	All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA, which is 509 km away, is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently, any potential impacts are likely to be negligible.	No LSE
Slavonian grebe	Wi/As	Collision	Only one Slavonian grebe was recorded flying below turbine height.	No LSE
		Barrier	Only one Slavonian grebe was recorded.	No LSE
		Displacement	Only one Slavonian grebe was recorded.	No LSE
Little gull	Wi/Mi	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 509 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Little tern	Mi	Collision	Three little terns were recorded, all flying below 5 m.	No LSE

A73		Baie de Seine Occidentale SPA		
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE
Common tern	Mi	Collision	collision risk modelling predicts up to one common tern collision per year (at a 98% avoidance rate). The predicted number of collisions and the distance this SPA is from Project One make the risk of a significant impact negligible.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic tern	Br/Mi	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006*,* Pettersson 2005).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Razorbill	Wi	Collision	A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.	No LSE
		Barrier	During migration razorbills will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). However, the site is 509 km away and therefore at very low risk of displacement effects.	No LSE
Turnstone	Wi/Mi	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.	No LSE

A73		Baie de Seine Occidentale SPA		
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Purple sandpiper	Wi	Collision	Only one purple sandpiper was recorded during two years of surveys.	No LSE
		Barrier	Only one purple sandpiper was recorded during two years of surveys.	No LSE
		Displacement	Only one purple sandpiper was recorded during two years of surveys.	No LSE
Fulmar	Wi	Collision	Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.	No LSE
		Barrier	The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.	No LSE
		Displacement	There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.	No LSE
Herring gull	Br/Wi	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This site is 509 km away and no significant impacts will occur.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Great black-backed gull	Br/Wi	Collision	A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, numbers recorded were higher and birds from this SPA may disperse widely. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE

A73		Baie de Seine Occidentale SPA		
Common scoter	Wi	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Eider	Wi	Collision	Two eider were recorded in the 10 km buffer area and outwith Project One Zones, both were flying below 20 m and therefore not at risk of collision. Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Great-crested grebe	Mi	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	Br/Wi	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE

A73		Baie de Seine Occidentale SPA		
Kittiwake	Wi	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Guillemot	Wi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	During migration guillemots will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, the SPA is 509 km away and therefore the potential for a LSE is very remote.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

<table>
<tr><th colspan="2">A74</th><th colspan="3">Falaise du Bessin Occidental SPA</th></tr>
<tr><td colspan="2">Area</td><td colspan="3">1,200 ha</td></tr>
<tr><td colspan="2">Distance from Project One</td><td colspan="3">540 km</td></tr>
<tr><td colspan="2">Annex 1 Species</td><td colspan="3">Short-eared owl, Peregrine, <u>Red-throated diver</u>, Dartford warbler.</td></tr>
<tr><td colspan="2">Non-Annex I species</td><td colspan="3"><u>Razorbill</u>, <u>Fulmar</u>, <u>Herring gull</u>, <u>Lesser black-backed gull</u>, <u>Red-breasted merganser</u>, <u>Shag</u>, <u>Cormorant</u>, <u>Kittiwake</u>, <u>Guillemot</u>.</td></tr>
<tr><td colspan="5">Note: Source INPN 2012. It is not possible to determine which Articles the species listed are designated under.
Due to the extensive list of species only those that have been recorded in surveys are assessed.</td></tr>
<tr><td colspan="5">Conservation Objectives:
It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).</td></tr>
<tr><td colspan="2">Qualifying Feature</td><td>Potential Impact</td><td>Details</td><td>LSE Test Result</td></tr>
<tr><td rowspan="3">Red-throated diver</td><td rowspan="3"></td><td>Collision</td><td>All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA, which is 540 km away, is negligible.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently, any potential impacts will be negligible.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Razorbill</td><td rowspan="3">Wi</td><td>Collision</td><td>A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>During migration razorbills will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco et al. 2006; Petersen et al. 2006). However, the site is 540 km away and therefore at very low risk of displacement effects.</td><td>No LSE</td></tr>
<tr><td rowspan="3">Fulmar</td><td rowspan="3">Br/Wi</td><td>Collision</td><td>Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.</td><td>No LSE</td></tr>
<tr><td>Barrier</td><td>The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.</td><td>No LSE</td></tr>
<tr><td>Displacement</td><td>There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.</td><td>No LSE</td></tr>
</table>

A74		Falaise du Bessin Occidental SPA		
Herring gull	Br	Collision	A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This SPA is 540 km away and no significant impacts will occur.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE
Lesser black-backed gull	Br	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from Project One and the small breeding population of 35 pairs, indicates low risk of a significant impact alone but may be increased in-combination with potential future developments.No collisions are predcited to be on birds from this SPA (see Annex B).	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Red-breasted merganser	As	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Cormorant	Wi	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE

A74		Falaise du Bessin Occidental SPA		
Shag	As	Collision	The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.	No LSE
		Barrier	There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	There are a no records of shags using Project One and therefore no displacement impacts are predicted.	No LSE
Kittiwake	Br	Collision	A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Guillemot	Wi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	During migration guillemots will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, the SPA is 540 km away and therefore the potential for a LSE is very remote.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A75		Frisian Front SPA		
Area		28,880 ha		
Distance from Project One		150 km		
Annex 1 Species		None		
Non-Annex I species		Great skua, Lesser black-backed gull, Great black-backed gull, Guillemot.		
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Great skua	Mi	Collision	A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5 m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from Project One suggests a low likelihood of birds from this site interacting with Project One during the breeding season.	No LSE
		Barrier	There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.	No LSE
		Displacement	Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.	No LSE
Great black-backed gull	Mi	Collision	A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is selected for it's migratory population of great black-backed gulls with an average population of 180 birds between August and September. (Derenberg *et al*. 2010). Birds occurring at the site may be from the wider North Sea population and there is low risk of of birds from this site interacting with Project One.	No LSE
		Barrier	During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).	No LSE

A75		Frisian Front SPA		
Lesser black-backed gull	Mi	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. Following breeding lesser black-backed gulls disperse away from their colonies and the SPA is a site for non-breeding migrating lesser black-backed gulls. The population is unknown (Deerenberg *et al.* 2010). The distance this SPA is from Project One and the small risk of collision, indicates low risk of a significant effect on birds from this SPA that will be part of the wider European population of more than 300,000 pairs (BLI 2013) many of which could occur in the SPA.	No LSE
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Guillemot	Mi	Collision	46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).	No LSE
		Barrier	During migration guillemots will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, the SPA is over 150 km away and therefore the potential for a LSE is very remote.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A76		Waddenzee (Wadden Sea) SPA		
Area		28,880 ha		
Distance from Project One		189 km		
Annex 1 Species		Short-eared owl, Barnacle goose, Kentish plover, Black-tern, Marsh harrier, Hen harrier, Bewick's swan, Peregrine falcon, Bar-tailed godwit, Golden plover, Avocet, Little tern, Common tern, Arctic tern, Sandwich tern.		
Non-Annex I species		Pintail, Shoveler, Teal, Wigeon, Mallard, Gadwall, Greylag goose, Lesser white-fronted goose, Turnstone, Scaup, Brent Goose, Goldeneye, Sanderling, Dunlin, Knot, Curlew sandpiper, ringer plover, oystercatcher, lesser black-backed gull, Black-tailed godwit, Red-breasted merganser, Goosander, Curlew, Cormorant, Grey plover, Great-crested grebe, Eider, Shelduck, Spotted redshank, Greenshank, Redshank, Lapwing.		
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Short-eared owl	Br	Collision	Only two short-eared owls were recorded in Project One in September and November of Year 1. One was flying at rotor height. The very low numbers recorded indicate that there is negligible risk of an effect.	No LSE
		Barrier	Migrating short-eared owls may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No short-eared owls were recorded using Project One and no displacement effects are predicted.	No LSE
Barnacle goose	Mi (wi)	Collision	No barnacle geese were recorded.	No LSE
		Barrier	No barnacle geese were recorded.	No LSE
		Displacement	No barnacle geese were recorded.	No LSE
Kentish plover	Br	Collision	No kentish plover were recorded.	No LSE
		Barrier	No kentish plover were recorded.	No LSE
		Displacement	No kentish plover were recorded.	No LSE
Black-tern	Mi (wi)	Collision	Only one black tern was recorded during two years of surveys.	No LSE
		Barrier	Only one black tern was recorded during two years of surveys.	No LSE
		Displacement	Only one black tern was recorded during two years of surveys.	No LSE
Marsh harrier	Br	Collision	No marsh harriers were recorded.	No LSE
		Barrier	No marsh harriers were recorded.	No LSE
		Displacement	No marsh harriers were recorded.	No LSE
Hen harrier	Br	Collision	No hen harriers were recorded.	No LSE
		Barrier	No hen harriers were recorded.	No LSE
		Displacement	No hen harriers were recorded.	No LSE

A76		Waddenzee (Wadden Sea) SPA		
Bewick's swan	Mi (wi)	Collision	No Bewick's swans were recorded.	No LSE
		Barrier	No Bewick's swans were recorded.	No LSE
		Displacement	No Bewick's swans were recorded.	No LSE
Pergrine falcon	Mi (wi)	Collision	No peregrines were recorded.	No LSE
		Barrier	No peregrines were recorded.	No LSE
		Displacement	No peregrines were recorded.	No LSE
Bar-tailed godwit	Mi (wi)	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Spoonbill	Br	Collision	No spoonbills were recorded.	No LSE
		Barrier	No spoonbills were recorded.	No LSE
		Displacement	No spoonbills were recorded.	No LSE
Golden plover	Mi (wi)	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Avocet	Br	Collision	No avocets were recorded.	No LSE
		Barrier	No avocets were recorded.	No LSE
		Displacement	No avocets were recorded.	No LSE
Little tern	Br	Collision	Three little terns were recorded, all flying below 5 m.	No LSE
		Barrier	Little terns were very rarely recorded within Project One and no barrier effects have been reported (e.g. Zucco *et al*. 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al*. 2006).	No LSE

A76		Waddenzee (Wadden Sea) SPA		
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Arctic tern	Br	Collision	A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all were flying below 22.5 m and therefore at very low risk of a significant impact.	No LSE
		Barrier	No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Pintail	Mi (wi)	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Shoveler	Mi (wi)	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE
Teal	Mi (wi)	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE

A76		Waddenzee (Wadden Sea) SPA		
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	Mi	Collision	A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Mallard	Mi (wi)	Collision	A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Gadwall	Mi (wi)	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Greylag goose	Mi (wi)	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Lesser white-fronted goose	Mi (wi)	Collision	No lesser white-fronted goose were recorded.	No LSE
		Barrier	No lesser white-fronted goose were recorded.	No LSE
		Displacement	No lesser white-fronted goose were recorded.	No LSE
Turnstone	Mi (wi)	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 22.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE

A76		Waddenzee (Wadden Sea) SPA		
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Scaup	Mi (wi)	Collision	No scaup were recorded.	No LSE
		Barrier	No scaup were recorded.	No LSE
		Displacement	No scaup were recorded.	No LSE
Brent goose	Mi (wi)	Collision	A total of seven dark-bellied brent geese were recorded, all but one were outwith Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No brent geese were recorded using Project One and no displacement effects are predicted.	No LSE
Goldeneye	Mi (wi)	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Sanderling	Mi (wi)	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Dunlin	Mi (wi)	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Knot	Mi (wi)	Collision	A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating knot may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No knot were recorded using Project One and no displacement effects are predicted.	No LSE
Curlew sandpiper	Mi (wi)	Collision	No curlew sandpiper were recorded.	No LSE
		Barrier	No curlew sandpiper were recorded.	No LSE
		Displacement	No curlew sandpiper were recorded.	No LSE

A76		Waddenzee (Wadden Sea) SPA		
Ringed plover	Br	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	Mi (wi)	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Lesser black-backed gull	Br	Collision	A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies and an estimated four collisions per year are predicted to be on birds from this SPA. The breeding population is 19,000 pairs and therefore four collisions will be negligible.	No LSE See Annex B
		Barrier	The SPA is outwith the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).	No LSE
Black-tailed godwit	Mi (wi)	Collision	No black-tailed godwits were recorded.	No LSE
		Barrier	No black-tailed godwits were recorded.	No LSE
		Displacement	No black-tailed godwits were recorded.	No LSE
Red-breasted merganser	Mi (wi)	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Goosander	Mi (wi)	Collision	Three goosander were recorded outwith Project One in Year 2.	No LSE
		Barrier	Three goosander were recorded outwith Project One in Year 2.	No LSE
		Displacement	Three goosander were recorded outwith Project One in Year 2.	No LSE
Curlew	Mi (wi)	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE

A76		Waddenzee (Wadden Sea) SPA		
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	Mi (wi)	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Lapwing	Mi (wi)	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Grey plover	Mi (wi)	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Great-crested grebe	Mi (wi)	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Eider	Br	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE

A76		Waddenzee (Wadden Sea) SPA		
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Shelduck	Mi (wi)	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Spotted redshank	Mi (wi)	Collision	No spotted redshank were recorded.	No LSE
		Barrier	No spotted redshank were recorded.	No LSE
		Displacement	No spotted redshank were recorded.	No LSE
Greenshank	Mi (wi)	Collision	Only one greenshank was recorded during two years of surveys.	No LSE
		Barrier	Only one greenshank was recorded during two years of surveys.	No LSE
		Displacement	Only one greenshank was recorded during two years of surveys.	No LSE
Redshank	Mi (wi)	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

A77		Voordelta SPA		
Area		85,383 ha		
Distance from Project One		235 km		
Annex 1 Species		Red-throated diver, little gull, bar-tailed godwit, spoonbill, slavonian grebe, avocet, common tern, sandwich tern.		
Non-Annex I species		Pintail, shoveler, teal, wigeon, gadwall, greylag goose, turnstone, scaup, goldeneye, sanderling, dunlin, ringer plover, oystercatcher, common scoter, red-breasted merganser, curlew, cormorant, grey plover, great-crested grebe, eider, shelduck, redshank, lapwing.		
Conservation Objectives: **It is assumed for the purpose of this assessment that the conservation objective for this site will be to maintain or restore the qualifying features/interests in favourable condition (subject to natural change).**				
Qualifying Feature		**Potential Impact**	**Details**	**LSE Test Result**
Red-throated diver	Br	Collision	Within the whole of the Project One ornithology study area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).	No LSE
		Barrier	Migrating red-throated diver may fly around Project One but the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using Project One and the water depths and location suggest that divers will not regularly use Project One. Consequently any potential impacts will be negligible.	No LSE
Little gull	Mi (wi)	Collision	A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 235 km from Project One and therefore the risk of a significant effect is negligible.	No LSE
		Barrier	Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al*. 2010). However, if migrating little gulls do fly around Project One the incremental increase in flight of up to 36 km to or from the SPA is negligible.	No LSE
		Displacement	No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).	No LSE
Bar-tailed godwit	Mi (wi)	Collision	A total of 29 bar-tailed godwit were recorded in the Hornsea Zone plus 10 km buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.	No LSE
		Barrier	Migrating bar-tailed godwit may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No bar-tailed godwit were recorded using Project One and no displacement effects are predicted.	No LSE
Slavonian grebe	Mi (wi)	Collision	No Slavonian grebes were recorded.	No LSE
		Barrier	No Slavonian grebes were recorded.	No LSE

A77		Voordelta SPA		
		Displacement	No Slavonian grebes were recorded.	No LSE
Golden plover	Mi (wi)	Collision	A total of 15 golden plover plover were recorded in Project One and a further 133 in the Hornzea Zone plus 10 km buffer. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.	No LSE
		Barrier	Migrating golden plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No golden plover were recorded using Project One and no displacement effects are predicted.	No LSE
Avocet	Br	Collision	No avocets were recorded.	No LSE
		Barrier	No avocets were recorded.	No LSE
		Displacement	No avocets were recorded.	No LSE
Common tern	Br	Collision	A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.	No LSE
		Barrier	No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no barrier effects will occur during this period. During migration birds will be able to fly around Project One estimated as being up to 36 km without causing a significant increase in overall distance flown.	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).	No LSE
Sandwich tern	Br	Collision	One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.	No LSE
		Barrier	Sandwich terns are rarely recorded within Project One and no barrier effects have been reported for sandwich terns (e.g. Petersen *et al.* 2006).	No LSE
		Displacement	Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al*. 2006).	No LSE
Pintail	Mi (wi)	Collision	No pintail were recorded.	No LSE
		Barrier	No pintail were recorded.	No LSE
		Displacement	No pintail were recorded.	No LSE
Shoveler	Mi (wi)	Collision	Only four shoveler were recorded during two years of surveys.	No LSE
		Barrier	Only four shoveler were recorded during two years of surveys.	No LSE
		Displacement	Only four shoveler were recorded during two years of surveys.	No LSE

A77		Voordelta SPA		
Teal	Mi (wi)	Collision	Teal were regularly recorded in small numbers throughout Project One with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	No birds were recorded using Project One and no displacement effects are predicted.	No LSE
Wigeon	Mi	Collision	A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision. Collision risk modelling predicts up to 20 collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report).	No LSE
		Barrier	Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around Project One will be very small.	No LSE
		Displacement	All wigeon were recorded in flight and none were seen using Project One. Therefore no displacement effects will occur.	No LSE
Gadwall	Mi (wi)	Collision	Only one gadwall was recorded during two years of surveys.	No LSE
		Barrier	Only one gadwall was recorded during two years of surveys.	No LSE
		Displacement	Only one gadwall was recorded during two years of surveys.	No LSE
Greylag goose	Mi (wi)	Collision	A total of 16 greylag geese were recorded outwith Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Project One ornithology study area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.	No LSE
		Barrier	Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.	No LSE
		Displacement	No greylag geese were recorded using Project One and no displacement effects are predicted.	No LSE
Turnstone	Mi (wi)	Collision	Four turnstone were recorded in the Hornsea Zone plus 10 km buffer, flying below 22.5 m in height and therefore at low risk of collision.	No LSE
		Barrier	Migrating turnstone may fly around Project One but the incremental increase in flight distance to or from the SPA is likely to be negligible.	No LSE
		Displacement	No turnstones were recorded using Project One and no displacement effects are predicted.	No LSE
Scaup	Mi (wi)	Collision	No scaup were recorded.	No LSE
		Barrier	No scaup were recorded.	No LSE
		Displacement	No scaup were recorded.	No LSE

A77		Voordelta SPA		
Goldeneye	Mi (wi)	Collision	Only one goldeneye was recorded during two years of surveys.	No LSE
		Barrier	Only one goldeneye was recorded during two years of surveys.	No LSE
		Displacement	Only one goldeneye was recorded during two years of surveys.	No LSE
Sanderling	Mi (wi)	Collision	No sanderling were recorded.	No LSE
		Barrier	No sanderling were recorded.	No LSE
		Displacement	No sanderling were recorded.	No LSE
Dunlin	Mi (wi)	Collision	A total of 23 dunlin were recorded in Project One. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating dunlin may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.	No LSE
		Displacement	No dunlin were recorded using Project One and no displacement effects are predicted.	No LSE
Ringed plover	Br	Collision	Four ringed plover were recorded in the Project One ornithology study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating ringed plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No ringed plover were recorded using Project One and no displacement effects are predicted.	No LSE
Oystercatcher	Mi (wi)	Collision	A total of 23 oystercatchers were recorded in the Project One ornithology study area. All were flying below 12.5 m and therefore not at risk of collision.	No LSE
		Barrier	Migrating birds may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No oystercatcher were recorded using Project One and no displacement effects are predicted.	No LSE
Common scoter	Br	Collision	A total of 419 common scoter were recorded throughout the Project One ornithology study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.	No LSE
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.	No LSE
		Displacement	There are a no records of common scoter using Project One and therefore no displacement impacts are predicted.	No LSE
Red-breasted merganser	Mi (wi)	Collision	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
		Barrier	Only two red-breasted merganser were recorded during two years of surveys.	No LSE

A77		Voordelta SPA		
		Displacement	Only two red-breasted merganser were recorded during two years of surveys.	No LSE
Curlew	Mi (wi)	Collision	Only four curlew were recorded in the Hornsea Zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.	No LSE
		Barrier	Migrating curlew may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible compared to the total distance flown during migration.	No LSE
		Displacement	No curlew were recorded using Project One and no displacement effects are predicted.	No LSE
Cormorant	Mi (wi)	Collision	Only 11 cormorants were recorded, of which three were within Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.	No LSE
		Barrier	There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al*. 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.	No LSE
		Displacement	Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).	No LSE
Lapwing	Mi (wi)	Collision	A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al*. 2006). Therefore the risk of an impact is low and will not be significant.	No LSE
		Barrier	A total of 148 lapwing were recorded. Any additional distance required to fly around Project One will be negligible relative to the overall distance migrated.	No LSE
		Displacement	No lapwing were recorded using Project One.	No LSE
Grey plover	Mi (wi)	Collision	One grey plover was recorded in the Project One ornithology study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.	No LSE
		Barrier	Migrating grey plover may fly around Project One but the incremental increase in flight distance to the SPA is likely to be negligible.	No LSE
		Displacement	No grey plover were recorded using Project One and no displacement effects are predicted.	No LSE
Great-crested grebe	Mi (wi)	Collision	Two great-crested grebes were recorded within the Project One ornithology study area flying below 22.5 m and therefore at low risk of collision.	No LSE
		Barrier	Migrating great-crested grebes may fly around Project One but the incremental increase in flight distance to or from the SPA is negligible.	No LSE
		Displacement	No great-crested grebes were recorded using Project One and no displacement effects are predicted.	No LSE
Eider	Br	Collision	A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.	No LSE

A77		Voordelta SPA		
		Barrier	Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.	No LSE
		Displacement	All records were of eiders flying over the the Project One ornithology study area with no records of eiders using Project One and therefore no displacement impacts are predicted.	No LSE
Shelduck	Mi (wi)	Collision	Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (Environmental Statement Volume 5, Annex 5.5.1: Ornithology Technical Report, Appendix D).	No LSE
		Barrier	Only one shelduck was recorded during two years of surveys.	No LSE
		Displacement	Only one shelduck was recorded during two years of surveys.	No LSE
Redshank	Mi (wi)	Collision	Only seven redshank were recorded during two years of surveys.	No LSE
		Barrier	Only seven redshank were recorded during two years of surveys.	No LSE
		Displacement	Only seven redshank were recorded during two years of surveys.	No LSE
Notes: Br = breeding, Wi = Winter, Mi = Migrant, As = Assemblage, Mi (br) = Article 4.2 qualification (migratory species) during the breeding season, Mi (wi) = Article 4.2 qualification (migratory species) during the winter				

References

Barton, C. Pollock, C and Harding, N. (2010) Arklow Bank Seabird and Marine Monitoring Programme. Year 9 Final report. A report to Airtricity.

BFN (2012b). East German Bight SPA Standard Data Form http://www.bfn.de/habitatmare/de/downloads/standarddatenboegen/1011-401_SPA_Oestliche_Deutsche_Bucht_2009_03_31.pdf. Accessed January 2012.

Birdlife International (2013). Lesser black-backed gull. http://www.birdlife.org/datazone/userfiles/file/Species/BirdsInEuropeII/BiE2004Sp3231.pdf Accessed April 2013.

BOW (2007) Results from Walney Island Bird Survey, Autumn 2007. Appendix to Barrow Offshore Wind Farm – First post construction monitoring report. BOWind, NIRAS A/S, Aarhus, Denmark.

Deerenberg, C. Teal, L.R. Beare, D. van der Wal, J.T. (2010) Pre-assessment of the impact of fisheries on the conservation objectives of Dutch marine protected areas. FIMPAS project. Report number C071/10.

LAL (2006). London Array Environmental Statement. London Array Limited.

Mitchell, C.R. and Hearn, R.D. (2004) Pink-footed Goose Anser brachyrhynchus (Greenland/Iceland population) In Britain 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl and Wetlands trust/Joint Nature Conservation Committee, Slimbridge.

Npower (2006) Gwynt y Mor Offshore Wind Farm Environmental Statement.

Petersen, I.K. Christensen, T.K. Kahlert, J. Deshom, M. and Fox, A.D. (2006) Final results of Bird Studies at the offshore wind farms at Nysted and Horns rev, Denmark. NERI Report. Commissioned by DONG Energy and Vattenfall A/S.

Pettersson J.Report for the Swedish Energy Agency. Lund, Sweden: Lund University; 2005. The impact of offshore wind farms on bird life in southern Kalmar Sound, Sweden: a final report based on studies 1999–2003.

Thaxter, C.B. Lascelles, B. Sugar, K. Cook, A.S.C.P. Roos, S. Bolton, M. Langton, R.H.W.and Burton, N.H.K. (2012) Seabird foraging ranges as a tool for identifying candidate marine protected areas.

Thomas, C. (2011) Yorkshire Bird Report 2009. Yorkshire Naturalists Union.

WWT (2007) Movements of East Anglian wintering Pink-footed Geese. Report to Natural England, March 2007.

Zucco, C. Wende, W. Merck, T. Kochling, I. Koppel, J. (2006) Ecological research on Offshore Wind Farms: International Exchange of Experiences. Part B: Literature Review of Ecological Impacts. BfN-Skripten 186.

ANNEX B – POTENTIAL IMPACTS FROM COLLISION AND DISPLACEMENT - ALONE

B.1 This Annex provides supporting information to Annex A to help inform on the consideration of potential for likely significant effect for a particular SPA qualifying interest feature, in relation to a particular impact. Numbers of individuals impacted per SPA during the non-breeding season have been apportioned based on relative population sizes of sites across the east coast of the UK and beyond, by assuming regular intermixing of populations during this period. In the breeding season, connectivity of an SPA population to Project One is based on mean maximum or maximum foraging range for each species and the distance of the colony from Project One. Where more than one colony is within foraging range during the breeding season, numbers of individuals at Project One are attributed to each colony based on a combination of colony size and distance from Project One.

B.2 In the context of the assessment presented within this Annex the potential for a significant effect is determined by a combination of numbers impacted in each season/annually in relation to the SPA's population size, as well as the distance from Project One and the Favourable Conservation Status (FCS) rating provided for each site.

Collision Impact

Table B.1

Gannet – Hornsea Project One alone						
Impact – Collision ***332 x 3.6 turbines***						
Predicted mean number of adult gannets from SPAs impacted per year (99% avoidance rate) – 23 (46 at 98% avoidance rate)						
Designated site	**Distance (km)**	**Pop[n] (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Flamborough Head and Bempton Cliffs	117.0	9,947	4	2	?	**Y**
Forth Islands	363.0	55,482	0	10 *	Y	**Y**
Seevogelschutzgebiet Helgoland	408	190	0	0	?	N
Fair Isle	645.7	4,085	0	1	Y	N
Noss	702.6	9,767	0	2	Y	N
Hermaness Saxa Vord and Valla Field	771.8	24,353	0	4	Y	N

* although only 10 losses were predicted, this SPA was taken forward to appropriate assessment stage as a precaution, since it is the next closest site to Project One, after Flamborough Head and Bempton Cliffs SPA, and within maximum foraging range.

Table B.2

Kittiwake - Hornsea Project One alone						
Impact – Collision ***332 x 3.6 turbines***						
Predicted mean number of adult kittiwakes from SPAs impacted per year (98% Avoidance rate) – 22 ***Three collisions occur during non-breeding period but are not associated with any SPA.***						
Designated site	**Distance (km)**	**Pop^{n} (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Flamborough Head and Bempton Cliffs	117	44,520	13	2	?	**Y**
Farne Islands	285	3,699	0	0	?	N
St Abb's head to Fast Castle	325.5	4,688	0	0	N	N
Forth Islands	363	3,884	0	0	N	N
Fowlsheugh	406.6	9,454	0	1	N	N
Buchan Ness to Collieston Coast	437.2	14,133	0	1	N	N
Littoral seino-Marin	460	828	0	0	?	N
Troup Pennan and Lion's Heads	494.3	17,171	0	1	N	N
East Caithness Cliffs	574.6	40,410	0	2	N	N
North Caithness Cliffs	590.4	9,960	0	1	N	N
Copinsay	607.4	3,552	0	0	N	N
Hoy	616.9	397	0	0	N	N
Calf of Eday	644.4	747	0	0	N	N
Fair Isle	645.7	1,438	0	0	N	N
Rousay	646.3	1,764	0	0	N	N
West Westray	655.7	12,055	0	1	N	N
Marwick Head	657.6	2,018	0	0	N	N
Sumburgh Head	676.5	549	0	0	N	N
Noss	702.6	507	0	0	N	N
Foula	717.3	582	0	0	N	N
Hermaness Saxa Vord and Valla Field	771.8	205	0	0	N	N

Table B.3

Lesser black-backed gull – Hornsea Project One alone						
Impact - Collision ***332 x 3.6 turbines***						
Predicted mean number of adult lesser black-backed gulls from SPAs impacted per year (98% Avoidance rate) – 5 ***Nine collisions occur during breeding period but are not associated with any SPA as site is beyond maximum foraging range.***						
Designated site	**Distance (km)**	**Population (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Alde Ore Estuary	190.4	1,811	0	0	?	N
Forth Islands	363	2,948	0	0	Y	N
Östliche Deutsche Bucht	387	0	0	0	?	N
Seevogelschutzgebiet Helgoland	408	37	0	0	?	N
Ramsar-Gebiet S-H Wattenmeer und angrenzend	430	7,285	0	1	?	N
Littoeal seino-Marin	460	5	0	0	?	N
Falaise du Bessin Occidentale	540	35	0	0	?	N
Waddenzee	250	19,000	0	4	?	N

Table B.4

Herring gull – Hornsea Project One alone						
Impact - Collision ***332 x 3.6 turbines***						
Predicted mean number of adult herring gulls within SPAs impacted per year (98% Avoidance rate) – 18 ***Seven collisions occur during non-breeding period but are not associated with any SPA.***						
Designated site	**Distance (km)**	**Population (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Flamborough Head and Bempton Cliffs	117	711	0 (2)*	0	?	Y
Alde Ore Estuary	190.4	390	0	0	?	N
St Abb's head to Fast castle	325.5	492	0	0	N	N
Forth Islands	363	3,223	0	2	Y	N
Fowlsheugh	406.6	214	0	0	N	N
Seevogelschutzgebiet Helgoland	408	217	0	0	?	N
Ramsar-Gebiet S-H Wattenmeer und angrenzend	430	12,119	0	7	?	N
Buchan Ness to Collieston Coast	437.2	3,114	0	2	N	N
Baie de Seine-Marin	460	2,154	0	1	?	N
Littoeal Seine-Marin	460	1,125	0	1	?	N
Troup Pennan and Lion's Heads	494.3	1,687	0	1	N	N
Falaise du Bessin Occidentale	540	369	0	0	?	N
East Caithness Cliffs	574.6	3,393	0	2	N	N

* Note Flamborough Head and Bempton Cliffs SPA is beyond the maximum reported foraging range for breeding herrings gulls. Therefore, it is unlikely that either of the two predicted collisions per year are from this SPA. The species has however been taken forward to the next stage as a precaution, as the SPA is the closest breeding colony.

Table B.5

Great black-backed gull – Hornsea Project One alone						
Impact - Collision *332 x 3.6 turbines*						
Predicted mean number of adult great black-backed gulls within SPAs impacted per year (98% Avoidance rate) – 42 *15 collisions are predicted to SPA birds during the breeding period but all qualifying sites are outwith the mean maximum foraging range and therefore zero impacts.* *27 collisions are predicted to SPA birds during the non-breeding period. Great black backed gulls from northern Britain stay largely within 100 km of their colonies and therefore none from these colonies are predicted to be impacted.* *85 collisions occur during the year are not associated with any SPA.*						
Designated site	**Distance (km)**	**Population (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Calf of Eday	644.4	938	0 (3)	0 (5)	?	N
Copinsay	607.4	600	0 (3)	0 (6)	?	N
East Caithenss Cliffs	574.6	850	0 (2)	0 (3)	N	N
Hoy	616.9	570	0 (5)	0 (8)	Y	N
Wattenmeer und angrenzend	430	14	0	0	N	N
Littoeal seino marin	460	29	0	1	?	N
Baie de seine Occidentale	460	231	0 (2)	4	?	N

Table B.6

Great skua – Hornsea Project One alone						
Impact - Collision *332 x 3.6 turbines*						
Predicted mean number of great skua impacted per year (98% Avoidance rate) – 1						
Designated site	**Distance (km)**	**Population (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Fair Isle	645.7	143	0	0.03	Y	N
Fetlar	746.2	593	0	0.11	Y	N
Foula	717.3	2,293	0	0,42	N	N
Hoy	616.9	1,963	0	0.36	Y	N
Noss	662.6	432	0	0.08	Y	N

Table B.7

Arctic skua – Hornsea Project One alone						
Impact - Collision ***332 x 3.6 turbines***						
Predicted mean number of Arctic skua impacted per year (98% Avoidance rate) – <1						
Designated site	**Distance (km)**	**Population (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Fair Isle	645.7	65	0	0.001	Y	N
Fetlar	746.2	96	0	0.002	N	N
Foula	717.3	63	0	0.001	N	N
Hoy	616.9	70	0	0.002	Y	N
Papa Westray (North Hill & Holm)	662.6	66	0	0.002	N	N
Rousay	646.3	133	0	0.003	N	N
West Westray	655.7	88	0	0.002	N	N

Displacement Impacts

Table B.8

Fulmar – Hornsea Project One alone						
Impact - Displacement ***Hornsea Subzone 1***						
Predicted number of adult fulmars impacted (30% displacement, 2% mortality during breeding and 1% mortality during non-breeding): ***breeding season – 4*** ***non-breeding – 1***						
Designated site	**Distance (km)**	**Pop[n] (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Buchan Ness to Collieston Coast	113	1,389	0	0.0	N	N
Calf of Eday	333	940	0	0.0	Y	N
Copinsay	297	1,366	0	0.0	Y	N
East Caithness Cliffs	260	16,164	0	0.1	Y	N
Fair Isle	356	29,649	0	0.2	Y	N
Fetlar	477	9,203	0	0.1	Y	N
Flamborough Head and Bempton Cliffs	117	1,447	4	0.0	unknown	**Y**
Forth Islands	16	4,245	0	0.0	Y	N
Foula	424	21,106	0	0.1	N	N
Fowlsheugh	62	119	0	0.0	Y	N
Hermaness, Saxa Vord &Valla Field	510	11,144	0	0.1	N	N
Hoy	301	35,858	0	0.2	N	N
North Caithness Cliffs	275	4,551	0	0.0	Y	N
Noss	428	5,248	0	0.0	Y	N
Rousay	337	1,622	0	0.0	Y	N
Sumburgh Head	396	1,487	0	0.0	Y	N
Troup, Pennan & Lion Heads	171	2,900	0	0.0	N	N
West Westray	342	3,185	0	0.0	N	N

Table B.9

Gannet – Hornsea Project One alone						
Impact - Displacement ***Hornsea Subzone 1***						
Predicted number of adult gannets impacted (70% displacement, 2% mortality during breeding and 1% mortality during non-breeding): ***breeding season – 3*** ***non-breeding – 2***						
Designated site	**Distance (km)**	**Pop^{n} (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Flamborough Head and Bempton Cliffs	117.0	9,947	3	0	Y	**Y**
Forth Islands	363.0	55,482	0	1	Y	**Y***
Seevogelschutzgebiet Helgoland	408	190	0	0	?	N
Fair Isle	645.7	4,085	0	0	Y	N
Noss	702.6	9,767	0	0	Y	N
Hermaness Saxa Vord and Valla Field	771.8	24,353	0	1	Y	N

* although only one loss was predicted, this SPA was taken forward to appropriate assessment stage as a precaution, since it is the next closest site to Project One, after Flamborough Head and Bempton Cliffs SPA, and within maximum foraging range.

Table B.10

Kittiwake - Hornsea Project One alone						
Impact - Displacement ***Hornsea Subzone 1***						
Predicted number of adult kittiwakes from SPAs impacted (25% displacement, 2% mortality during breeding and 1% mortality during non-breeding): ***breeding season – 8*** ***non-breeding – 36*** ***Seven losses during non-breeding period are not associated with any SPA.***						
Designated site	**Distance (km)**	**Pop^{n} (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non-breeding**		
Flamborough Head and Bempton Cliffs	117	44,520	8	7	?	**Y**
Farne Islands	285	3,699	0	1	?	N
St Abb's head to Fast Castle	325.5	4,688	0	1	N	N
Forth Islands	363	3,884	0	1	N	N
Fowlsheugh	406.6	9,454	0	2	N	N
Buchan Ness to Collieston Coast	437.2	14,133	0	2	N	N
Littoral seino-Marin	460	N/A	0	3	?	N
Troup Pennan and Lion's Heads	494.3	17,171	0	7	N	N
East Caithness Cliffs	574.6	40,410	0	2	N	N
North Caithness Cliffs	590.4	9,960	0	1	N	N
Copinsay	607.4	3,552	0	0	N	N
Hoy	616.9	397	0	0	N	N
Calf of Eday	644.4	474	0	0	N	N
Fair Isle	645.7	1,438	0	0	N	N
Rousay	646.3	1,764	0	2	N	N
West Westray	655.7	12,055	0	0	N	N
Marwick Head	657.6	2,018	0	0	N	N
Sumburgh Head	676.5	549	0	0	N	N
Noss	702.6	507	0	0	N	N
Foula	717.3	582	0	0	N	N
Hermaness Saxa Vord and Valla Field	771.8	205	0	8	N	N

Table B.11

<table>
<tr><th colspan="8">Guillemot – Hornsea Project One alone</th></tr>
<tr><td colspan="8">Impact - Displacement
Hornsea Subzone 1 + 1 km buffer</td></tr>
<tr><td colspan="8">Predicted number of adult guillemots from SPAs impacted (30% displacement, 10% mortality during breeding; 2% mortality during post breeding and 1% mortality during non-breeding):
breeding season – 74;
post-breeding – 80; non-breeding – 28
Four losses during non-breeding period are not associated with any SPA.</td></tr>
<tr><th rowspan="2">Designated site</th><th rowspan="2">Distance (km)</th><th rowspan="2">Pop[n] (Ind.)</th><th colspan="3">Number impacted</th><th rowspan="2">FCS</th><th rowspan="2">Potential for a Significant Effect</th></tr>
<tr><th>Breeding</th><th>Post-breeding</th><th>Non-breeding</th></tr>
<tr><td>Flamborough Head and Bempton Cliffs</td><td>117</td><td>83,214</td><td>74</td><td>50</td><td>3</td><td>?</td><td>Y</td></tr>
<tr><td>Farne Islands</td><td>285</td><td>48,126</td><td>0</td><td>30</td><td>2</td><td>?</td><td>N</td></tr>
<tr><td>St Abb’s Head to Fast Castle</td><td>325.5</td><td>33,181</td><td>0</td><td>0</td><td>1</td><td>Y</td><td>N</td></tr>
<tr><td>Forth Islands</td><td>363</td><td>23,495</td><td>0</td><td>0</td><td>1</td><td>Y</td><td>N</td></tr>
<tr><td>Fowlsheugh</td><td>406.6</td><td>50,566</td><td>0</td><td>0</td><td>2</td><td>Y</td><td>N</td></tr>
<tr><td>Buchan Ness to Collieston Coast</td><td>437.2</td><td>20,858</td><td>0</td><td>0</td><td>1</td><td>Y</td><td>N</td></tr>
<tr><td>Troup Pennan and Lion’s Heads</td><td>494.3</td><td>17,598</td><td>0</td><td>0</td><td>1</td><td>N</td><td>N</td></tr>
<tr><td>East Caithness Cliffs</td><td>574.6</td><td>158,895</td><td>0</td><td>0</td><td>6</td><td>Y</td><td>N</td></tr>
<tr><td>North Caithness Cliffs</td><td>590.4</td><td>72,108</td><td>0</td><td>0</td><td>3</td><td>Y</td><td>N</td></tr>
<tr><td>Copinsay</td><td>607.4</td><td>13,680</td><td>0</td><td>0</td><td>1</td><td>Y</td><td>N</td></tr>
<tr><td>Hoy</td><td>616.9</td><td>9,020</td><td>0</td><td>0</td><td>0</td><td>Y</td><td>N</td></tr>
<tr><td>Calf of Eday</td><td>644.4</td><td>9,012</td><td>0</td><td>0</td><td>0</td><td>N</td><td>N</td></tr>
<tr><td>Fair Isle</td><td>645.7</td><td>19,501</td><td>0</td><td>0</td><td>1</td><td>Y</td><td>N</td></tr>
<tr><td>Rousay</td><td>646.3</td><td>8,822</td><td>0</td><td>0</td><td>0</td><td>N</td><td>N</td></tr>
<tr><td>West Westray</td><td>655.7</td><td>50,613</td><td>0</td><td>0</td><td>2</td><td>N</td><td>N</td></tr>
<tr><td>Marwick Head</td><td>657.6</td><td>16,817</td><td>0</td><td>0</td><td>1</td><td>N</td><td>N</td></tr>
<tr><td>Sumburgh Head</td><td>676.5</td><td>7,931</td><td>0</td><td>0</td><td>0</td><td>N</td><td>N</td></tr>
<tr><td>Noss</td><td>702.6</td><td>22,065</td><td>0</td><td>0</td><td>1</td><td>N</td><td>N</td></tr>
<tr><td>Foula</td><td>717.3</td><td>41,500</td><td>0</td><td>0</td><td>2</td><td>Y</td><td>N</td></tr>
<tr><td>Hermaness Saxa Vord and Valla Field</td><td>771.8</td><td>12,046</td><td>0</td><td>0</td><td>0</td><td>N</td><td>N</td></tr>
<tr><td>Seevogelschutzgebiet Helgoland</td><td>408</td><td>4,954</td><td>0</td><td>0</td><td>0</td><td>?</td><td>N</td></tr>
</table>

Table B.12

Razorbill – Hornsea Project One alone							
Impact - Displacement ***Hornsea Subzone 1 + 1 km***							
Predicted number of adult razorbills from SPAs impacted (40% displacement, 10% mortality during breeding; 2% mortality during post breeding and 1% during non-breeding): ***breeding season – 30*** ***post-breeding – 47*** ***non-breeding – 15*** ***Six losses during non-breeding period are not associated with any SPA.***							
Designated site	**Distance (km)**	**Pop[n] (Ind.)**	**Number impacted**			**FCS**	**Potential for a Significant Effect**
			Breeding	**Post Breeding**	**Non-Breeding**		
Flamborough Head and Bempton Cliffs	117	21,140	30	44	5	?	**Y**
St Abb's head to Fast Castle	325.5	1,687	0	3	0	Y	N
Forth Islands	363	3,469	0	0	2	Y	N
Fowlsheugh	406.6	4,632	0	0	1	Y	N
Troup Pennan and Lion's Heads	494.3	3,001	0	0	1	N	N
East Caithness Cliffs	574.6	15,834	0	0	4	Y	N
North Caithness Cliffs	590.4	2,796	0	0	1	Y	N
Fair Isle	645.7	1,365	0	0	0	Y	N
West Westray	655.7	813	0	0	0	N	N
Foula	717.3	4,200	0	0	1	Y	N

Table B.13

Puffin – Hornsea Project One alone						
Impact - Displacement ***Hornsea Subzone 1 + 1 km***						
Predicted number of adult birds impacted (40% displacement, 10% mortality during breeding and 1% mortality during non-breeding) ***breeding season – 30, non-breeding – 2*** ***One loss during non-breeding period is not associated with any SPA.***						
Designated site	**Distance (km)**	**Pop$^{\underline{n}}$ (pairs)**	**Number impacted**		**FCS**	**Potential for a Significant Effect**
			Breeding	**Non breeding**		
Flamborough Head and Bempton Cliffs	117	490	3	0	N	**Y**
Coquet Islands	260	15,812	9	0	?	N
Farne Islands	285	36,835	18	1	?	N
Forth Islands	363	62,249	0	1	Y	N
East Caithness Cliffs	574.6	270	0	0	Y	N
North Caithness Cliffs	590.4	7,071	0	0	Y	N
Hoy	616.9	3,500	0	0	Y	N
Fair Isle	645.7	7,278	0	0	N	N
Noss	702.6	802	0	0	Y	N
Foula	717.3	22,500	0	0	Y	N
Hermaness Saxa Vord and Valla Field	771.8	27,968	0	0	Y	N

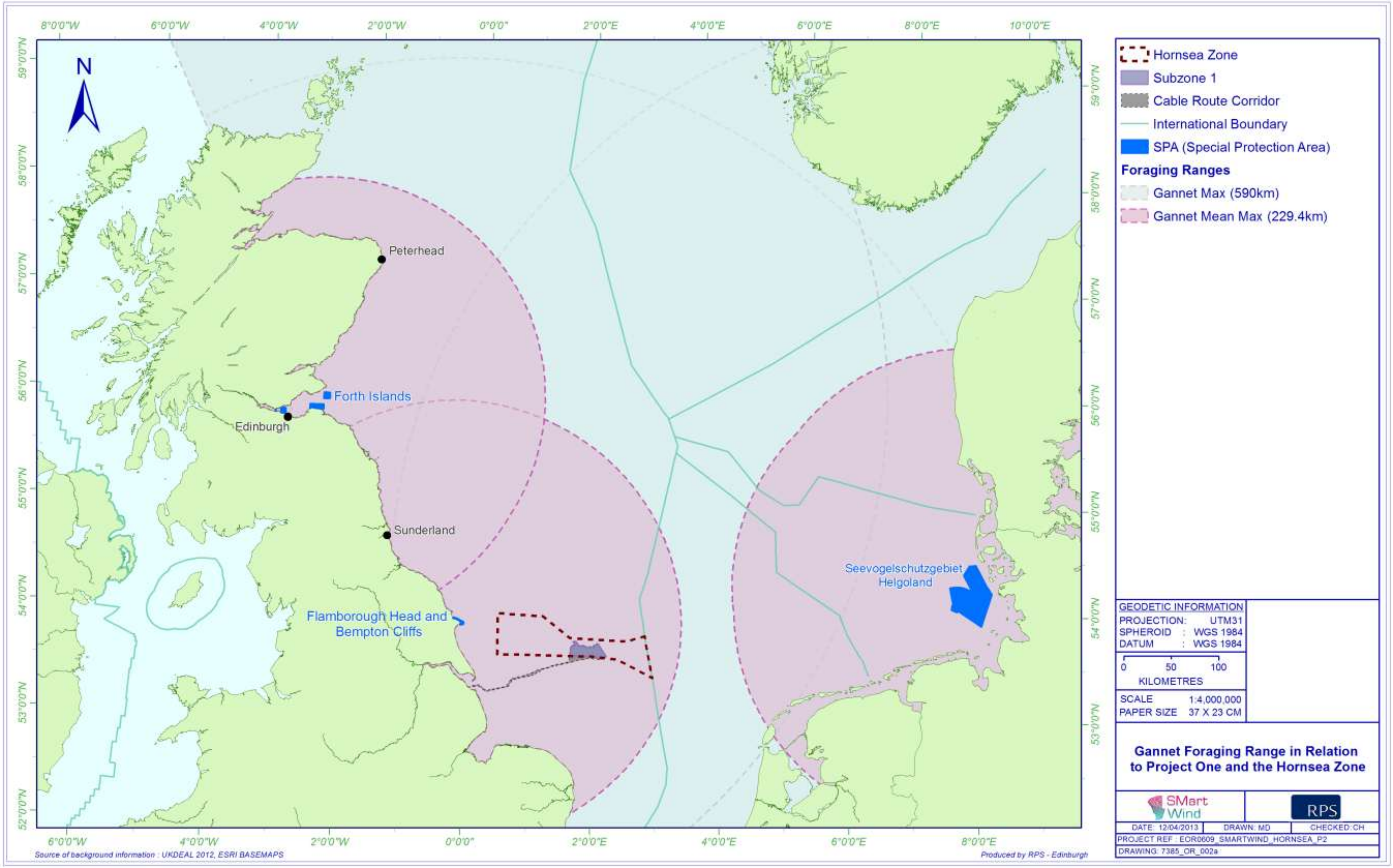


Figure C.1 Gannet Foraging Range.

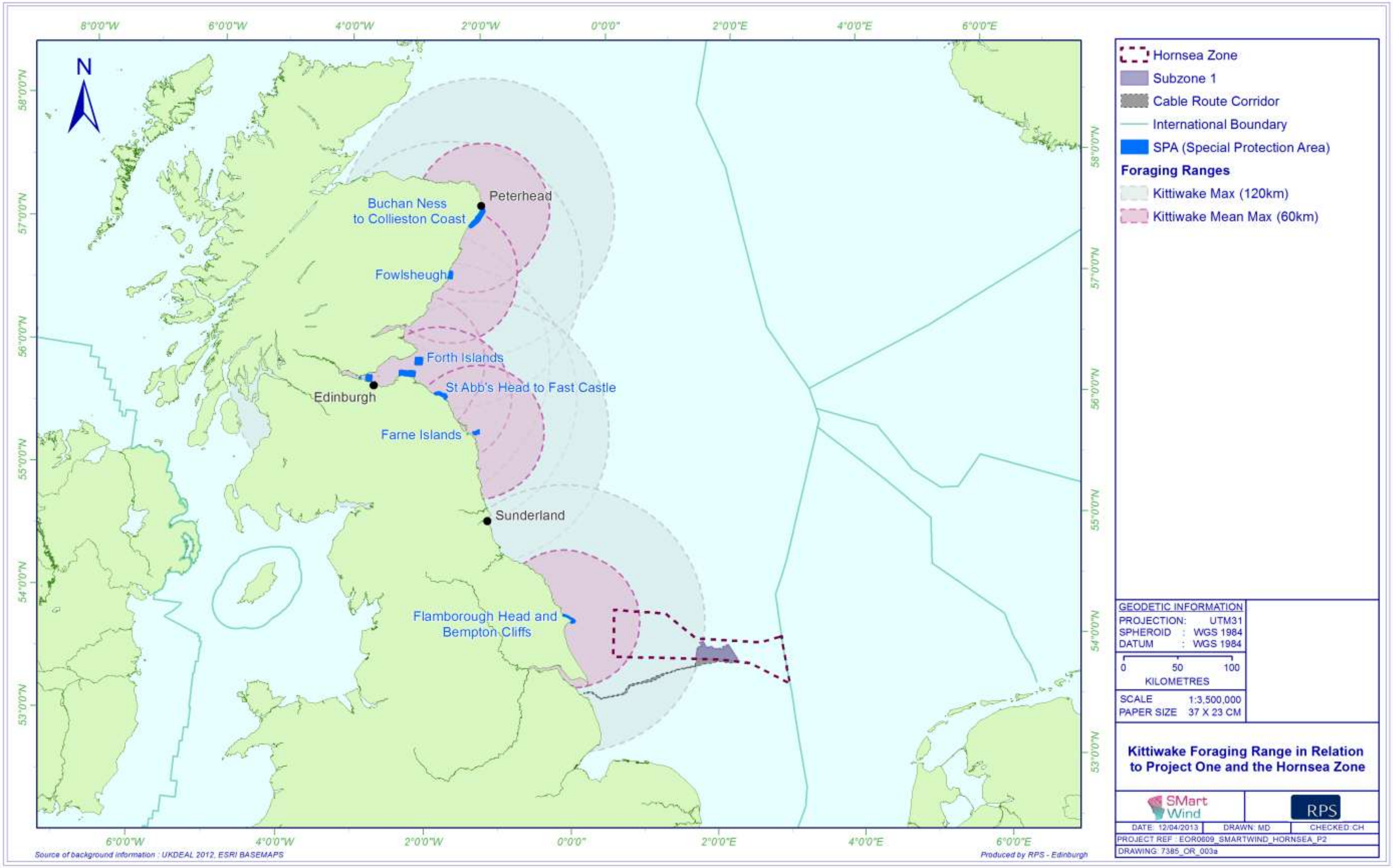


Figure C.2 Kittiwake Foraging Range.

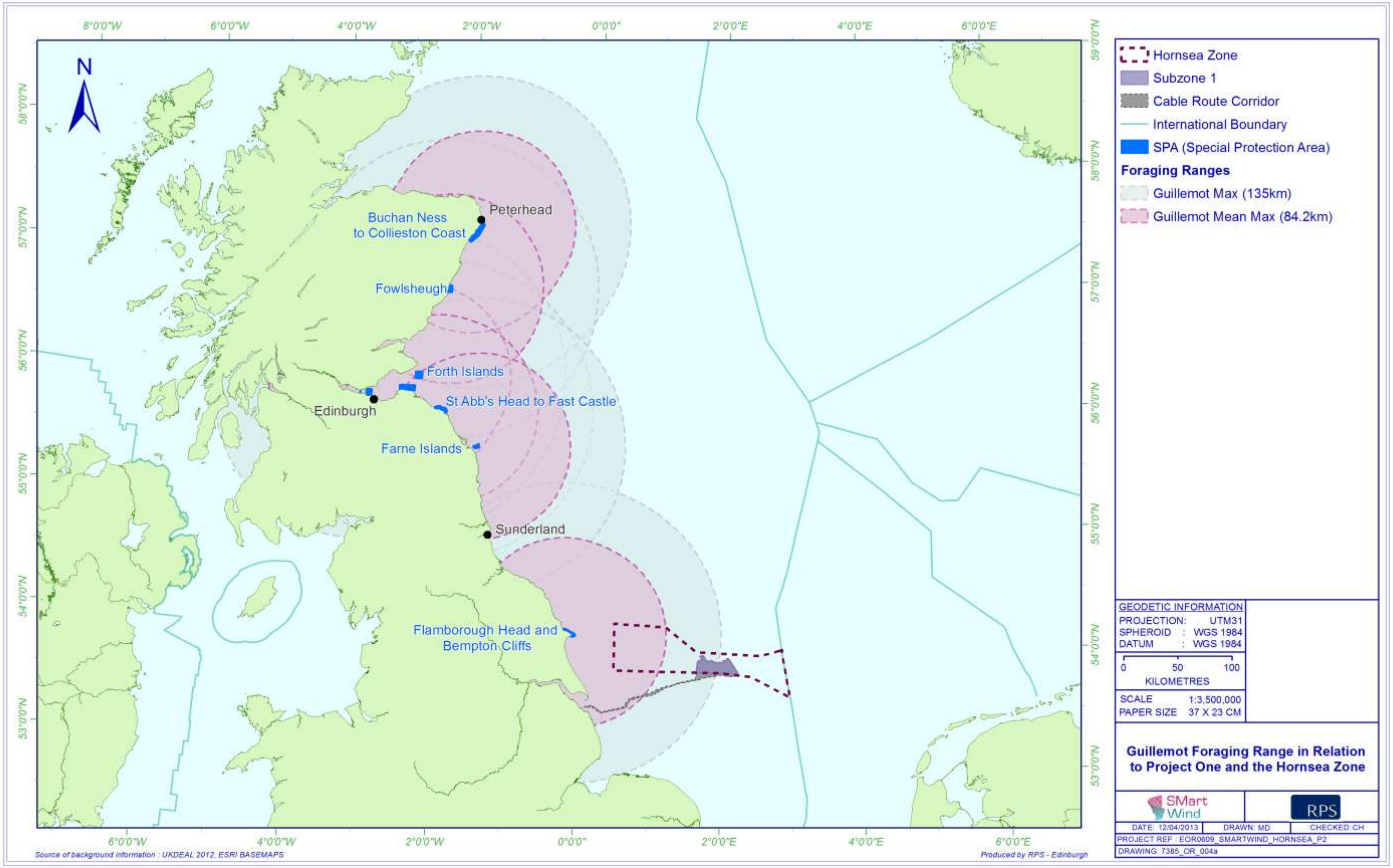


Figure C.3 Guillemot Foraging Range.

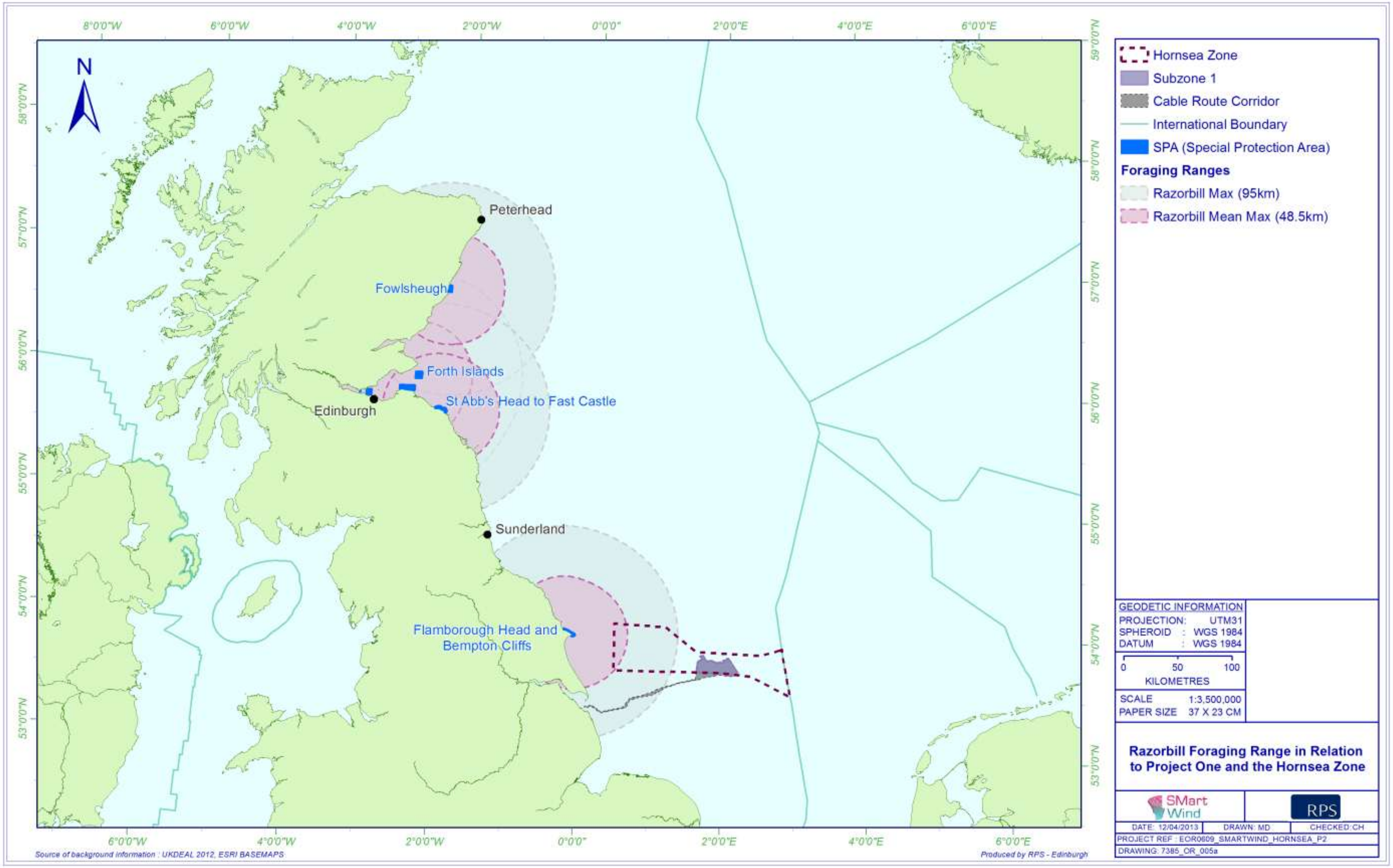


Figure C.4 Razorbill Foraging Range.

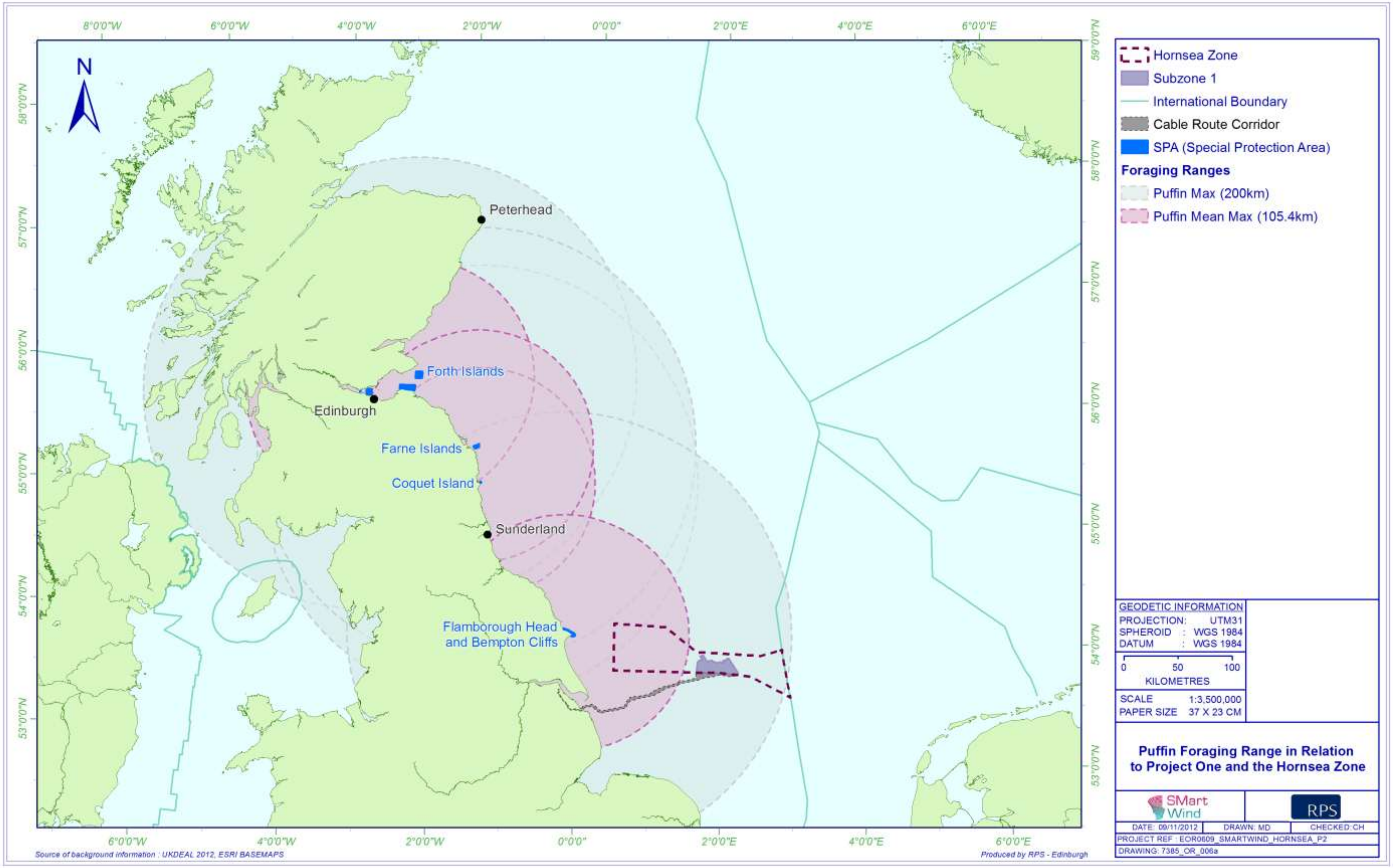


Figure C.5 Puffin Foraging Range.

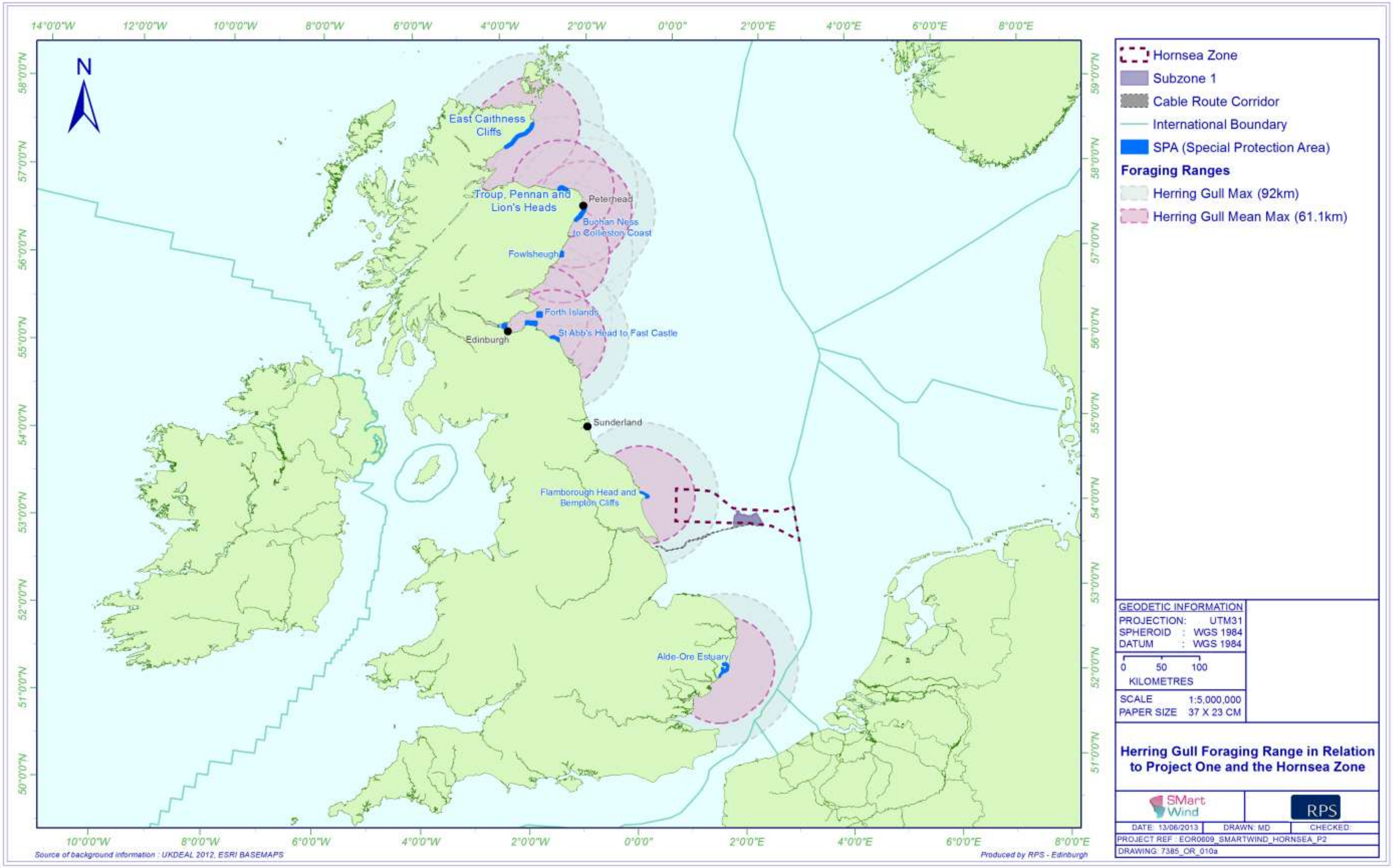


Figure C.6 Herring Gull Foraging Range

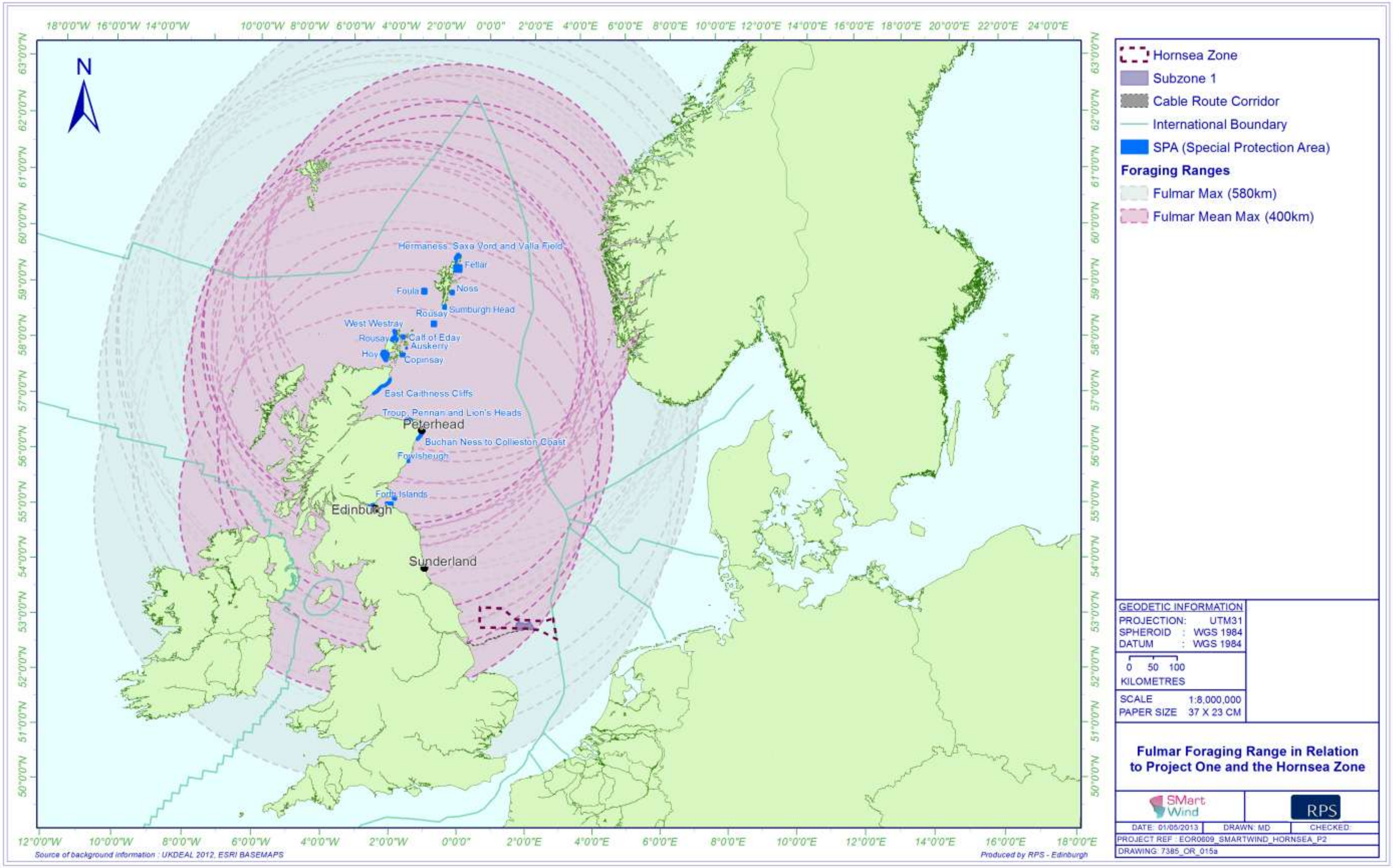


Figure C.7 Fulmar Foraging Range

Table of Contents

Table of Tables

D.1 NOTE: This Annex is presented as a record of initial consultation undertaken with Natural England and JNCC on the Habitats Regulations Assessment on 22 September 2011 (see main HRA report, Table 1.1). The information detailed below does not represent the final HRA screening, the methodology of which is presented in Section 3.2 of the main HRA report with full details of the screening assessment undertaken presented in Section 4 of the HRA report.

D.2 This Annex is divided into two sections: Annex D (i) presents a high level overview of potential sites and features which could be affected by cable installation and operation within the Humber Estuary, predicted impacts and potential mitigation measures, based on project information available at the time of submission (i.e. September 2011). Annex D (ii) presents the draft approach to the HRA (this has subsequently been updated and is presented in the main HRA report).

Annex D (i): Hornsea Offshore Wind Farm: Draft HRA Screening for the Humber Estuary European Marine Site

Table D.1 Draft HRA Screening Table for the Humber Estuary European Marine Site.

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Saltfleetby –Theddlethorpe Dunes and Gibraltar Point SAC				
Annex I Habitats that are primary reason for selection of this site: Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`); Fixed dunes with herbaceous vegetation (`grey dunes`); Dunes with *Hippophae rhamnoides; NS* Humid dune slacks. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Embryonic shifting dunes.	The northern boundary of this SAC is located: 12 km south of the landfall works at Horseshoe Point; 13 south of the subtidal cable route at MLWS; and 40 km south of the Grid Connection point at Killingholme	No potential impacts during construction, operation and decommissioning phases.	None necessary due to absence of impacts.	None necessary due to absence of impacts.
The Humber Estuary SAC				
Annex I Habitats that are primary reason for selection of this site: Estuaries; and Mudflats and sandflats not covered by seawater at low tide. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site Sandbanks which are slightly covered by sea water all the time; Coastal lagoons; *Salicornia* and other annuals colonising mud and sand; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`); Fixed dunes with herbaceous vegetation (`grey dunes`); and Dunes with *Hippophae rhamnoides.*	Qualifying Annex I habitats identified in the Horseshoe Point landfall study area during Phase 1 intertidal, saltmarsh and sand dune survey including: Mudflats and sandflats not covered by seawater at low tide *Salicornia* and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)	Construction Temporary loss or disturbance of Annex I habitats as a result of cable laying operations. Temporary increase in sedimentation (smothering) of Annex I habitats during cable laying operations. Operation Normal operation - No potential impacts on Annex I habitats. Potential disturbance of Annex I habitats as a result of cable exposure and/or cable reburial operations. Decommissioning Temporary habitat loss and disturbance due to decommissioning activities. Temporary increase in sedimentation (smothering) of Annex I habitats during decommissioning activities.	Benthic subtidal and intertidal ecology ES chapter (including impact assessment). Phase 1 intertidal, saltmarsh and sand dune survey of proposed Horseshoe Point landfall. Phase 2 intertidal survey of proposed Horseshoe Point landfall. Export cable route subtidal benthic ecology characterisation report. Coastal Processes modelling to inform extent over which increased sedimentation may occur.	Good working practices to minimise impacts on Annex I habitats. Horizontal Directional Drilling to avoid Annex I habitats with long recovery times (i.e. Atlantic salt meadows). Ensure adequate cable burial depth.

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Annex II species present within the Humber Estuary SAC as a qualifying feature, but not a primary reason for selection of this site: Sea lamprey *Petromyzon marinus*; and River lamprey *Lampetra fluviatilis*	These species are known to migrate through the Humber Estuary SAC to spawning grounds further upstream.	Construction and Decommissioning Disruption of migratory pathways and feeding activity of Annex II species as a result of seabed disturbance from cable laying (and decommissioning) operations and the physical presence of structures and associated increased suspended sediments. Potential lethal and sublethal effects on Annex II species as a result of accidental release of contaminants or resuspension of contaminated sediments. Operation Disruption of migratory pathways of Annex II species as a result of electromagnetic fields from export cabling.	Fish ecology ES chapter (including impact assessment). Desk based fish ecology desktop study. Seasonal intertidal fish ecology surveys (seine, fyke and push netting) of proposed landfall sites. Seasonal subtidal fish ecology surveys (otter trawl) of export cable route corridors.	Potential mitigation may include seasonal restrictions on construction operations to avoid main migratory period for these species (August to October).
Annex II species present within the Humber Estuary SAC as a qualifying feature, but not a primary reason for selection of this site: Grey seal *Halichoerus grypus.*	The Donna Nook grey seal breeding colony is situated at the mouth of the Humber Estuary, close to the proposed Horseshoe Point landfall site.	Construction and Decommissioning Temporary disturbance and displacement of grey seals as a result of cable laying (or decommissioning) activities at Horseshoe Point. Potential reduction of prey species distribution and abundance due to habitat disturbance and direct prey disturbance resulting from cable laying (or decommissioning) activities. Potential mortality/injury to grey seals as a result of potential increase in vessel strike with grey seals during cable laying (or decommissioning) operations. Operation No potential operational impacts on grey seals.	Marine mammal ES chapter (including impact assessment). Desk based review of annual surveys of Donna Nook grey seal haul out sites/colonies and telemetry data.	Potential mitigation includes seasonal restrictions on construction works to avoid main seal pupping period (October to December).

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Humber Estuary SPA				
During the breeding season: Little Tern: 51 pairs representing at least 2.1% of the breeding population in Great Britain; Marsh Harrier: 10 females representing at least 6.3% of the breeding population in Great Britain; Bittern: 2 males representing 10.5% of the breeding population in Great Britain; and Avocet: 64 pairs representing 8.6% of the breeding population in Great Britain.	Inter tidal and inland areas directly affected by development. In land areas may be used by breeding birds. WeBS data shows little tern observed in the Horseshoe Point to Tetney Haven WeBS zone during the breeding season (May). Breeding bird survey (2011) did not identify marsh harrier breeding territory within Horseshoe Point area. No little terns were recorded within the Horseshoe Point survey area.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Breeding bird survey (completed 2011).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.
Annex 1 Species Over Winter				
Bar-tailed Godwit: 2,752 individuals representing at least 4.4% of the wintering population in Great Britain; Bittern: 4 individuals representing at least 4.0% of the wintering population in Great Britain; Golden Plover: 30,709 individuals representing at least 12.3% of the wintering population in Great Britain; Hen Harrier: 8 individuals representing at least 1.1% of the wintering population in Great Britain; and, Avocet: 59 pairs representing 1.7% of the breeding population in Great Britain.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting. WeBS data shows bar-tailed godwit observed in the Horseshoe Point to Tetney Haven WeBS zone during winter.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Annex 1 Species On Passage				
Ruff: 128 individuals representing at least 1.4% of the Western Africa wintering population in Great Britain.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting. WeBS data shows ruff identified in Grainthorpe Haven zone (35485) adjacent (south) of Horseshoe Point to Tetney Haven zone.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.
Article 4.2 Over Winter				
Dunlin: 22,222 individuals representing at least 1.7% of the wintering Northern Siberia/Europe/Western Africa population; Knot: 28,165 individuals representing at least 6.3% of the wintering North-eastern Canada/Greenland/Iceland/North-western Europe population; Black-tailed godwit: 1,113 individuals representing at least 3.2% of the Iceland breeding population; Redshank: 4,621 individuals representing at least 3.6% of the Eastern Atlantic - wintering population; and Shelduck: 4,464 individuals representing at least 1.5% of the North-western Europe population.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting. WeBS data shows dunlin, knot, redshank and shelduck observed in the Horseshoe Point to Tetney Haven WeBS zone during winter.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Article 4.2 On Passage				
Dunlin: 20,269 individuals representing at least 1.5% of the wintering Northern Siberia/Europe/Western Africa population; Knot: 18,500 individuals representing at least 4.1% of the wintering North-eastern Canada/Greenland/Iceland/North-western Europe population; Black-tailed godwit: 915 individuals representing at least 2.6% of the Iceland breeding population; and, Redshank: 7,462 individuals representing at least 5.7% of the Eastern Atlantic - wintering population.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting. WeBS data shows dunlin, knot and redshank observed in the Horseshoe Point to Tetney Haven WeBS zone during winter.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.
Article 4.2 of the Birds Directive: internationally important assemblage of birds: over winter, the area regularly supports 153,934 individual waterfowl.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Humber Estuary Ramsar				
Ramsar criterion 1: Representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Qualifying component habitats identified in the Horseshoe Point landfall study area during Phase 1 intertidal, saltmarsh and sand dune survey, including intertidal sandflats, dune systems and saltmarshes.	Construction Temporary loss or disturbance of estuarine habitats (i.e. sandflats, saltmarsh and dune systems) as a result of cable laying operations. Temporary increase in sedimentation (smothering) of estuarine habitats during cable laying operations. Operation Normal operation - No potential impacts on Annex I habitats. Potential disturbance of Annex I habitats as a result of cable exposure and/or cable reburial operations. Decommissioning Temporary estuarine habitat loss and disturbance due to decommissioning activities. Temporary increase in sedimentation (smothering) during decommissioning activities.	Benthic subtidal and intertidal ecology ES chapter (including impact assessment). Phase 1 intertidal, saltmarsh and sand dune survey of proposed Horseshoe Point landfall. Phase 2 intertidal survey of proposed Horseshoe Point landfall. Export cable route subtidal benthic ecology characterisation report. Coastal Processes modelling to inform extent over which increased sedimentation may occur.	Good working practices to minimise impacts on estuarine habitats. Horizontal Directional Drilling to avoid estuarine habitats with long recovery times (i.e. saltmarshes). Ensure adequate cable burial depth.
Ramsar criterion 3: Breeding colony of grey seals.	The Donna Nook grey seal breeding colony is situated at the mouth of the Humber Estuary, close to the proposed Horseshoe Point landfall site.	Construction and Decommissioning Temporary disturbance and displacement of grey seals as a result of cable laying (or decommissioning) activities at Horseshoe Point. Potential reduction of prey species distribution and abundance due to habitat disturbance and direct prey disturbance resulting from cable laying (or decommissioning) activities. Potential mortality/injury to grey seals as a result of potential increase in vessel strike with grey seals during cable laying (or decommissioning) operations. Operation No potential operational impacts on grey seals.	Marine mammal ES chapter (including impact assessment). Desk based review of annual surveys of Donna Nook grey seal haul out sites/colonies and telemetry data.	Potential mitigation includes seasonal restrictions on construction works to avoid main seal pupping period (October to December).

Feature of Interest	Distribution and Relevance	Potential Impacts	Studies to inform HRA	Potential Mitigation
Ramsar criterion 5: Assemblages of international importance: 153,934 waterfowl, non-breeding season.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.
Ramsar criterion 6: Species/populations occurring at levels of international importance: Eurasian golden plover *Pluvialis apricaria altifrons*, red knot *Calidris canutus islandica*, dunlin *Calidris* alpine, black-tailed godwit *Limosa limosa islandica*, common redshank *Tringa tetanus brittanica*, common shelduck *Tadorna tadorna*, bar-tailed godwit *Limosa lapponica lapponica*.	Inter tidal and inland areas directly affected by development. These areas are used by the wintering and on passage migratory birds for foraging and nesting. WeBS data shows knot, dunlin, redshank, shelduck and bar-tailed godwit observed in the Horseshoe Point to Tetney Haven WeBS zone during winter.	Construction Disturbance and habitat loss or damage as a result of construction works, access or associated work. Operation Permanent habitat loss due to development e.g. transition joint bays. Decommissioning Habitat loss or damage as a result of decommissioning works, access or associated work.	Wintering and migratory estuarine bird counts (Sep 2011 to May 2012).	Seasonal restrictions to construction works. Day light working only. Reinstatement of intertidal area to reduce habitat loss / abnormal sediment movement. Habitat enhancement. Good working practices adhered to. Pre-work check of area. Ecological clerk of works present during construction. Monitoring during and post construction.
Ramsar criterion 8: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas	These species are known to migrate through the Humber Estuary SAC to spawning grounds further upstream.	Construction and Decommissioning Disruption of migratory pathways and feeding activity of lamprey species as a result of seabed disturbance from cable laying (and decommissioning) operations and the physical presence of structures and associated increased suspended sediments. Potential lethal and sublethal effects on lamprey species as a result of accidental release of contaminants or resuspension of contaminated sediments. Operation Disruption of migratory pathways of lamprey species as a result of electromagnetic fields from export cabling.	Fish ecology ES chapter (including impact assessment). Desk based fish ecology desktop study. Seasonal intertidal fish ecology surveys (seine, fyke and push netting) of proposed landfall sites. Seasonal subtidal fish ecology surveys (otter trawl) of export cable route corridors.	Potential mitigation may include seasonal restrictions on construction operations to avoid main migratory period for these species (August to October).

Annex D (ii): Habitats Regulations Appraisal – Draft Proposed Approach for Consultation

D.3 The aim of this document is to present a possible approach of any future Habitat Regulations Appraisal that may be required to be undertaken by a competent authority with respect to the potential impacts arising from the proposed Hornsea Round 3 development.

D.4 The document does not purport to answer all the questions but hopefully provides an outline as to how a future Habitats Regulations Appraisal may be prepared and consequently the information required to support it. It is recognised that it is the responsibility of the relevant competent authority (in this case the IPC and to become SoS DECC in advent of the Localism Bill) to undertake the appraisal and not the applicant. However, it is the responsibility of the applicant to present the necessary information for an assessment to be undertaken.

D.5 Information to support an HRA will be presented in separate report/annex as required by the application requirements under the Planning Act 2008 and will draw on two parts of the ES.

D.6 The Nature Conservation Chapter will provide details of all the relevant designated sites and their qualifying features that may have the potential for an interaction with the proposed development. Information within the Nature Conservation Chapter will help identify the designated sites and relevant qualifying species or habitats that may be subject to an HRA.

D.7 The information required to inform an HRA will be presented within each species/habitats accounts within the ES. The HRA section will be separated into two parts, with one considering the potential impacts alone and another for in-combination impacts with other plans or projects. The scope of what may be included within the definition of other plans or projects has still to be finalised and will take into account the guidance provided by the IPC on this matter.

D.8 A considerable amount of work has already been undertaken by EMU and Cork Ecology to identify the relevant SACs and SPAs that may be subject to a Habitats Regulations Appraisal and will be presented within the Nature Conservation and Species chapters.

SPAs

D.9 The following SPAs are currently considered to be within the scope of any future HRA based on advice received on the Scoping Report.

- North Norfolk Coast SPA;
- The Wash SPA;
- Gibraltar Point SPA;
- Great Yarmouth SPA;
- Hornsea Mere SPA;
- Humber Flats, Marshes and Coasts SPA;
- Broadland SPA;
- Coquet Island SPA;
- Northumbria Coast SPA;
- Teesmouth and Cleveland Coast SPA;
- Lindisfarne SPA;
- Firth of Forth SPA;
- Forth Islands SPA;
- Hornsea Mere SPA; and
- St Abb's Head to Fast Castle SPA.

D.10 It is recognised that many species of bird recorded within the Hornsea Development Zone may also be qualifying species for other SPAs not listed above. However, unless evidence becomes available indicating a direct connectivity between individuals from other SPAs and the species recorded within the proposed development it is not proposed to consider further SPAs.

D.11 When undertaking an HRA it is the site that is being assessed and all qualifying species associated with that site are to be considered as part of the HRA. Consequently, information on all bird species listed within the SPAs presented above will be presented to inform any future Hornsea HRA.

Qualifying Species

D.12 Based on the above the following species are currently being considered as requiring assessment under HRA:

- Gannet;
- Cormorant (subspecies carbo);
- Shag;
- Black-headed gull;
- Herring gull;
- Kittiwake;
- Sandwich tern;
- Common tern;
- Arctic tern;
- Little tern;
- Guillemot;
- Razorbill;
- Puffin;

- Pink-footed goose;
- Greylag goose;
- Teal;
- Mallard;
- Pochard;
- Common eider;
- Common scoter;
- Great cormorant;
- Oystercatcher;
- Ringed plover;
- Golden plover;
- Grey plover;
- Knot;
- Dunlin;
- Bar-tailed godwit;
- Whimbrel;
- Curlew; and
- Turnstone.

Relevant Populations

D.13 The Directive requires the assessment to be based on the population present at the time of designation. However, it is recognised that in most instances more up-to-date data are available and an assessment based on these data is more appropriate. Consequently, data presenting both the population at the time of designation and the most recently available data will be presented within the ES although the assessment will be undertaken based on the latest published population figures.

Assessment of Potential Adverse Effects

D.14 All species listed as qualifying species for the relevant SPA will be assessed.

Collision Risk

D.15 The collision risk assessment will be based on the latest Band model recently developed by the SOSS group and in the first instance, a range of avoidance rates, including 98%, 99% and 99.5% will be presented.

D.16 For migratory species infrequently recorded from site specific surveys the results from the APEM migration model currently being developed will be used to inform the possible number of individuals migrating across the area of potential impact and these will be used in the CRM.

Displacement/Disturbance

D.17 It is recognised that for many species there are limited data available to predict the potential magnitude of displacement nor, should it occur, its effects on populations. For most species there has been little evidence of total displacement from constructed offshore wind farms, with only Divers indicating significant levels of displacement. However, for other species the reported levels of displacement have been variable. Previously, when assessing the effects of displacement a common starting default position has been the extreme scenario that all displaced birds die. However, this is recognised as being unrealistic and overly precautionary.

D.18 Within the EIA a range of potential displacement effects will be presented ranging from 0% to 100% displacement and 0% and 100% mortality for each relevant species and ranging from 0 km to 2 km from the proposed development. A potential way of presenting the results from this is provided in Table D.2 below.

Table D.2 Example presentation of displacement/mortality effects.

Species	Mortality (%)										
Displaced (%)	*0*	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	*100*
0											
10											
|											
100											

D.19 In order to assess the potential impacts displacement may have on qualifying species for each SPA, the number of birds predicted to be displaced will be based on the proportion of birds each SPA contributes to the regional population. An assessment will be made depending on the predicted level of mortality for each species.

Barrier effect

D.20 The potential barrier effects will be assessed in a similar way as presented in the Year 1 report. For the HRA assessment species considered to have a likely significant effect will be further assessed taking into consideration the distance the designated site is from the proposed development and known or likely foraging/resting areas.

Assessment of significance

D.21 In order to determine whether a potential effect is likely to be adverse the HRA section will present information based on baseline mortality rates. The use of a 1% of baseline mortality rate as a guide as to whether an adverse effect may occur has been widely used and accepted. The figure is based on an EC Report on the application of the Birds Directive with respect to derogations from hunting. It is intended to use this figure as guide to determine whether there is the potential for an adverse effect arising from the potential impacts to the SPAs.

D.22 It is not proposed to produce a separate HRA Chapter within the final ES. Information to inform an HRA will be presented within the ornithological technical report based on methods used in the Year 1 report. A summary of the findings to inform an HRA will be clearly presented separately within the ES ornithological chapter.

SACs

D.23 The following SACs are currently considered to be within the scope of any future HRA based on advice received on the Scoping Report.

- Dogger Bank;
- North Norfolk Sandbanks and Saturn Reef candidate;
- Inner Dowsing, Race Bank and North Ridges;
- Berwickshire and North Northumberland Coast;
- Flamborough Head;
- Humber Estuary;
- Saltfleetby –Theddlethorpe Dunes and Gibraltar Point SAC;
- The Wash and North Norfolk Coast;
- River Derwent;
- Haisborough, Hammond and Winterton;
- Moray Firth; and
- Firth of Tay and Eden.

D.24 However, it is recognised that depending on the potential effects arising from the proposed development there may be a requirement to expand the list of SACs to be considered to include sites outwith UK waters. In particular sites for which marine mammals are qualifying species. Further consideration on sites to be included that have marine mammals as qualifying species will be made based on the results of noise modelling studies to be undertaken.

Relevant Habitats and Species

D.25 In line with the requirements of the Directive, all habitats and species that are qualifying features of the SAC for which an assessment is to be undertaken will be considered.

Assessment Of Potential Adverse Effects

<u>Physical impacts</u>

D.26 Adverse effects to habitats may arise from a number of sources, particularly during construction. The effects to be considered on qualifying habitats will be primarily physical impacts and these will be assessed based on the scale of potential impact in relation to the overall area of qualifying habitat and its sensitivity to the particular impact of concern. The significance of any impact will be initially based on the percentage of habitat being affected and whether the impact will affect the structure, function and integrity of the site.

<u>Impacts on marine life</u>

D.27 Qualifying species for SACs include common (harbour) seal, grey seal, bottlenose dolphin and otter. There is the potential for harbour porpoise to be included should impacts occur on some Dutch or German designated sites. Those in the UK sector of the Dogger Bank are not subject to HRA. River lamprey and sea lamprey may also need to be assessed.

D.28 The main impact on the qualifying species associated with offshore wind farms is from noise arising during the construction period. The HRA will be based on the results from noise modelling to be undertaken. The thresholds against which adverse effects will be determined are still to be finalised.

In-combination Assessment

D.29 An important part of the HRA is the consideration of other plans or projects. Further detailed document is being prepared to address the cumulative/in-combination impacts and further discussions with statutory advisors to discuss the potential scope of any in-combination assessment would be welcomed.

D.30 *It is our understanding that within the ES an assessment including conclusions against the criteria of the Birds Directive is to be presented.*

Humber Estuary

D.31 Distinct types of effect that may arise from the onshore/intertidal/offshore cable route and/or the Converter Station in the sites collectively referred to as the Humber Estuary European Marine Site. To cover this aspect of the HRA, RPS is also collating part of the HRA to cover comprehensively all likely significant effects on features of interest and conservation objectives of the Humber Estuary sites.

ANNEX E – BACKGROUND INFORMATION ON DESIGNATED SITES AND QUALIFYING FEATURES FOR HUMBER ASSESSMENT

Table of Contents

Table of Tables

Table of Figures

Introduction

E.1 As discussed in the main HRA report, the scope of the Humber assessment focuses on the effects of the Project One export cable landfall and onshore infrastructure on Natura 2000 sites, including the Humber Estuary EMS and other Natura 2000 sites with potential connectivity to the Humber Estuary (i.e. sites with mobile features which are known to transit through the Humber Estuary). This annex provides a description of the designated sites, background information on the qualifying features and the conservation objectives for the Humber Estuary and Natura 2000 sites with potential connectivity. This information has been prepared with appropriate reference to the EN (now NE) advice on the Humber Estuary European Marine Site, given under Regulation 33(2) of the Conservation (Natural Habitats & c.) Regulations 1994 (English Nature, 2003).

E.2 This section also provides information on the distribution of qualifying features of the Humber Estuary EMS relative to the Project One area as identified through the data sources and site specific surveys summarised in Section 3.2 of the HRA report.

Humber Estuary SAC (SAC EU Code: UK0030170)

E.3 The Humber Estuary SAC covers an area of 36,657.15 ha and has been designated for a range of features, including ten qualifying habitats and three qualifying species (). These include a number of habitats which occur in the vicinity of the Horseshoe Point proposed cable route landfall site (see Table E.1). The Natura 2000 'Standard Data Form' for the Humber Estuary SAC is attached in Annex H.

Table E.1 Qualifying Features of the Humber Estuary SAC.

Annex I qualifying features
The Annex I habitats which are the primary reason for the selection of the site as a SAC:
▪ Estuaries; and
▪ Mudflats and sandflats not covered by seawater at low tide.
Other Annex I habitats present as a qualifying feature, but not the primary reason for the selection of the site are:
▪ Sandbanks which are slightly covered by sea water all the time;
▪ Coastal lagoons (priority feature under the Habitats Directive[1]);
▪ *Salicornia* and other annuals colonising mud and sand;
▪ Atlantic salt meadows (Glauco-Puccinellietalia maritimae);
▪ Embryonic shifting dunes;
▪ Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`);
▪ Fixed dunes with herbaceous vegetation (`grey dunes`) (priority feature under the Habitats Directive[1]); and
▪ Dunes with Hippophae rhamnoides.
Annex II qualifying features
Annex II species present within the Humber Estuary SAC as a qualifying feature, but not a primary reason for site selection are:
▪ Sea lamprey Petromyzon marinus;
▪ River lamprey Lampetra fluviatilis; and
▪ Grey seal Halichoerus grypus.

Humber Estuary SAC Qualifying Features and Conservation Objectives

E.4 Conservation objectives for the Humber Estuary SAC (and Ramsar, where relevant; see paragraph E.123 *et seq*.) habitat features are presented in Table E.3.

E.5 These state that, subject to natural change, the conservation objective is to maintain the designated features in favourable condition, which is defined in part in relation to a balance of habitat extents (extent attribute). These conservation objectives are accompanied by one or more habitat extent definitions for the special interest features at this site.

E.6 In addition to habitat extent objectives, there are also site specific standards for quality which should be achieved to maintain the estuary feature in favourable condition and these are described in full in Annex I. They describe the distribution

[1] A sub-set of the Annex I habitat types are defined as being 'priority' because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union; jncc.defra.gov.uk.

and spatial pattern of habitats in the estuary and give standards for sediment budget, salinity and water quality.

E.7 The conservation objectives for the species features of the Humber Estuary SAC (and Ramsar, where relevant; see paragraph E.123 *et seq*.) are provided in Table E.2 but can be broadly summarised as "*subject to natural change, maintain the [grey seal, sea and river lamprey] in favourable condition, with respect to its long term population viability, natural range and the structure and function of its habitat within the site*."

E.8 The conservation objectives for grey seals are defined in part in relation to their population attributes. Site specific targets are in place to ensure a stable or increasing number of breeding female grey seals in the SAC; this is typically estimated from pup production. The pup production baseline reported in the NE Humber Estuary conservation objectives was from a survey in 1981, which estimated 34 pups, though this rate has increased in the intervening years (discussed below). Other targets for achieving 'favourable condition' include ensuring a stable or increasing area of usage within the SAC and ensuring that all breeding sites, namely the site at Donna Nook, remain accessible to the estuary and sea.

E.9 To maintain the sea and river lamprey in favourable condition, site specific population targets exist with regard to age structure, density and distribution of the species within the estuary. There are targets which also relate to water quality and flow rates but the primary target for relevance to this project relates to river morphology. It states that to maintain favourable status there should be no artificial barriers which would significantly impair the ability of adults to reach existing and historical spawning grounds.

<u>Other SACs with potential connectivity</u>

E.10 The River Derwent is one of the many rivers which flows into the Humber Estuary and the lower reaches of this river are designated as an SAC for the features described in paragraph E.123 *et seq*. This SAC has been considered in the current assessment as the two migratory fish species designated for this site (i.e. river lamprey and sea lamprey) would be expected to migrate through the Humber Estuary on their way to spawning grounds in the River Derwent. As such, any potential adverse effects on lamprey species in the Humber Estuary may have consequent adverse effects on lamprey species in the River Derwent SAC.

E.11 Conservation objectives for the River Derwent SAC are to "*Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features"* (see Annex I). Population attributes and site specific targets for measuring Favourable Conservation Status of river and sea lamprey were not available for the River Derwent SAC, though these are likely to be similar to those for the Humber Estuary (Table E.4). Therefore, for the purposes of the current assessment the conservation objectives detailed in Table E.4) have been used for both the Humber Estuary and River Derwent SACs as representative attributes and targets for the favourable conservation of these species in this part of the UK.

Table E.2 Qualifying Features of the River Derwent SAC.

Annex I qualifying features
Annex I habitats present as a qualifying feature, but not the primary reason for the selection of the site are: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.
Annex II qualifying features
Annex II species that are a primary reason for selection of this site are: ▪ River lamprey Lampetra fluviatilis Annex II species present within the River Derwent SAC as a qualifying feature, but not a primary reason for site selection are: ▪ Sea lamprey Petromyzon marinus; ▪ Bullhead Cottus gobio; and ▪ Otter Lutra lutra.

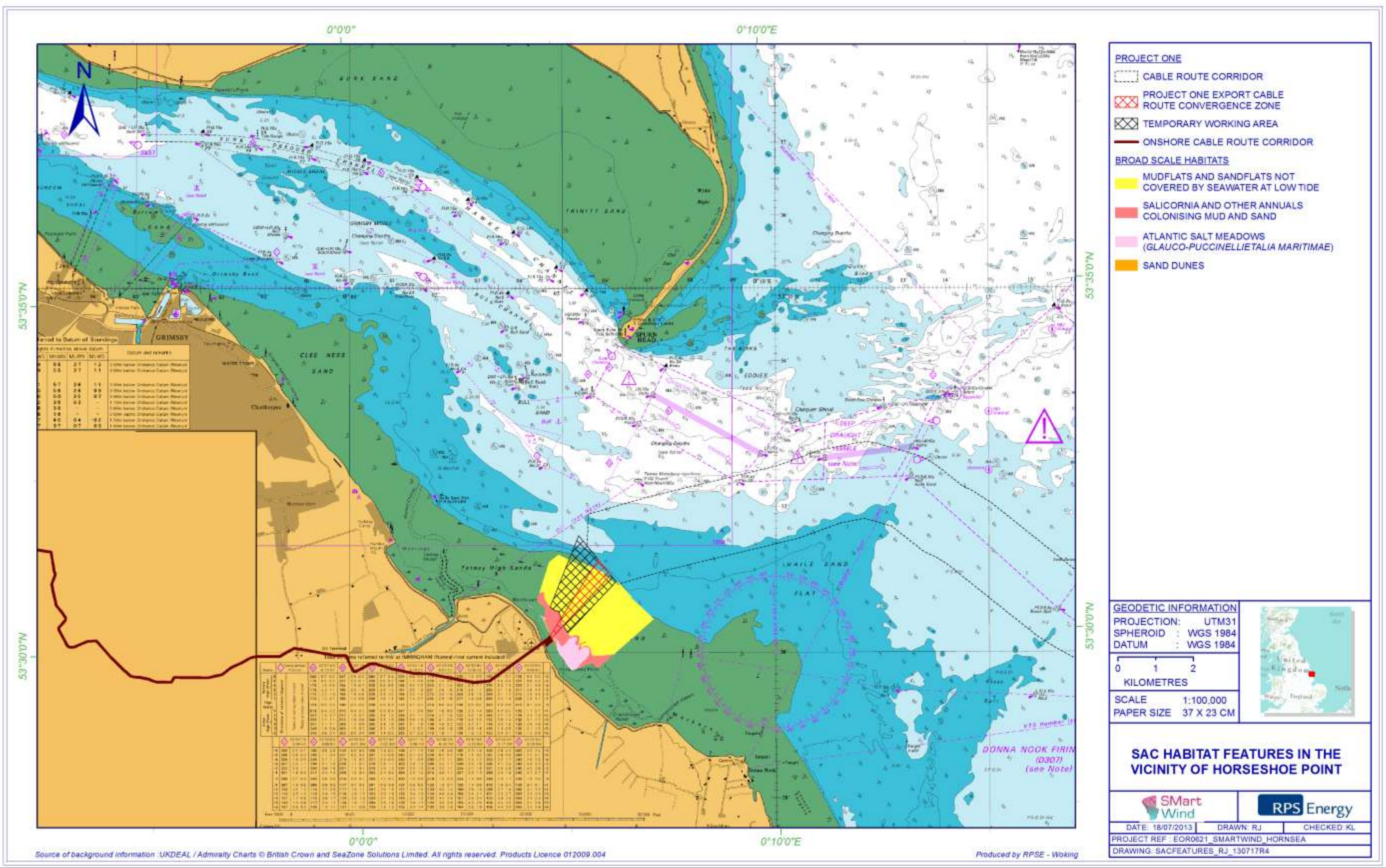


Figure E.1 Humber Estuary SAC habitat features in the vicinity of Horseshoe Point.

Table E.3 Conservation objectives for Annex I habitat features of the Humber Estuary SAC and Ramsar (Annex I).

Conservation Objective for Habitat Extent	To maintain the designated features in favourable condition, which is defined in part in relation to a balance of habitat extents (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards.		
Extent – Dynamic Balance	On this site favourable condition requires the maintenance of the extent of each habitat type (either designated habitat or habitat supporting designated species). Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.		
Broad Habitat Type	**Habitat feature**	**Estimated extent of habitat in SAC**	**Site Specific Target Range and Measures**
Estuary	Estuary	Total: 36657.15 ha (SAC boundary)	No reduction in extent of estuary feature, except due to natural processes.
Littoral Sediment	Atlantic Salt Meadows (Coastal Saltmarsh)	Key sites at North Somercotes, Spurn Bight, Cleethorpe and Cherry Cob Sands. Total: 1643.61 ha	No reduction in extent of feature, except due to natural processes.
	Mudflats and sandflats not covered by seawater at low tide	9382.46 ha	No reduction in the extent of the littoral sediment biotope(s) identified for the site allowing for natural succession/known cyclical change.
Inshore sublittoral sediment	Sandbanks which are slightly covered by sea water at all times	Grimsby Middle: 206-236 ha Middle Shoal: 252-340 ha Bull Sand: 355-486 ha	No reduction in extent of inshore sublittoral sandbanks allowing for natural succession/known cyclical change.
Saline Lagoons	Coastal Lagoons	Total: 22.77 ha Humberston Fitties: 1.75 ha Northcoates Point A: 1.82 ha Northcoates Point B: 2.2 ha Blacktoft Sands: 17 ha	No reduction in extent of saline/coastal lagoon area. N.B. Northcoates Point lagoons lie outside the coastal protection works and are subject to natural coastal processes which may affect extent.
Sand Dunes	Fixed Dunes with herbaceous vegetation	Total: 31.63 ha Key site at Spurn Peninsula and North Lincolnshire Coast	No reduction in extent from the established baseline, subject to natural change.
	Dunes with *Hippophae rhamnoides*	Total: 66.13 ha Key sites at Cleethorpes and Spurn Peninsula	No reduction in extent from the established baseline, subject to natural change.
	Embryonic shifting dunes	Total: 39.14 ha Key sites at Spurn Peninsula, Easington Lagoons and North Somercotes	No reduction in extent from the established baseline, subject to natural change, although location may change.
Standing open water and canals Ramsar feature	Complex of open water habitats (i.e. disused clay pits) with transitions from freshwater to brackish.	Total: 209.3 ha	No reduction in extent of standing water.

Table E.4 Conservation objectives for species features of the Humber Estuary SAC and Ramsar (Annex I).

Conservation Objective for Species Populations	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.	
Population Balance	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.	
Species Feature	**Population Attribute**	**Site Specific Target Range and Measures**
River lamprey[2] (*Lampetra fluviatilis*) and sea lamprey [2] (*Petromyzon marinus*)	Population a. Age Structure	For samples of 50 or less, at least two distinct size classes should normally be present. If more than 50 ammocoetes are collected, at least three size classes should be present.
	Population b. Distribution within catchment	Lampreys should be present at not less than 2/3 of sites surveyed. As a minimum, there should be no reduction in the distribution of ammocoetes within the catchment. Where barriers to migration or pollution issues are thought to be a problem, the population should be classed as being in unfavourable condition and targets for an appropriate increase should be set.
	Population c. Ammocoete density	*Lampetra* spp: Optimal habitat: >10 m^{-2}, Chalk streams >5 m^{-2}, Overall catchment mean: >5m^{-2} *Petromyzon*: Ammocoetes should be present in at least four sampling sites, each not less than 5 km apart.
	Population d. Spawning Activity (sea lamprey only)	No reduction in extent of spawning activity year on year.
	River morphology	No artificial barriers significantly impairing adults from reaching existing and historical spawning grounds.
	Negative indicators	No stocking of other fish species at excessively high densities.
	Water quality	Biological General Quality Assessment (GQA) Class: b/B Target: Chemical GQA Class: B Targets for Dissolved Oxygen (DO): DO should not fall below 2mg/l; DO should not fall below 5mg/l for more than 5 consecutive days; and Following a period of DO of less than 5mg/l there should be at least 2 consecutive days where DO remains above 5mg/l (source: Hopkins, 2007). Suspended solids: Annual mean <25 mg L^{-1} Soluble Reactive Phosphorus: Targets should be set in relation to river/reach type(s) and should be near background levels)
	Flow	As a guideline, flow should be at least 90% and not more than 110% of the naturalised daily flow throughout the year.
	River morphology	River habitat Site of Special Scientific Interest (SSSI) features should be in favourable condition.

[2] Population attributes and site specific targets for river and sea lamprey were not available for the River Derwent SAC and therefore those of the Humber Estuary SAC have been used as representative attributes and targets for these species in this part of the UK.

Species Feature	Population Attribute	Site Specific Target Range and Measures
Grey seal (*Halichoerus grypus*)	Pup production in the SAC/SSSI	A stable or increasing number of breeding female grey seals in the SAC/SSSI (baseline 34 pups in 1981).
	Distribution of grey seal pups within the SAC/SSSI	A stable or increasing area of usage within the SAC/SSSI.
	Accessibility of SAC/SSSI for breeding	An accessible breeding site.
Natterjack toad (*Bufo calamita*) Ramsar feature	Toadlet production	For at least 1 year in every 4 years, each breeding pond to have baseline toadlet production +/- 1 order of magnitude. Fail [to achieve target] if zero production at all breeding ponds for 3 consecutive years
	Aquatic macrophyte cover and shading	>90% of breeding ponds to have: aquatic macrophyte covering/shading less than 25% of surface, and no scrub solidly shading southern margin of pond. Target may be adjusted to suit pond characteristics.
	Breeding pond presence	No net loss in extent or number of breeding ponds.
	Terrestrial habitat in proximity of breeding ponds - extent	Set site-specific targets according to conditions. Use the following as a guide: Habitat structure to be open, with no significant encroachment of dense scrub vegetation, areas of low sward to remain low (height approx. 1cm), and bare/sparsely vegetated areas to remain as such. Bare sand, slag or rock piles also suitable habitat.
	Breeding pond persistence	Minimum summer water depth 5cm for at least 75% of breeding ponds on each year of assessment. Target may be adjusted according to pond type.
	Discretionary attribute: Breeding pond water quality (saltmarsh sites and saltmarsh ponds seaward of dunes only)	Breeding ponds exposed to seawater inundation.

Background Information on Qualifying Habitats

Estuary

E.12 At over 36,000 ha, the Humber Estuary is the second-largest coastal plain estuary in the UK, and the largest on the east coast of Britain, draining around 20% of the total land surface of England. It is a muddy, macro-tidal estuary, fed by the Rivers Ouse, Trent and Hull, Ancholme and Graveney. It is the northernmost of the English east coast estuaries whose structure and function is intimately linked with soft eroding shorelines.

E.13 The Humber Estuary encompasses a wide variety of habitats including Atlantic salt meadows and *Salicornia* beds, together with subtidal sandbanks, vast intertidal mudflats and sandflats, sand dunes and coastal lagoons. The intertidal areas and their associated benthic communities provide an important source of food for birds and fish species. As many as 82 different fish species have been recorded in the estuary, including river and sea lamprey, allis and twaite shad and salmon. It is also used as a nursery ground for fish such as plaice and there are some cockle and mussel beds in the outer estuary (English Nature, 2003). However, due to extensive historical land claim and drainage it is estimated that nearly 2,300 ha of intertidal land was lost in the middle and outer estuary between 1828 and 1996 (Hemingway, 2008).

E.14 Suspended sediment concentrations are high and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast. The erosion and accretion of these sediments is a feature of much of the estuary, as is the changing position of the channel both in the outer estuary and more predominantly upstream of the Humber Bridge. Upstream the estuary is fringed by reedbeds and brackish saltmarsh communities which are important for bird and insect species.

E.15 Two of the sub-features for which the estuary has been designated, saltmarsh communities and intertidal mudflats and sandflat communities, are classified in the Habitats Directive as interest features in their own right and are therefore described separately below. The subtidal sediment community sub-feature forms an important component of the estuarine ecosystem; the bed of the estuary is predominantly sandy with some patches of gravel whereas the intertidal areas are mostly glacial till/silty clay, an exception being the intertidal areas of the outer part of the south bank which are sandy.

Mudflats and sandflats not covered by seawater at low tide

E.16 The Humber Estuary supports a large area of intertidal habitats which fringe most of the shores of the estuary and represent 4.5% of the total British resource. The habitats present range from gravels and sands, to muddy sands and mud, reflecting varying degrees of exposure to waves, currents and inflowing rivers (English Nature, 2003).

E.17 At low tide almost 50% of the area of the estuary is exposed, with extensive areas of mudflats in the outer estuary, particularly inside Spurn Bight and Cherry Cob. However, the higher energy environment and greater marine sediment component of the outer estuary (i.e. around Horseshoe Point) and coastal reaches means that the intertidal flats of these areas are predominantly sandy (English Nature, 2003).

Gravel and Sand

E.18 Intertidal gravel and sand communities are typical of high energy environments such as those in the outer estuary found around Hessle and South Ferriby. These highly mobile areas support high numbers of robust polychaetes, amphipods and crustaceans that can tolerate abrasion. The sandflats also support cockle beds on the north Lincolnshire coast and are an important source of material for the mature sand dunes behind them (English Nature, 2003).

Muddy Sand

E.19 Areas of intertidal muddy sand occur in the more sheltered areas including the south bank of the outer estuary from Cleethorpes to Donna Nook. These areas are colonised by a wide range of species including polychaetes (particularly the lugworm *Arenicola marina*) and bivalve molluscs (English Nature, 2003).

Mud

E.20 Extensive mudflats form in sheltered areas of the mid and outer estuary and support abundant communities dominated by polychaete worms (particularly *A. marina* and the fan worm *Manayunkia aestuarina*), bivalve molluscs and the mud-snail *Hydrobia ulvae* which is an important food source for many wading birds. Mudflats also provide valuable roosting and resting areas for species of wading birds and waterfowl.

Eelgrass bed communities

E.21 Eelgrass beds are nationally rare and are an important habitat as they provide spawning, nursery and refuge areas for fish. Historically there were extensive eelgrass beds of *Zostera noltei* (dwarf eelgrass) and *Zostera marina* (common eelgrass) on Spurn Bight and in the Grimsby area, but these have declined for reasons that are not fully understood, although it is likely that some eelgrass still exists in these areas (English Nature, 2003).

Mudflats and sandflats at Horseshoe Point landfall site

E.22 During intertidal surveys of the Horseshoe Point landfall site, the intertidal zone was found to be dominated by sandy substrates (Figure E.2), with areas of cockle bed recorded within the survey area, to the south and east of the proposed cable route corridor (Volume 5, Annex 5.2.1: Benthic Subtidal and Intertidal Technical Report). Much of the cable route corridor is dominated by sandy and muddy sand sediments, with infaunal communities characterised by molluscs and polychaetes, including lugworm (i.e. the biotopes LS.LSa.MuSa.MacAre: *Macoma balthica* and *Arenicola marina* in littoral muddy sand and LS.LSa.FiSa.Po: Polychaetes in littoral fine sand) with areas of barren intertidal sand also present in the mid to lower shore (i.e. the biotope LS.LSa.MoSa: Barren or amphipod-dominated mobile sand shores).

E.23 Many of these communities are likely to be tolerant or have low sensitivity to displacement from cable burying operations, with most species capable of reburying themselves in the disturbed sediment following disturbance. Any effects of increased predation from birds, fish or other fauna are likely to be short lived, with species characterising these habitats having high rates of recovery (i.e. recovery within months of disturbance; Tyler-Walters and Marshall, 2008; Rayment, 2008; Budd, 2008). Similarly, these habitats have very low sensitivity to the indirect impacts of cable laying operations (i.e. increased suspended sediments, smothering).

E.24 Intertidal mud sediments and eelgrass bed communities were not recorded during the intertidal surveys.

Sandbanks which are slightly covered by sea water at all times

E.25 Subtidal sandbanks consist of sandy sediments that are permanently covered by shallow seawater, typically at depths of less than 20 m below chart datum. The subtidal area of the Humber Estuary comprises over 55% of the total area of the estuary and this environment is highly dynamic. The seabed is predominantly sandy with some patches of gravel and glacial till, grading into silty clay in the intertidal areas of the main body of the estuary. The benthic community of these areas is dominated by invertebrates such as polychaete worms, mysid shrimp and gammarid amphipod species; diversity increases towards the mouth of the estuary (English Nature, 2003).

Subtidal gravel and sands

E.26 Subtidal gravel and sands are patchily distributed throughout the estuary. Off the mouth of the Humber, the seabed is composed largely of gravels and is characterised by the bryozoan *Flustra foliacea*, the common whelk *Buccinum undatum*, the horse mussel *Modiolus modiolus* with the tube-dwelling polychaete worm *Sabellaria spinulosa*. The seabed of the outer to middle estuary is composed of very poorly sorted sandy shell gravel supporting communities of polychaete worms, crustaceans and bivalves. The sheltered sediments of the southern bank of the outer estuary are characterised by the polychaetes *Spiophanes bombyx* and *Spio filicornis*.

Subtidal muddy sands

E.27 Subtidal muddy sands are found predominantly in the middle and outer estuary and support ‘transitional’ communities of polychaetes worms such as *Scoloplos armiger*, *Nephyts hombergii* and *Polydora* species, along with the phoronid *Phoronis muelleri* and the bivalves *Macoma balthica*.

Sandbanks in the vicinity of Horseshoe Point landfall site

E.28 The three main sandbank features within the Humber Estuary SAC - Grimsby Middle, Middle Shoal and Bull Sand (see Figure E.1 and Table E.3)) - are located approximately 7 km, 11 km and 3 km northwest from the export cable route corridor. These features will not therefore be directly impacted by the proposed cable laying works. Indirect impacts on these habitats are also not expected as the plume created by sediments resuspended from cable laying operations would not be likely to extend beyond 100 m from the cable laying operations.

Figure E.2 Humber Estuary SAC habitat features at Horseshoe Point

Coastal lagoons

E.29 Coastal (or saline) lagoons are areas of shallow, coastal salt water, wholly or partially separated from the sea by sandbanks, shingle or, less frequently, rocks. Nationally important lagoons have developed in the Humber region behind dune-capped barrier islands where there were formerly saltmarshes. Coastal lagoons are listed as a priority feature of the Humber Estuary SAC because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union (jncc.defra.gov.uk).

E.30 Within the Humber Estuary, 26 *coastal lagoons* have been identified comprising 7.9% of the total number of UK lagoons (Allen *et al.*, 2003) and there are good examples of four of the five physiographic types of coastal lagoon: isolated (Humberstone Fitties), percolation (Northcoates), silled (Northcoates) and sluiced (Blacktoft Sands). The majority are distributed along the southern shoreline from North Somercotes in the outer estuary to Blacktoft Sands (over 8 km to the south of Horseshoe Point). Of these, the lagoons which have been classified as being of 'SAC quality' are the Humberston Fitties, south of Cleethorpes (5 km to the north of Horseshoe Point), and Northcoates A and Northcoates B on the north Lincolnshire coast (450 m to the north of the Horseshoe Point landfall site; Natural England, 2009).

E.31 The lagoons are host to three nationally scarce invertebrate species: the lagoon sand-shrimp *Gammarus insensibilis*, the tentacled lagoon worm *Alkmaria romijni* and the starlet sea anemone *Nematostella vectensis*. The nationally scarce stonewort *Tolypella glomerata* is also found. Also notable in this region's lagoons are the opossum shrimp *Paramysis nouveli*, the lagoonal cockle *Cerastoderma glaucum*, the lagoonal periwinkle *Littorina saxatilis* var. *lagunae*, the lagoonal mud snails *Hydrobia ventrosa* and *Hydrobia neglecta*, together with a significant marine component, including the mud snail *Hydrobia ulvae*.

Coastal lagoons at Horseshoe Point landfall site

E.32 As previously discussed, the Northcoates *coastal lagoons* are located close to the Horseshoe Point landfall site (450 m to the north; Figure E.2 This is a complex system consisting of a high salinity silled lagoon and a moderate salinity percolation lagoon. Feeder channels for this lagoon system were recorded within the intertidal survey area, approximately 130 m to the north of the landfall site. At high tide, seawater enters the system through these feeder channels, directly maintaining the silled lagoon and therefore these feeder channels are an integral part of the coastal lagoon system.

E.33 A small area of coastal lagoon habitat was recorded to the northwest of the export cable route landfall site at Horseshoe Point (Figure E.2). This was not connected to the Northcoates coastal lagoon system and at the time of survey only a small amount of water was present in these areas, suggesting that these areas are prone to drying out completely (Volume 6, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report).

Atlantic salt meadows

E.34 *Atlantic salt meadows* develop when salt-tolerant vegetation colonises intertidal mud and sand sediments in areas protected from strong wave action. This vegetation forms the middle and upper reaches of saltmarshes, where tidal inundation occurs with decreasing frequency and duration. Saltmarsh is found fringing much of the Humber Estuary but overall cover is atypically low (less than 1% of the total estuarine area) for an estuary of this size, due to historic losses from land claim. It is found predominantly in sheltered areas such as Cherry Cobb sands and artificial embayments such as Welwick on the north bank. On the south bank there are notable areas near Tetney and south of Donna Nook where the saltmarsh fronts the North Lincolnshire dune complex. Although the coastal saltmarsh extent referenced in the conservation objectives for the Humber Estuary SAC was 1,643.61 ha (see Table E.3and Annex I) this was based on a 2001 estimate and more recent mapping by the EA (Environment Agency, 2009) has estimated that coastal saltmarsh covers an area of approximately 1,840 ha.

E.35 The *Atlantic salt meadows* of the Humber are notable as being predominantly ungrazed and subsequently support a range of communities dominated by sea purslane *Atriplex portulacoides* and *Puccinellia maritima* with frequent sea aster *Aster tripolium* and sea lavender *Limonium vulgare*. Over half of the marsh, and in particular the tidal marsh communities of the inner reaches of the estuary between the Humber Bridge and Trent Falls, are dominated by common reed *Phragmites australis* and sea club-rush *Bulboschoenus maritimus*.

E.36 The low to mid marsh communities are predominantly represented by sea aster, common saltmarsh grass *P. maritima* and the species-poor sea purslane communities. The mid to upper marsh communities are dominated by the saltmarsh rush *Juncus gerardii* and saltmarsh grass/fescue communities *Puccinellia*/*Festuca*. Important transition communities occur around the extreme high water mark and commonly comprise sea couch grass *Elymus pycnanthus* and *P. australis* tidal reed beds.

Atlantic salt meadows at Horseshoe Point landfall site

E.37 The intertidal survey of the Horseshoe Point landfall site conducted in July 2011 identified that the intertidal zone was dominated by sandy sediments, though saltmarsh habitats were recorded on the upper shore (Figure E.2). The southern section of the survey area was found to overlap with a block of continuous saltmarsh, equating to approximately 25 ha within the survey area (though this habitat extended over a wider area further to the south), with communities typical of the Lincolnshire coast. Extensive areas of the main block of saltmarsh vegetation had a mixed species composition typical of *Atlantic salt meadows* with frequent common saltmarsh-grass tussocks and sea lavender with sea arrowgrass *Triglochiin maritima*, sea purslane and sea plantain *Plantago maritima*. The vegetation of the lower regions of the saltmarsh community, adjoining the sandflats, was composed of abundant glassworts and common cord-grass *Spartina anglica* along the seaward edge of the lower saltmarsh.

E.38 The development of this area of saltmarsh habitat from 1992 until 2010 has been presented in Annex G, which shows aerial photography of the Horseshoe Point landfall site. This shows that this area of saltmarsh has increased considerably in extent since 1992, with the majority of the expansion occurring to the southeast. This area of saltmarsh has increased in extent from approximately 17 ha in 1992, to approximately 29 ha in 2001 and approximately 40 ha in 2011. The saltmarsh habitat has been shown recently to be expanding slowly to the northwest (i.e. towards the landfall site), with patches of saltmarsh vegetation appearing since 2007 (see Annex G).

E.39 Saltmarsh communities have typically slow rates of recovery following direct habitat disturbance (e.g. from cable laying), with full recovery occurring over years. Recent saltmarsh monitoring surveys for the Thanet Offshore Wind Farm export cable route showed recovery of pioneer saltmarsh species within 6 months of the completion of cable laying operations, with recovery of the entire saltmarsh likely to occur over a longer period (Royal Haskoning, 2010).

Salicornia and other annuals colonising mud and sand

E.40 *Salicornia*, also known as glasswort or samphire, occurring on mud and sand is generally known as pioneer saltmarsh as these plants are the first saltmarsh species to colonise the bare flat in areas protected from strong wave action. It develops at the lower reaches of the saltmarshes and is an important precursor to the development of more stable saltmarsh vegetation. The communities comprise a very small number of species and are dominated by open stands of *Salicornia* species or annual sea-blite *Suaeda maritima*.

E.41 Unusually, pioneer saltmarsh communities in the Humber are found predominantly in the outer estuary on both the north and south banks; the largest concentrations are south of Cleethorpes. The bare mud and sand flats of the upper Humber are colonised by small amounts of common cordgrass *Spartina anglica* and sea club rush *Bolboschoenus maritimus* where freshwater influence is greater (English Nature, 2003).

E.42 The annual *Salicornia* community is the most extensive pioneer marsh community in the Humber Estuary SAC and forms a distinct zone sometimes several hundred metres wide. It is found within the Humber Flats and Marshes; Pyewipe and Cleethorpes Coast Site of Special Scientific Interest (SSSI), Spurn Head to Saltend Flats SSSI and North Lincolnshire Coast SSSI. *Salicornia* species germinate in May from a widespread dispersion of seeds, the lower limit of the community being set by the time between tides and the time taken for the seeds to become firmly anchored. The annual *S. maritima* community is characteristic of gravelly mud on the lower marsh, and is uncommon in the Humber Estuary SAC.

E.43 No specific conservation objectives (i.e. with regard to extent) were identified for this habitat as these were incorporated into the conservation objectives for *Atlantic salt meadows*. For the purposes of the current assessment the baseline extent of 61.48 ha has been used, as reported by Allen *et al.,* (2003), though this is likely to be an underestimate of the extent of this habitat within the SAC as approximately 68 ha of this habitat were mapped during site specific surveys at Horseshoe Point. The use of this low baseline area will therefore lead to a conservative (precautionary) assessment.

Salicornia and other annuals at Horseshoe Point landfall site

E.44 The intertidal survey at the Horseshoe Point landfall site in July 2011 identified an area of annual glasswort plants extending across most of the survey corridor in the upper shore of the intertidal sandflat (Figure E.2). Glasswort plants in the survey area typically measured less than 5 cm in height and were present at densities of ten to 50 individual plants per m^2. The extent of this habitat equated to approximately 68 ha within the survey area (Figure E.2This indicates that Horseshoe Point represents one of the key areas in the Humber Estuary for this Annex I habitat.

E.45 As *Salicornia* spp. are pioneer saltmarsh species, this habitat is less sensitive to habitat disturbance from cable laying operations than the other saltmarsh habitats. These species are known to recolonise disturbed habitats quickly following disturbance, with *Salicornia* spp. recorded at the Thanet Offshore Wind Farm landfall site within two months of completion of cable burial operations (Royal Haskoning, 2010).

Embryonic shifting dunes

E.46 *Embryonic shifting dunes* are low dunes that develop along the upper shore above the high tide line. The Humber Estuary is considered to support a significant presence of these dues as the total extent in the UK is considered to be less than 1000 ha. Key sites within the Humber Estuary are at Spurn Peninsula, Easington lagoon and North Somercotes (Allen *et al.*, 2003). *Embryonic shifting dunes* account for 4% of both north and south sandbank systems at the mouth of the Humber Estuary and the total extent of this habitat within the Humber Estuary is approximately 27.34 ha (Hemingway, 2008).

E.47 *Embryonic shifting dunes* are inherently species-poor with little floral species variation. Strandline species are commonly found such as sea rocket *Cakile maritima*, lyme-grass *Leymus arenarius* and sand couch *Elytrigia juncea*. The existence of this community is highly dependent on the continuous supply of new sand from the beach into the dune system, and this habitat type is an extremely important indicator of the general structure and functional 'health' of a dune system (JNCC, 2011).

Embryonic shifting dunes at Horseshoe Point landfall site

E.48 Embryonic dune vegetation was recorded establishing in the upper shore of the Horseshoe Point landfall site, in a thin strip immediately adjacent to the sea wall (approximately 1.1 ha; Figure E.2). Embryonic dune vegetation establishing in this habitat was characterised by sand couch *Eltrygia juncea* with sea sandwort *Honckenya peploides* and sea rocket *Cakile maritima*, which is typical of intertidal zones in Lincolnshire. The large expanse of sandflat which partially dries out at low tide creates the conditions that allow the accumulation of windblown sand and the establishment of pioneer sand dune vegetation (Volume 4, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report).

Shifting dunes along the shoreline with Ammophila arenaria ('White dunes')

E.49 *Shifting dunes along the shoreline with Ammophila arenaria ('white dunes')* encompasses most of the vegetation of unstable dunes where there is active sand movement and where the sand-binding marram *Ammophila arenaria* is a prominent feature. The extent of these dynamic 'white dunes' in the Humber Estuary is estimated at 30.67 ha and they are located predominantly around Spurn Peninsula. White dunes occupy 16.66 ha (32%) of the north bank system of the outer Humber Estuary, 0.74 ha (10%) of the south bank system of the outer Humber Estuary, and 5.64 ha (11%) of Easington Lagoons (Hemingway, 2008).

Shifting dunes at Horseshoe Point landfall site

E.50 White dunes (or semi-fixed sand dune vegetation), supporting a community of marram grass *Ammophila arenaria*, lyme grass *Elymus arenarius* and red fescue *Fesutca rubra*, were identified in the intertidal landfall survey area (Volume 4, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report), though these were limited in extent (approximately 1 ha within the survey area; Figure E.2). This sand dune vegetation was recorded in a thin strip on the sand trapped on the seaward side of the sea wall. The presence of the sea wall has led to an over-stabilisation of the dune and an absence of mobile sand within the narrow strip of sand dune vegetation with abundant marram grass.

Dunes with *Hippophae rhamnoides*

E.51 *Dunes with sea buckthorn Hippophae rhamnoides* comprise scrub vegetation on more-or-less stable sand dunes in which sea-buckthorn is abundant. This habitat is found at scattered localities around the UK but as a native vegetation type it is confined to a few sites on the east coast of England, of which the Humber Estuary is one. In other locations sea-buckthorn has been planted and due to its tendency to invade other dune habitats it is regarded as a conservation problem in these areas.

E.52 The estimated extent of this habitat around the Humber estuary is 134.33 ha (Allen *et al.*, 2003). Both of the north and south bank dune habitats of the outer Humber Estuary are dominated by sea-buckthorn scrub and this habitat covers 5.5 ha (73%) of the sand dunes on the south bank and 27 ha (51%) of the sand e dunes on the north bank, mostly on Spurn Peninsula (Hemingway, 2008).

Dunes with Hippophae rhamnoides at Horseshoe Point landfall site

E.53 Although this habitat feature is present in the vicinity of the landfall site, it was not recorded within the cable corridors shown on Figure E.2and therefore will not be impacted by the proposed cable laying works. This habitat was not recorded in the survey area but sea buckthorn was reported in one area further to the north of the survey.

Fixed Dunes with herbaceous vegetation (`Grey dunes`)

E.54 Fixed dune vegetation occurs mainly on large dune systems that have the width to allow it to develop. On coastal dunes it typically occurs inland of the zone dominated by marram *Ammophila arenaria*, and represents the vegetation that replaces marram as the dune stabilises and the organic content of the sand increases. Grey dunes are listed as a priority feature of the Humber Estuary SAC because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union (jncc.defra.gov.uk). As discussed above, sand dunes are features of both the north and south bank of the outer Humber Estuary and fixed grey dunes occupy 13% of both of these dune systems with 6.85 ha and 0.98 ha in the north and south banks respectively. Fixed grey dunes cover an approximate total area of 45.08 ha in the Humber Estuary and the Spurn Peninsula is a key site for this habitat (Hemingway, 2008).

Fixed dunes at Horseshoe Point landfall site

E.55 Fixed dune vegetation was not recorded during baseline ecology surveys at the Horseshoe Point landfall site and is not known to occur in the immediate vicinity. Most of the records of this habitat are from the north bank of the outer estuary. As such, this has been excluded from the AA.

Background Information on Qualifying Species

Grey seal *Halichoerus grypus*

E.56 Grey seals are amongst the rarest seals in the world and the UK population represents about 38% of the world population and 95% of the EU population (English

Nature, 2003; SCOS, 2011). Grey seals are the larger of the two resident UK seal species, the other being the harbour seal *Phoca vitulina*, and they forage in the open sea and return to haul out sites to rest, moult and breed. In the UK, grey seals typically breed on remote uninhabited islands or coasts and are in general highly sensitive to disturbance by humans. On the Lincolnshire coast grey seal start to aggregate in mid-September to begin breeding and pupping at Donna Nook commences in late October and runs until December (Lincolnshire Wildlife Trust (LWT(, *pers. comm.*). Further south on the North Norfolk coastline the breeding season is slightly later with pupping occurring at the end of October/early November and finishing in January (LWT, *pers. comm.*).

Grey seals at Horseshoe Point landfall site and cable route

E.57 Donna Nook within the Humber Estuary SAC is the second largest grey seal breeding colony in England, and the number of pups born each year has been increasing throughout the past decade (Hemingway *et al.*, 2008). In 2009, ground counts carried out during the breeding season by the Lincolnshire Wildlife Trust, estimated pup production to be 1,318 individuals (Volume 5, Annex 5.4.1: Marine Mammal Technical Report). The numbers of grey seals counted during the harbour seal population monitoring/moult aerial surveys in August estimated the Donna Nook population in 2009 to be 2,068 individuals (Volume 5, Annex 5.4.1: Marine Mammal Technical Report). Grey seals at the Donna Nook colony have become habituated to human disturbance and over 70,000 people visit this colony during the breeding season (SCOS, 2011).

Sea lamprey *Petromyzon marinus*

E.58 The sea lamprey is the largest and least common of the three lamprey species occurring in the UK; reaching a length of 120cm and weight of 2.5kg. Sea lamprey are anadromous (migrating to fresh water to breed). They are thought to occur over much of the North Atlantic, both in shallow coastal and deep offshore waters, but migrate into fresh water to spawn (Humber Management Scheme, 2012). The Humber Estuary is the migration route for sea lamprey between freshwater catchments to coastal waters and vice versa. The estuary provides the only route to and from the River Derwent SAC which is recognised as an important spawning river for sea lamprey both at European and national level.

E.59 The sea lamprey is present in the estuary all year round, although numbers increase during the summer and autumn periods when migration takes place. Mature adults begin their run up to the River Derwent and rivers of the Ouse system in May and juvenile lamprey begin their descent into the estuary between October and March (English Nature, 2003). Sea lamprey is listed as a qualifying features, but not a primary reason for selection of the River Derwent SAC.

River lamprey *Lampetra fluviatilis*

E.60 River lamprey are confined to Western Europe and are smaller than the sea lamprey; reaching a length of around 40 cm and weight of around 60 g. The species is normally anadromous, migrating from the sea and estuaries to spawn in UK rivers including the River Derwent and Ouse. The River Derwent SAC is recognised at European and national level as an important spawning river and the Humber Estuary is the only migration route to and from this river and the River Ouse (English Nature, 2003). River lamprey is listed as a primary reason for selection of the River Derwent SAC.

E.61 River lamprey require clean gravel for spawning and marginal silt and sand for the juvenile fish to burrow in. The larvae remain buried in the silt beds for several years before metamorphosing and migrating downstream into estuaries, between October and March, to feed on fish. After one or two years, they stop feeding and migrate upstream to spawn in freshwater. The upstream migration of mature fish to spawn in the River Derwent and the rivers of the Ouse system begins in November, although spawning does not take place until May. The migration is thought to be triggered by water temperature and pheromones from juvenile lamprey (English Nature, 2003). Data from power station fish impingement indicate that they are present in the Humber throughout the year (Humber Management Scheme, 2012). Adults of these species are parasitic, attaching themselves to other fish species and cetaceans and feeding off their hosts for several days. Many species on which lamprey are known to feed (e.g. cod, herring and salmon) have been recorded within the Project One study area (i.e. both within the Humber Estuary and further offshore; see Volume 2, Chapter 3: Fish and Shellfish Ecology).

Lamprey species at Horseshoe Point landfall site and cable route

E.62 Intertidal fish ecology surveys were undertaken at Horseshoe Point during spring and autumn 2011, which comprised seine, push and fyke netting surveys with the aim of characterising the fish ecology at the landfall site. Subtidal fish (otter trawl) surveys were undertaken as part of the fish ecology characterisation, primarily focussing on the offshore wind farm site. These trawl surveys also included sites along the export cable route, close to the mouth of the Humber Estuary. No lamprey were recorded during any of the intertidal or subtidal fish surveys.

Humber Estuary SPA

Background Information and Conservation Objectives

E.63 The Humber Estuary supports populations of species listed in Annex I of the Birds Directive during the breeding season, over winter and/or on passage and therefore qualifies as SPA under Article 4.1 of the Directive. The area also qualifies under Article 4.2 of the Birds Directive as the area supports regularly occurring migratory species of birds (see Table E.5). Information presented below is based on data provided within the JNCC's Natura 2000 Standard Data Form for the Humber Estuary SPA (Annex H), which was revised in August 2007.

Table E.5 Qualifying features of the Humber Estuary SPA.

Article 4.1 qualification (Birds Directive)

During the breeding season the area regularly supports:

- Bittern, *Botaurus stellaris*: 2 males, representing 10.5% of the population in Great Britain 2000 to 2002;
- Marsh harrier, *Circus aeruginosus*: 10 females representing 6.3% of the population in Great Britain 1998 to 2002;
- Avocet, *Recurvirostra avosetta*: 64 pairs representing 8.6% of the population in Great Britain 1998 to 2002; and
- Little tern, *Sterna albifrons*: 51 pairs representing 2.1% of the population in Great Britain 1998 to 2002.

Over winter the area regularly supports:

- Bittern, *Botaurus stellaris*: 4 individuals representing 4% of the population in Great Britain 1998/9 to 2002/3;
- Hen harrier, *Circus cyaneus*: 8 individuals representing 1.1% of the population in Great Britain 1997/8 to 2001/2;
- Bar-tailed godwit, *Limosa lapponica*: 2,752 individuals representing 4.4% of the population in Great Britain 1996/7 to 2000/1;
- Golden plover, *Pluvialis apricaria*: 30,709 individuals representing 12.3% of the population in Great Britain 1996/7 to 2000/1; and
- Avocet, Recurvirostra avosetta: 59 individuals representing 1.7% of the population in Great Britain 1996/7 to 2000/1.

On passage the area regularly supports:

- Ruff, *Philomachus pugnax*: 128 individuals representing 1.4% of the population in Great Britain 1996-2000.

Article 4.2 qualification (Birds Directive)

Over winter the area regularly supports:

- Dunlin, *Calidris alpina alpina*: 22,222 individuals representing 1.7% of the population in Great Britain 1996/7 to 2000/1;
- Knot, *Calidris canutus*: 28,165 individuals representing 6.3% of the population in Great Britain 1996/7 to 2000/1;
- Black-tailed godwit, *Limosa limosa islandica*: 1,113 individuals representing 3.2% of the population in Great Britain 1996/7 to 2000/1;
- Shelduck, *Tadorna tadorna*: 4,464 individuals representing 1.5% of the population in Great Britain 1996/7 to 2000/1; and
- Redshank, *Tringa totanus*: 4,632 individuals representing 3.6% of the population in Great Britain 1996/7 to 2000/1.

On passage the area regularly supports:

- Dunlin, *Calidris alpina alpina*: 20,269 individuals representing 1.5% of the population in Great Britain 1996 to2000;
- Knot, *Calidris canutus*: 18,500 individuals representing 4.1% of the population in Great Britain 1996 to2000;
- Black-tailed godwit, *Limosa limosa islandica*: 915 individuals representing 2.6% of the population in Great Britain 1996 to2000; and
- Redshank, *Tringa totanus*: 7,462 individuals representing 5.7% of the population in Great Britain 1996 to2000.

Article 4.2 Qualification (Birds Directive): An Internationally Important Assemblage of Birds

In the non-breeding season the area regularly supports:

- 153,934 waterfowl (5 year peak mean 1996/7 to 2000/1), including:

Teal *Anas crecca* , Wigeon *Anas penelope* , Mallard *Anas platyrhynchos* , Turnstone *Arenaria interpres* , Pochard *Aythya ferina* , Greater scaup *Aythya marila* , Bittern *Botaurus stellaris*, Dark-bellied brent goose *Branta bernicla bernicla* , Goldeneye *Bucephala clangula*, Sanderling *Calidris alba*, Dunlin *Calidris alpina alpina*, Knot *Calidris canutus* , Ringed plover *Charadrius hiaticula*, Oystercatcher *Haematopus ostralegus*, Bar-tailed godwit *Limosa lapponica* , Black-tailed godwit *Limosa limosa islandica* , Curlew *Numenius arquata*, Whimbrel *Numenius phaeopus*, Ruff *Philomachus pugnax* , Golden plover *Pluvialis apricaria*, Grey plover *Pluvialis squatarola*, Avocet *Recurvirostra avosetta*, Shelduck *Tadorna tadorna*, Greenshank *Tringa nebularia*, Redshank *Tringa totanus*, Lapwing *Vanellus vanellus.*

E.64 The Humber Estuary has the second highest tidal range in Britain (7.2 m), with a third of the estuary exposed at low tide (Collier *et al.,* 2005). This makes it an important feeding and roosting site in a national context for a range of species, in particular wintering waders and wildfowl. It has a valuable strategic role as a result of its position along the East Atlantic Flyway, a broad zone stretching between the breeding grounds of waders in the arctic and sub-arctic and their over-wintering sites in southern Europe and Africa (Allen *et al.,* 2003).

E.65 The area is markedly industrialised in places, although arable farming is well established around the estuary, resulting in an environment where birds must often coexist in proximity to human activities. Disturbance is therefore possible due to activities including industrial operations, fisheries, agriculture, tourism and other recreational pursuits such as wildfowling, sailing and walking.

E.66 The Humber Estuary SPA is therefore subject to the impacts of human activities as well as ongoing processes such as sea level rise and climate change. Management intervention has thus been necessary to enable the estuary to recover and to secure the ecological resilience required to respond to both natural and anthropogenic changes. Key issues include loss of intertidal habitat (coastal squeeze), impacts on sediment sources and sinks, changes to geomorphological structure and function of the estuary (due to sea level rise, flood defence works, dredging, and the construction, operation and maintenance of ports, pipelines and other infrastructure), changes in water quality and flows, pressure from additional built development, and damage and disturbance arising from access, recreation and other activities.

E.67 The conservation objectives of the Humber Estuary SPA were published in 2012 by Natural England (see Annex I). These are as follows:

- With regard to the individual species and/or assemblage of species for which the site has been classified (“the Qualifying Features” listed in Table E.5);
- Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive; and
- Subject to natural change, to maintain or restore:
  - The extent and distribution of the habitats of the qualifying features;
  - The structure and function of the habitats of the qualifying features;
  - The supporting processes on which the habitats of the qualifying features rely;
  - The populations of the qualifying features; and
  - The distribution of the qualifying features within the site.

E.68 The SPA is associated with coincidental SSSIs, and for each site, favourable condition tables are written. These tables underpin the conservation objectives of the SPA and cover all site features. They set attributes and monitoring targets which, along with the conservation objectives, inform an assessment of likely significance and adverse effect on integrity. The Humber Estuary SSSI is a component SSSI of the wider SPA, along with North Killingholme Haven Pits SSSI, The Lagoons SSSI and Saltfleetby-Theddlethorpe Dunes SSSI. Draft conservation objectives for the SPAs north of the Humber were provided by NE in November 2011, which form the best available guidelines to inform the HRA.

E.69 The overriding Conservation Objective for the main SSSI (Humber Estuary) is:

“subject to natural change, to maintain the habitats and geological features in favourable condition, with particular reference to any dependent component special interest features (species, species assemblages etc.) for which the land is designated (SPA, Ramsar, etc.)”.

E.70 Outlined in the draft SSSI conservation objectives are particular ‘species population objectives’ (i.e. as well as those for habitats) that underpin the main SSSI conservation objectives, with those relevant to the SPA/Ramsar site being:

- Aggregations of non-breeding birds - internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl; and
- Aggregations of breeding birds listed on the SPA citation.

E.71 For each of these, the SSSI Conservation Objective for species populations is “*To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes*”. There are a number of population attributes for each species population objective, which are summarised in Table E.6in relation to site-specific targets and measures used to inform these targets. These will help inform whether any predicted impacts may compromise any of the SPA conservation objectives.

E.72 The identified habitats relevant to the population attributes for both species features are:

- Estuary;
- Inshore sublittoral sediment;
- Littoral sediment (Coastal saltmarsh, sandflats, mudflats, tidal reedbed);
- Saline/coastal lagoons; and
- Standing open water and canals.

<u>Other SPAs with potential connectivity and potential for LSEs</u>

E.73 Although common tern is not listed as one of the features of the Humber Estuary SPA, during consultation NE raised a concern that birds may be migrating from other SPAs where they are listed features. The Horseshoe Point area has been identified by NE to be a common tern roost site in late summer, likely coinciding with birds on southward migration.

E.74 There are two SPAs further north on the east coast of England which have the greatest likelihood of hosting common terns that may roost in the vicinity of the cable landfall site. While there are other sites further north, these were in excess of 300 km from the Horseshoe Point landfall and therefore not likely to be affected by the works within the Humber Estuary. The two sites considered in the current assessment are:

- Coquet Island SPA (740 pairs, representing 6% of the GB breeding population 5 year mean, 1993-1997; JNCC, 2006a); and
- Farne Islands SPA (230 pairs, representing 1.9% of the GB breeding population 5 year mean, 1993-1997; JNCC, 2006b).

E.75 Common tern qualifies at both sites under Article 4.1 of the Birds Directive as an Annex I breeding species. The conservation objectives for these two SPA sites (Natural England, 2012a and 2012b) are identical as those for the Humber Estuary SPA (as presented in Annex I) and therefore the HRA has been undertaken with reference to the Humber Estuary SPA conservation objectives.

Table E.6 Species population objectives of the Humber Estuary SSSI, SPA and Ramsar site.

Species Feature	Population Attribute	Site-specific target	Measure
Aggregations of non-breeding birds	Habitat extent	No decrease in extent of listed habitats from established baselines, subject to natural change as defined in the conservation objectives for these habitats. Maintain the ability of the estuary to support its bird populations.	See conservation objectives for specified habitats.
	Bird population size	Maintain the population within acceptable limits.	Based on the known natural fluctuations of the population, maintain the population at or above the minimum for the site (i.e. maintain the population above either the five year mean peak count used at designation OR any other five year period since designation – whichever is the highest). Where long term datasets do not exist to enable natural population fluctuations to be calculated, the generic threshold will be used: maintain the population above 50% of that at designation.
	Disturbance and displacement	No significant reduction in bird numbers either on the site, or from one part of the site to another attributable to anthropogenic factors.	The 'bird population size' attribute will be used to inform this target. A 'significant' reduction will be determined on a case by case basis, however a decline of 1% or greater should be taken as a guide.
	Variety of species	Maintain assemblage diversity as at designation (2004) OR as at any other 5 year period since designation – whichever is the most diverse.	If the number of wintering species falls by 25% or more then the feature is in unfavourable condition (winter is November to February). If the number of passage species falls by 25% or more then the feature is in unfavourable condition (passage periods are Autumn: August to October and Spring: March to April).
Aggregations of SPA breeding birds	Habitat extent	No decrease in extent of listed habitats from established baselines, subject to natural change, as defined in the conservation objectives for these habitats.	See conservation objectives for specified habitats.
	Habitat condition	No decrease in extent of suitable habitat for breeding species from established baselines, subject to natural change, as defined in the conservation objectives for these habitats.	See conservation objectives for specified habitats.
	Bird population size	Maintain the population within acceptable limits.	Based on the known natural fluctuations of the population, maintain the population at or above the minimum for the site (i.e. maintain the population above either the five year mean count used at designation OR any other five year period since designation – whichever is the highest).
	Disturbance and displacement	No significant reduction in bird numbers either on the site, or from one part of the site to another attributable to anthropogenic factors.	The 'bird population size' attribute will be used to inform this target. A 'significant' reduction will be determined on a case by case basis, however a decline of 1% or greater should be taken as a guide.

Results of Desktop Study and Site Specific Surveys

E.76 This section provides an overview of the information gathered on birds in and around the Humber Estuary, which has been used to inform the HRA process. This has been a combination of desk-based research utilising the estuary-wide studies that have been published to date, and project-specific surveys in the vicinity of the cable landfall site and onshore route.

Temporal data coverage

E.77 A summary of the temporal distribution of survey information available on the Horseshoe Point landfall site and surrounding area is shown below in Table E.7. This also shows that all months have been covered by at least two survey types.

Table E.7 Annual and monthly distribution of surveys (survey periods marked in grey) covering the Horseshoe Point landfall site and surrounding area (up to submission date).

Survey	Period	Sector	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WeBS Low tide counts	2003/04	MSE2												
	2003/04	MSF												
WeBS Core counts	2006/07	35486												
	2009	35486												
	2005/10	35485												
Cable route surveys	2011	Horseshoe Pt.												
	2012	Horseshoe Pt.												
Breeding birds	2011	Cable route corridor												

WeBS core counts 2005/06 to 2009/10

E.78 Core counts are conducted around high water on all estuaries and key wetland sites in the UK, generally on a set day each month. As the counts are undertaken around high water, they are able to ensure a relative accuracy of counting, as waterfowl are relatively close to the estuary banks. Core counts therefore tend to quantify birds present at high tide roosts.

E.79 The Humber Estuary has good coverage from core counts, and is split into sectors to aid surveyors. Sector 35486 (Tetney Haven to Horseshoe Point, hereafter referred to as Horseshoe Point) overlaps with the cable landfall site, with sector 35485 (Horseshoe Point to Grainthorpe Haven, hereafter Grainthorpe Haven) close by. The latter sector has full monthly coverage from 2005/06 to 2009/10, whereas the former has only been surveyed sporadically, in December-January 2006/07 and May 2009 (Table E.7). Because of its proximity and similarity of habitat, however, it is considered that results from Grainthorpe Haven sector should be largely reflective of general trends within the adjacent Horseshoe Point sector.

WeBS low-tide counts 2003/04

E.80 The WeBS low tide count scheme generally records the number of waders and wildfowl that are foraging within a site, or more specifically a ‘count sector’. It aims to monitor the importance of inter-tidal feeding areas of UK estuaries and complement the information gathered by WeBS core counts. Low tide counts provide information to gauge the potential effects on waterbirds of a variety of human activities which affect the extent or value of inter-tidal habitats. Designing mitigation or compensation for such activities can be assisted using data collected under the scheme.

E.81 The first low tide count programme on the Humber was undertaken in 1998/9 and involved low water monthly co-ordinated counts made by volunteer counters across the estuary and was reported by Catley (2000).

E.82 The most recent data available for the Humber Estuary was collected during winter 2003/04 (Mander and Cutts, 2005a; Collier *et al.,* 2005). Repeat surveys occurred in winter 2011/12, but these data are not currently available. In addition, a review of low tide count results in June 2004 was carried out by Mander and Cutts (2005b), which provides a useful indication of bird distribution during the summer. A distribution map of WeBS low tide sectors, showing key locations referenced in this report is shown below.

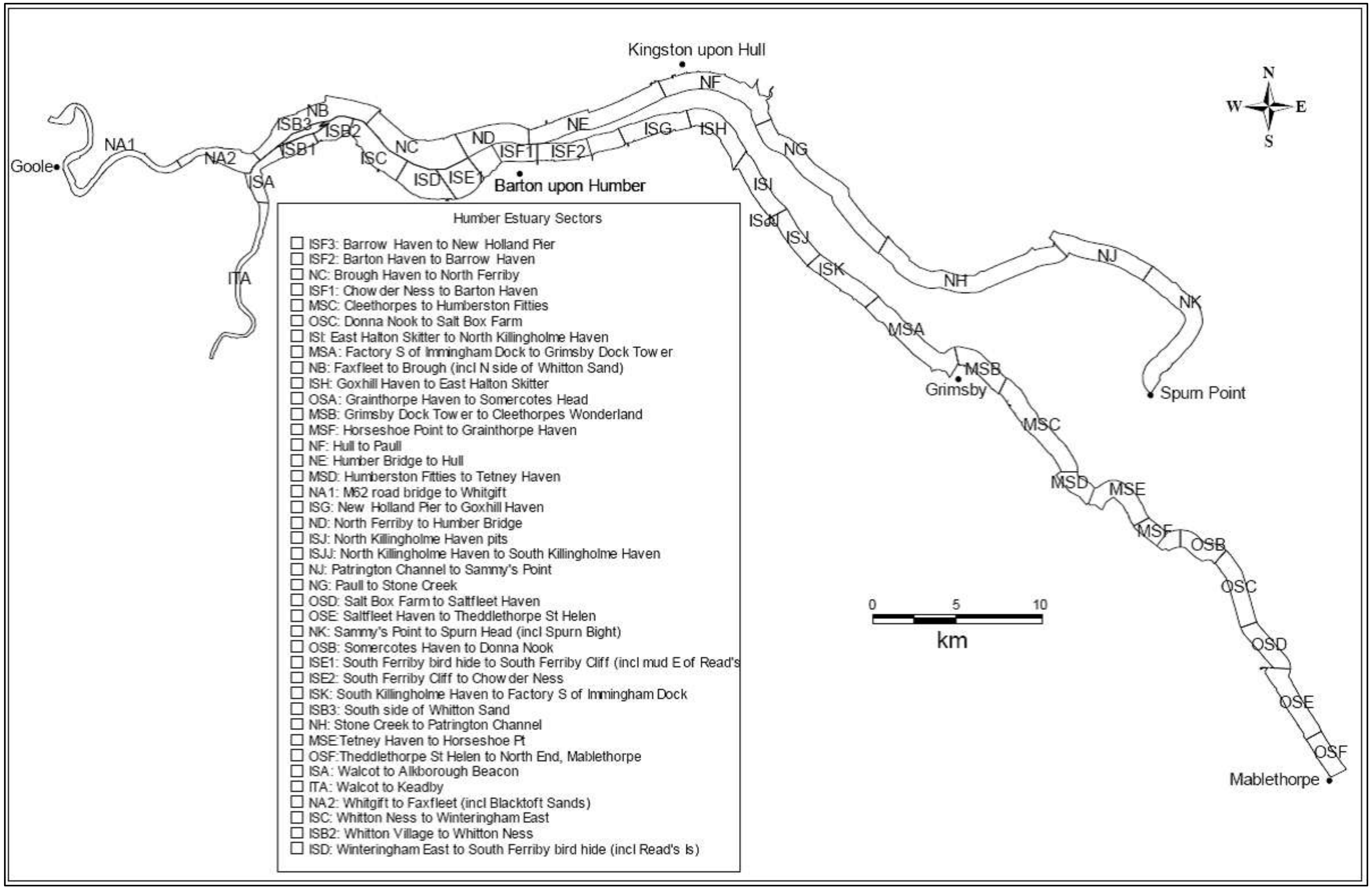


Figure E.3 Humber estuary sectors as used in the WeBS core and low tide counts.

E.83 Low tide count surveyors were allocated a count sector (in many cases the same as their WeBS core count sector), and conducted a survey of the intertidal areas of the Humber Estuary on a pre-determined date each month. The low water survey effort was restricted to a period two hours either side of low tide on all sectors, except for some of those in the outer estuary which, due to their size (and therefore the distance to low water) could not be completely covered around low water, these sectors being surveyed at a period around mid water Mander and Cutts (2005a). The area to be covered at low water was defined as the habitat between the high water mark, often the flood defence embankment, and the low water mark.

E.84 Species of interest included all waders and wildfowl, along with additional species such as divers, grebes, cormorants, herons, rails, gulls, terns and kingfisher. Recording of gulls and terns was, however, optional. In addition, counters were asked during the breeding season to make any notes of breeding waders in their count sector.

E.85 Sector MSF and sub-sector MSE2 (those overlapping with the cable landfall corridor) were covered each month from September 2003 to August 2004 (Mander and Cutts, 2005a), allowing a robust assessment of temporal and spatial distributions of birds at low tide.

Humber Estuary Nature Conservation Review 2003

E.86 Prior to designation of the Humber Estuary SPA, English Nature reviewed the national and international designations on the estuary, and collated all relevant data on the current features of the Humber, identifying where possible, key data sources (Allen *et al.,* 2003). The ornithological component of the review drew heavily on data derived from the WeBS core count survey scheme and the previous EN Humber Low Tide Count Initiative in 1998/99 (Catley, 2000), as well as additional published data. It provides detailed species-specific information on breeding and non-breeding numbers and distribution, seasonality and historical changes and trends.

Breeding bird surveys 2011

E.87 Breeding bird surveys were conducted to inform the onshore EIA process, along targeted areas of the onshore cable route between April and June 2011, including the area around Horseshoe Point and substation locations. These followed the Common Bird Census method that is most appropriate for the assessment of many lowland breeding species (Gilbert *et al.*, 1998; Marchant, 1983) and were designed to record all breeding birds, but also establish the degree to which the near shore cable route environment is used for foraging by breeding SPA species outside of the SPA itself. Further details of methodology and results can be found in the ES (Volume 3, Chapter 3: Project Description and Volume 6, Annex 6.3.9).

Horseshoe Point cable route bird surveys 2011/12

E.88 Targeted survey work can provide temporal and spatial information of site usage, which can inform any possible tidal restrictions that would be required for cable installation activity during this period.

E.89 Counts in the intertidal and above high water have therefore focused around the cable landfall site at Horseshoe Point, as well as covering the planned converter station site. These fortnightly surveys began in September 2011 and continued to August 2012. The survey method, agreed with NE, was designed to assess the use of the following areas by SPA-qualifying bird species during the non-breeding season (covering migration periods and winter months):

- The cable corridor area across the estuarine mudflats and saltmarsh area;
- The intertidal habitats of the Humber Estuary immediately adjacent to the site;
- The inland areas adjacent to the cable corridor used for foraging and roosting; and
- The area around the access track along the sea defence wall.

E.90 The surveys covered the area from 1 km south to 1 km north of the cable route, and extended 1 km inland. The seaward extent of the survey area is to the low water mark (approximately MLWS). The survey area corresponds with the sectors used for the WeBS core counts, which allows for better comparison and evaluation of results. The landfall point lies in the middle of the Horseshoe Point WeBS sector.

E.91 Counts of the foreshore and intertidal area were made regularly throughout half of a tidal cycle. Where this was not possible due to short daylight hours over winter, each survey attempted to cover as wide a range of the tidal cycle as possible. Approximately three or four counts are made throughout a six hour period. A range of neap and spring tides have been surveyed.

E.92 Observations were limited to birds on the ground, although direction of travel for birds entering or leaving the area was noted. Behavioural observations were also recorded to identify how each species uses the site. Observations were plotted on a 1:10,000 map with a 200 m grid, to provide the surveyor with a greater degree of accuracy when recording.

E.93 All disturbance events (both predator related and anthropogenic) were also recorded whether they were related to birds feeding or birds at the roost sites.

E.94 Counts of the inland part of the study area were made monthly at high tide on the same day as the intertidal counts. This was to assess the use of the inland areas by estuarine birds for feeding and roosting.

E.95 Using the sea defence as a vantage point did on occasion pose some difficulties in surveying due to the relatively large distance between the sea defence and MLWS, but it was not considered possible to walk through the intertidal area for health and safety reasons. The main creek channel through the site is important for birds and could not be seen from any vantage point, as it is low lying. Any birds entering or leaving would however have been recorded as the incoming tide moves these birds into more visible areas.

E.96 The limitations imposed by access for these surveys have been recognised during consultation with NE. The data recorded however allow a robust, accurate interpretation of site usage.

E.97 Full details of the survey methods and results can be found in the survey report in Volume 6, Annex 6.3.9.

Humber Industry Nature Conservation Organisation (INCA) survey

E.98 NE and RSPB have been involved in a strategic approach to development in the Humber Estuary (South Humber Gateway), and the Humber Industry Nature Conservation Association (INCA) has recently completed a 1,000 ha survey. Winter bird survey data have been obtained to inform the HRA on the HVDC converter/HVAC substation site inland at North Killingholme.

Converter station surveys 2012

E.99 Surveys were conducted in February and March 2012 at the proposed converter station site at North Killingholme to assess the suitability of the habitat for either feeding or roosting waterfowl from the SPA, and included a buffer of 200 m, which is likely to represent the upper limit of disturbance for any SPA species found on the site. They commenced between one and two hours prior to high tide (or inundation of the intertidal area, whichever was first) and finished one hour after high tide. Notes were taken on habitat type and anything that may influence the use of the site as a roost. Special attention was paid to any overflying waterfowl with the direction of flight noted.

E.100 Surveys were also conducted on the same days at a pond and adjacent field near Thornton Abbey, within 2 km of the converter station site, which was identified by RSPB as being an inland roost site. This was to provide a comparison of activity between the two sites, in order to increase the confidence of survey results conducted at the converter station site, where activity levels were previously unknown.

HVDC converter/ HVAC Substation

E.101 Data on SPA species' usage of the area of the proposed HVDC converter/ HVAC substation were also provided by the Humber INCA for regular surveys undertaken within the wider area from February 2006 to March 2011.

E.102 Table E.8shows the peak counts of SPA species recorded during the Humber INCA surveys within the proposed HVDC converter/ HVAC substation location, and a buffer up to 250 m. The frequency of presence and the context of these numbers in relation to the cited and current SPA populations are also considered.

Table E.8 SPA species recorded within 200 m of proposed converter station/substation during Humber INCA surveys 2007/08 and 2010/11.

Species	Peak count (month)	Number of surveys recorded	% of cited SPA population	% of current SPA population
Black-tailed godwit	1 (Sep 10)	1	0.09%	0.02%
Curlew	31 (Aug 07)	21	0.6%	0.5%
Lapwing	3 (Dec 07)	1	<0.01%	<0.01%
Whimbrel	5 (Apr 07)	1	4.4%	8.3%

E.103 Results show that only a small number of SPA species make use of the site, and of these it is likely that all except curlew are present only briefly, with only single records of each.

E.104 Curlew was the species recorded most frequently, being found between August and January in a number of years. Flock size peaked at 31 individuals, although often numbers were much smaller than this, typically fewer than five birds.

E.105 During the first site-specific survey in February 2012 which covered the HVDC converter/HVAC substation site and 250 m buffer, only one curlew was recorded in flight. No other SPA species were observed. At Thornton Abbey on the same day, no waders were recorded, with 24 teal and 16 mallard recorded using a nearby pond. In the second survey in March, no SPA species were recorded at the converter station/substation site, although at Thornton Abbey 16 teal and 20 mallard were present.

Bird distribution within the outer Humber Estuary SPA

E.106 According to Allen *et al.,* (2003) the Humber Estuary can be split into three distinct areas: the Inner Estuary, stretching from Trent Falls to Hessle/Barton; the Middle Estuary from Hessle to Hawkins Point, and Barton to Doverstrand; and the Outer Estuary, east of Hawkins and Doverstrand. It is the third of these areas that includes the landfall location of the cable route.

E.107 The sandy substratum and marine nature of the section is reflected in the bird assemblage which includes species associated with more coastal habitats, such as brent geese, oystercatcher, knot, sanderling and grey plover. In addition, the shingle and dune areas support breeding little tern and ringed plover.

E.108 The north bank, dominated by Spurn Bight, has large feeding populations of waders and wildfowl during winter and during the spring and autumn passage periods, whilst

Welwick Marsh and adjacent upper shore habitats are also important for breeding and roosting species.

E.109 On the south bank of the estuary where the cable landfall will be located, the main area of ornithological interest is the intertidal mudflats of Pyewipe, north of Grimsby and upriver of the export cable route landfall site, supporting large numbers of shelduck, dunlin, bar-tailed godwit, curlew and redshank (Allen *et al.,* 2003). High water roosts have been established on the fields east of Stallingborough power station for golden plover and lapwing, with curlew using the flat roofs of industrial units in the area (Shepherd *et al.,* 1982).

E.110 The Cleethorpes shore closer to the north of the cable landfall area is characterised by dry sand ridges, muddy basins and low dunes and as such is distinct from the more muddy intertidal mudflats within the main body of the estuary. Despite the very high level of human disturbance, it can support large numbers of waterfowl, with knot in particular occurring in large numbers in the latter part of the winter, and movement of flocks between this area and Spurn Bight.

E.111 Other wader species using the area in important numbers include oystercatcher, sanderling, bar-tailed godwit and turnstone (Allen *et al.,* 2003).

E.112 The Tetney section of the coast that corresponds with the cable landfall site is characterised by soft mudflats, sand flats and sandy ridges, backed by saltmarsh and dune. The variable substratum of the area is reflected in the ornithological assemblage, with a number of wildfowl and wader species present in regionally, and occasionally nationally, important numbers, including brent goose, shelduck, oystercatcher, knot, golden plover, redshank, sanderling and turnstone (Allen *et al.,* 2003). Feeding is carried out across the majority of habitats, depending on prey preference, with high tide roosts established on the sand ridges, and saltmarsh. A breeding colony of little tern has been present within the area, whilst oystercatcher, ringed plover and redshank have also bred on the saltmarsh and adjacent high sand and shingle habitats.

E.113 Downstream, the Grainthorpe, Donna Nook and Saltfleet reach comprises an extensive intertidal area dominated by fine sand and areas of mud and shingle, backed by saltmarsh, dune and buckthorn. This section of coast has supported large numbers of brent geese, shelduck and redshank, together with other waterfowl and roosting hen harrier in the winter.

Seasonality within the Humber Estuary SPA and Horseshoe Point

E.114 Although species are present all year round within the Humber Estuary, numbers are usually at their lowest during June, when only breeding birds, as well as non or failed breeders are present (Allen *et al.,* 2003). The estuary is dominated by wildfowl, with shelduck the most common species at this time.

E.115 The assemblage size increases rapidly during July, due to the return of wader flocks, with around 30,000 waders present, including the return of around 10,000 dunlins (Allen *et al.,* 2003). By late summer, many of the dunlins have passed through the site, and golden plover become more abundant. Numbers continue to increase into the early autumn with the arrival of over-wintering geese, ducks and waders such as knot, with a maximum of c. 70,000 to 100,000 waterfowl expected (Allen *et al.,* 2003). Waterfowl numbers continue to increase, with the Humber maximum achieved during November to January, when a peak of around 150,000 birds is usually recorded. Maximum figures are often affected by weather conditions both in the region and in continental Europe.

E.116 Depending on the severity of the weather, numbers begin to decline again in late winter, with a substantial reduction occurring during February, due to the departure of golden plover and knot. Around 25,000 to 40,000 individuals are present by March. The spring sees an increase in some wader species as passage flocks move through the area, although these increases are offset by the departure of wildfowl.

E.117 In general, the recorded seasonal distribution in the wider area around Horseshoe Point was reflective of the patterns observed across the Humber Estuary as a whole. Figure E.4 below shows that in the wider Tetney Haven to Grainthorpe Haven locality, WeBS low tide counts recorded peaks between November and March, with some evidence of smaller peaks during migration, and low numbers in summer. It shows that the wider area is relatively important for some species within the context of the SPA, including oystercatcher, knot and Brent goose.

E.118 Figure E.5 generally replicates this pattern at a smaller scale, showing peak counts per survey for species recorded at Horseshoe Point during 2011-12 surveys. Relatively, the area is of greater importance in winter months compared to the breeding season.

E.119 A detailed presentation of seasonal distribution per species is contained in Annex F.

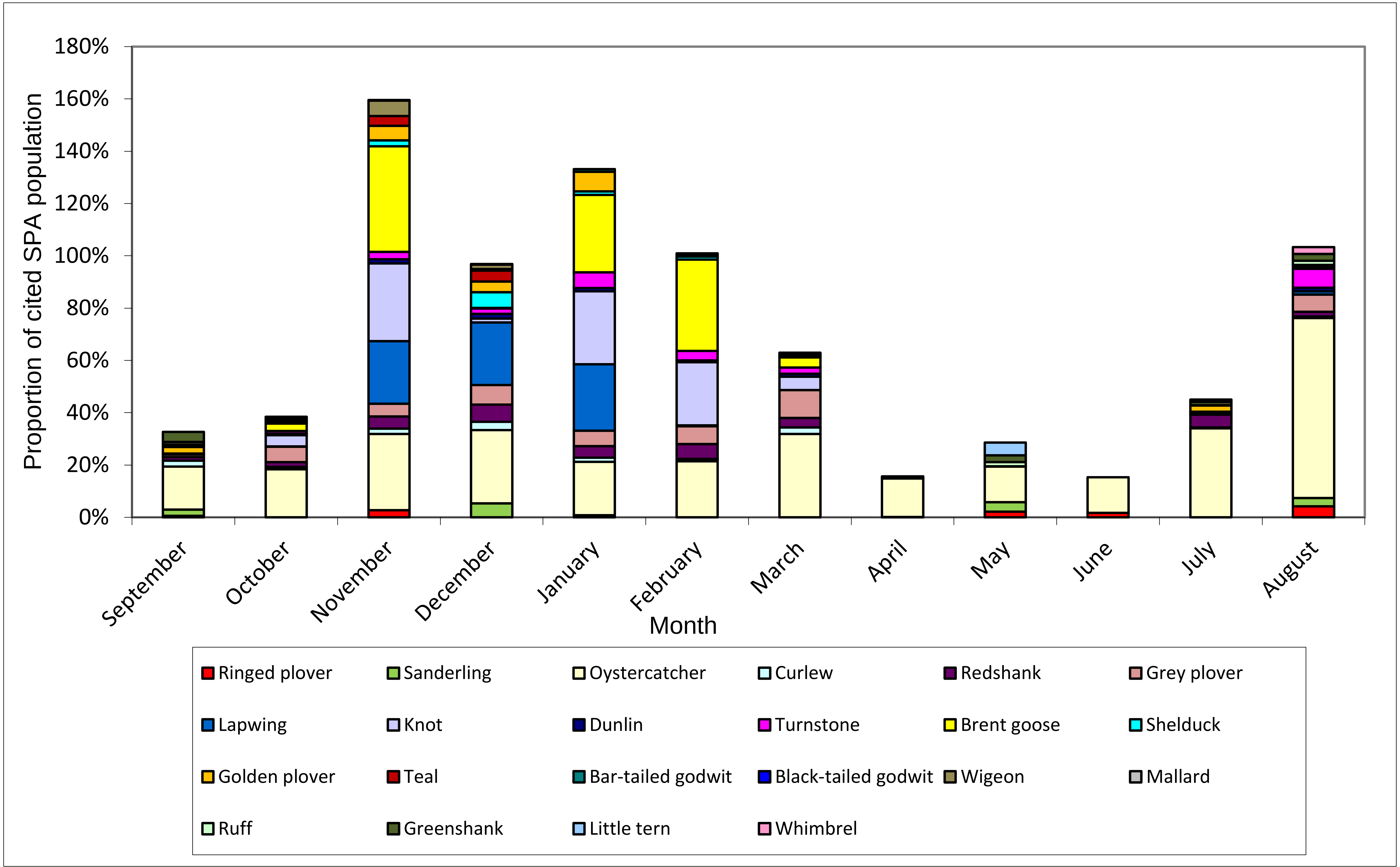


Figure E.4 Relative monthly importance of combined WeBS low count sectors (MSE2 and MSF) in 2003/04 overlapping with Horseshoe Point in comparison with overall SPA population for each species.

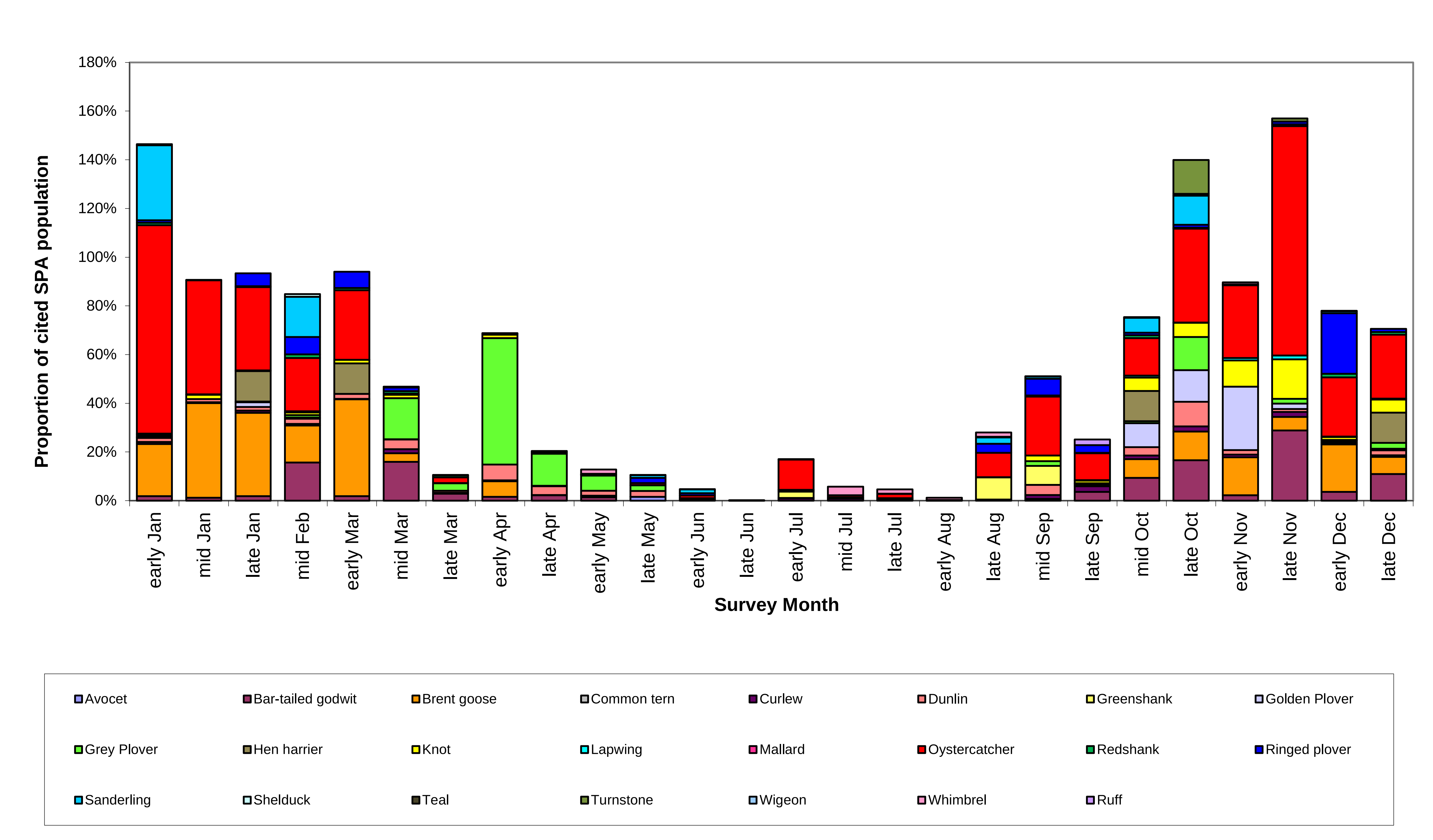


Figure E.5 Relative monthly importance (peak counts per survey) of Horseshoe Point cable landfall site (2011/12) in comparison with overall SPA population for each species.

Summary of results of surveys conducted within the Humber Estuary SPA

E.120 Presented below are summary tables showing conservation status, peak counts and/or peak mean counts of Humber Estuary SPA qualifying species recorded during the various surveys described. Table E.9shows the conservation status for each species at the Humber Estuary SPA level, with reference to the cited SPA population and the current trends, reflected by results from the most recent estuary-wide WeBS core counts since 2005/06 and the presence or absence of WeBS alerts (Thaxter *et al.,* 2010). Alerts have been triggered for ten species, five of which are thought to have declined because of site-specific pressures in the Humber.

E.121 Table E.10 presents finer scale data recorded from WeBS core counts of the sectors that overlapped or were adjacent to the cable landfall location. Peak counts are placed within the context of the overall SPA population. Table E.11 presents results of WeBS low tide counts in 2003/04.

E.122 Table E.12 presents results of ongoing surveys covering the cable landfall location within the context of the cited SPA population, and the best estimate of current SPA population, taken from estuary-wide WeBS core counts.

Table E.9 Trends and conservation status of Humber Estuary SPA qualifying species.

Species	Season	Cited SPA Pop.	Humber Estuary Complex WeBS Count		% change since design-nation	Trend	2010 WeBS Alert and period of concern
			5 year peak mean	Month			
Article 4.1 qualification							
Bittern	B	2 M	-	-	-	n/a	-
	W	4 I				n/a	-
Marsh Harrier	B	10 F	-	-	-	n/a	-
Avocet	B	64 P	639	Aug	399%	++	-
	W	59 I			983%	++	-
Little tern	B	51 P	52	May	-49%	-	-
Hen harrier	W	8 I	-	-	-	n/a	-
Bar-tailed godwit	W	2,752 I	5,926	Mar	115%	++	MEDIUM (short-term)
Golden plover	W	30,709 I	48,653	Nov	58%	++	-
Ruff	P	128 I	64	Aug	-50%	--	-
Common tern: Coquet Island	B	740 P	7,000	Aug	n/a	n/a	n/a
Common tern: Farne Islands	B	230 P					
Article 4.2 qualification							
Dunlin	W	22,222 I	19,493	Jan	-12%	o	MEDIUM (Medium /long-term since designation)
	P	20,269 I			-3.8%	o	
Knot	W	28,165 I	38,388	Jan	36%	+	-
	P	18,500 I			107%	++	-

Species	Season	Cited SPA Pop.	Humber Estuary Complex WeBS Count		% change since design-nation	Trend	2010 WeBS Alert and period of concern
			5 year peak mean	Month			
Black-tailed godwit	W	1,113 I	4,180	Oct	276%	++	-
	P	915 I			357%	++	-
Shelduck	W	4,464 I	5,283	Aug	18%	o	-
Redshank	W	4,632 I	4,428	Sep	-4.4%	o	MEDIUM (short-term)
	P	7,462 I			-41%	-	
Article 4.2 assemblage qualification only							
Teal	W	2,322 I	3,170	Jan	36%	-	-
Mallard	W	2,456 I	2,000 *	-	-19%	o	HIGH/ MEDIUM (Long-term since designation)
Ringed plover	W	403 I	2,505	May	522%	++	MEDIUM (Short/ medium term since designation)
	P	1,766 I			42%	+	
Lapwing	W	22,765 I	18,756	Nov	-18%	o	HIGH/ MEDIUM (medium-term since designation)
Curlew	W	3,253 I	4,239	Mar	30%	+	-
Turnstone	W	629 I	553	Nov	-12%	o	-
Pochard	W	719 I	400 *	-	-44%	-	MEDIUM (medium-term since designation)
Greater scaup	W	127 I	50 *	-	-61%	--	-
Dark-bellied brent goose	W	2,098 I	4,586	Jan	119%	++	-
Goldeneye	W	467 I	371	Nov	-21%	o	-
Sanderling	W	486 I	970	Aug	100%	++	MEDIUM (Short/ medium tern since designation)
	P	818 I			19%	o	
Oyster-catcher	W	3,503 I	3,624	Dec	3.5%	o	MEDIUM (since designation)
Wigeon	W	5,044 I	4,400 *	-	-13%	o	MEDIUM (Medium/ long-term since designation)
Whimbrel	W	113 I	60	Aug	-47%	-	-
Grey plover	W	1,704 I	2,879	Apr	69%	++	-
Greenshank	W	77 I	41	Sep	-47%	-	-

*B = breeding season; W = winter; P = passage. o = stable (<25% change since citation); + / - = increase/decline of 25-50% since citation; ++ / -- = increase/decline of 50-100% (or greater). WeBS alert short term = 5-year; medium-term = 10-year; long-term = 25 year or maximum if less. Designation populations are those presented in Stroud et al., (2001). * = data not provided in WeBS reports – estimated minimum population.*

Table E.10 WeBS core counts results from the Humber Estuary and relevant sectors for each SPA qualifying species.

Species	Season	Humber Estuary Complex WeBS Count			Tetney to Horseshoe Pt WeBS Sector Population		% Cited SPA Population (Sector Pop.)	Horseshoe Pt to Grainthorpe WeBS Sector Population		% Cited SPA Population (Sector Pop.)
		5 year peak count	5 year peak mean	Month	peak count	Month	5 year peak count	5 year peak count	Month	5 year peak
Article 4.1 qualification										
Bittern	B	-	-	-	0	-	-	0	-	-
	W						-			
Marsh Harrier	B	-	-	-	0	-	-	0	-	-
Avocet	B	1,153 I	639 I	Aug	0	-	-	1	May/Jul	0.8%
	W						-			1.7%
Little tern	B	59	52	May	4	May	3.9%	8	Jun	7.8%
Hen harrier	W	-	-	-	0	-	-	0	-	-
Bar-tailed godwit	W	5,926	5,926	Mar	270	Dec	9.8%	330	Jan	12.0%
Golden plover	W	50,188	48,653	Nov	0	-	-	3,960	Oct	12.9%
Ruff	P	84	64	Aug	0	-	-	8	Sep/Jan	6.3%
Common tern	B	7,000	7,000	Aug	0	-	-	220	Aug	11.3% *
Article 4.2 qualification										
Dunlin	W	26,305	19,493	Jan	116	Dec	0.5%	940	Mar	4.2%
	P						0.6%			4.6%
Knot	W	41,772	38,388	Jan	3,100	Jan	11.0%	4,500	Jan	16.0%
	P						16.8%			24.3%
Black-tailed godwit	W	5,323	4,180	Oct	0	-	-	23	Nov	2.1%
	P						-			2.5%
Shelduck	W	5,804	5,283	Aug	42	Dec	0.9%	320	Dec	7.2%
Redshank	W	4,716	4,428	Sep	18	Jan	0.4%	697	Sep	15.0%
	P						0.2%			9.3%
Article 4.2 assemblage qualification only										
Teal	W	3,739	3,170	Jan	0	-	-	34	Aug	1.5%
Mallard	W	-	2,000	-	2	May	0.1%	45	Dec	1.8%
Ringed plover	W	2,505	2,505	May	778	May	193.1%	54	May	13.4%
	P						44.1%			3.1%
Lapwing	W	27,421	18,756	Nov	0	-	-	1,060	Oct	4.7%

Species	Season	Humber Estuary Complex WeBS Count			Tetney to Horseshoe Pt WeBS Sector Population		% Cited SPA Population (Sector Pop.)	Horseshoe Pt to Grainthorpe WeBS Sector Population		% Cited SPA Population (Sector Pop.)
		5 year peak count	5 year peak mean	Month	peak count	Month	5 year peak count	5 year peak count	Month	5 year peak
Curlew	W	5,180	4,239	Mar	96	Jan	3.0%	481	Sep	14.8%
Turnstone	W	553	553	Nov	0	-	-	38	Nov	6.0%
Pochard	W	-	400	-	0	-	-	0	-	-
Greater scaup	W	-	50	-	0	-	-	0	-	-
Dark-bellied brent goose	W	4,586	4,586	Jan	1,130	Jan	53.9%	2,660	Feb	126.8%
Goldeneye	W	577	371	Nov	0		-	0	-	-
Sanderling	W	970	970	Aug	158	May	32.5%	54	Feb	11.1%
	P						19.3%			6.6%
Oystercatcher	W	3,468	3,624	Dec	1,020	May	29.1%	2,400	Jan	68.5%
Wigeon	W	-	4,400	-	0	-	-	41	Oct	0.8%
Whimbrel	W	107	60	Aug	1	May	0.9%	1	Sep/Oct	0.9%
Grey plover	W	3,530	2,879	Apr	122	Dec	7.2%	610	Sep	35.8%
Greenshank	W	54	41	Sep	0	-	-	3	Aug	3.9%

* = combined Coquet Island and Farne Islands cited SPA populations

Table E.11 WeBS low tide count 2003/04 results in overlapping sectors with Horseshoe Point, for each SPA qualifying species.

Species	Season	WeBS Low Tide Counts 2003/04	
		Peak count	Sector and Month
Article 4.1 qualification			
Bittern	B	0	-
	W		
Marsh Harrier	B	0	-
Avocet	B	0	-
	W		
Little tern	B	0	-
Hen harrier	W	0	-
Bar-tailed godwit	W	29	MSF, Jan
Golden plover	W	2,300	MSF, Jan

Species	Season	WeBS Low Tide Counts 2003/04	
		Peak count	Sector and Month
Ruff	P	2	MSE2, May/Aug
Common tern	B	10	MSF, Aug
Article 4.2 qualification			
Dunlin	W	380	MSF, Dec
	P		
Knot	W	7,300	MSF, Jan
	P		
Black-tailed godwit (Iceland breeding)	W	2	MSE2, Aug
	P		
Shelduck	W	266	MSF, Dec
Redshank	W	248	MSF, Dec
	P		
Article 4.2 assemblage qualification only			
Teal	W	97	MSF, Dec
Mallard	W	10	MSF, Oct
Ringed plover	W	53	MSE2, Aug
	P		
Lapwing	W	5,800	MSF, Jan
Curlew	W	98	MSF, Dec
Turnstone	W	27	MSE2, Jan/Aug
Pochard	W	0	-
Greater scaup	W	0	-
Dark-bellied brent goose	W	803	MSF, Nov
Goldeneye	W	0	-
Sanderling	W	26	MSE2, Aug; MSF Dec
	P		
Oystercatcher	W	2,400	MSF, Aug
Wigeon	W	300	MSF, Oct
Whimbrel	W	3	MSF, Aug
Grey plover	W	168	MSF, Mar
Greenshank	W	3	MSF, Sep

Table E.12 Site-specific 2011/12 Hornsea cable route study area results for each SPA qualifying species.

Species	Season	2011-12 Horseshoe Point cable route survey area			
		Survey peak count	Month	% Cited SPA Population	% WeBS Count 5 year peak mean
Article 4.1 qualification					
Bittern	B	0	-	0%	n/a
	W				
Marsh Harrier	B	1	Various	10%	n/a
Avocet	B	2	May	1.6%	0.3%
	W				
Little tern	B	0	-	0%	0%
Hen harrier	W	1	Jan/Dec/Mar	12%	n/a
Bar-tailed godwit	W	794	Nov	29%	13%
Golden plover	W	8,000	Nov	26%	16%
Ruff	P	3	Sep	2.3%	4.7%
Common tern	B	2	Jul	0.1%*	<0.1%
Article 4.2 qualification					
Dunlin	W	2,050	Oct	9.2%	10.5%
	P			10.1%	
Knot	W	3,000	Nov	11%	7.8%
	P			16%	
Black-tailed godwit (Iceland breeding)	W	0	-	0%	0%
	P			0%	
Shelduck	W	52	Feb	1.2%	1.0%
Redshank	W	87	Oct	1.9%	2.0%
	P			1.2%	
Article 4.2 assemblage qualification only					
Teal	W	6	Aug	0.3%	0.2%
Mallard	W	3	Apr	0.1%	<0.1%
Ringed plover	W	120	Sep	30%	4.8%
	P			6.8%	
Lapwing	W	362	Nov	1.6%	1.9%
Curlew	W	74	Sep	2.3%	1.7%

Species	Season	2011-12 Horseshoe Point cable route survey area			
		Survey peak count	Month	% Cited SPA Population	% WeBS Count 5 year peak mean
Turnstone	W	87	Oct	14%	16%
Pochard	W	0	-	0%	0.0%
Greater scaup	W	0	-	0%	0.0%
Dark-bellied brent goose	W	835	Mar	40%	18%
Goldeneye	W	0	-	0%	0.0%
Sanderling	W	150	Jan	31%	15%
	P			18%	
Oystercatcher	W	3,300	Nov/Feb	94%	91%
Wigeon	W	13	Jan	0.3%	<0.3%
Whimbrel	W	4	Jul	3.5%	6.7%
Grey plover	W	885	Apr	52%	31%
Greenshank	W	7	Aug	9.1%	17%

** = combined Coquet Island and Farne Islands cited SPA populations.*

Humber Estuary SPA Qualifying Species Accounts

E.123 Each SPA qualifying species is considered separately in Annex F in relation to the following aspects:

- Key sites – concentrations of populations and/or the most important habitat within the Humber Estuary to a species, as listed by Allen *et al.,* (2003);
- Seasonality – when each species is present within the Humber Estuary in a typical year, and which months numbers usually peak in;
- Distribution – how populations are usually distributed within the Humber Estuary as a whole;
- Population trends and status – based mainly on WeBS Alerts for the Humber Estuary (Thaxter *et al.,* 2010); and
- Horseshoe Point landfall site – summary of population estimates and seasonal distribution around the cable landfall site, within the context of the SPA population.

E.124 Site specific and desktop information indicated that a number of SPA qualifying species are likely to occur in the area potentially affected by Project One. Table E.13) presents a summary of those species (i) likely to be absent; (ii) those likely to be present at Horseshoe Point at low abundances and/or frequency; and (iii) those likely to be regularly present at Horseshoe Point in relatively large numbers during at least part of the year, which may utilise the area for feeding, roosting, over wintering or passage.

Table E.13 Summary of SPA qualifying species distribution information at Horseshoe Point (Full details of species accounts presented in Annex F).

Species likely to be absent from Horseshoe Point landfall site	Species present at Horseshoe Point, though at relatively low abundances	Species regularly present at Horseshoe Point
Bittern, black-tailed godwit, pochard, greater scaup, goldeneye.	Marsh harrier, avocet, little tern, hen harrier, ruff, teal, wigeon, mallard, turnstone, curlew, whimbrel, greenshank, lapwing.	Bar-tailed godwit, golden plover, dunlin, knot, shelduck, redshank, dark-bellied brent goose, sanderling, ringed plover, oystercatcher, grey plover, common tern.

Humber Estuary Ramsar Site

E.125 The Humber Estuary Ramsar site covers an area of 37,987.8 ha. In accordance with the NPPF (DCLG, 2012) and Defra's Ramsar Sites in England Policy Statement (2006), Ramsar sites must be given the same consideration as European sites when considering plans and projects that may affect them.

E.126 The Humber Estuary Ramsar site is a Wetland of International Importance which qualifies under the following criteria:

Criterion 1 - a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
The Humber estuary is a representative example of a near-natural estuary with dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.
Criterion 3 - it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
The Humber Estuary supports a breeding colony of grey seals at Donna Nook.
Criterion 5 - it regularly supports 20,000 or more waterbirds.
The Humber Estuary regularly supports 153,934 individual waterbirds in the non-breeding season.
Criterion 6 - it regularly supports 1% of the individuals in the populations of specified species or subspecies of waterbird in any season.
The Humber Estuary regularly supports 1% of the individuals in the populations of the following species: Eurasian golden plover *Pluvialis apricaria altifrons*, red knot *Calidris canutus islandica*, dunlin *Calidris alpina*, black-tailed godwit *Limosa limosa islandica*, common redshank *Tringa tetanus brittanica*, common shelduck *Tadorna tadorna*, bar-tailed godwit *Limosa lapponica lapponica*.
Criterion 8 - it is a migration path on which fish stocks, either within the wetland or elsewhere, depend.
The Humber Estuary acts as an important migration route for both river lamprey and sea lamprey between coastal waters and their spawning areas.

E.127 The Ramsar Information Sheet (RIS) for the site is attached in Annex I.

Background Information and Conservation Objectives

E.128 The conservation objectives for the Humber Estuary Ramsar site are broadly similar to those discussed above for the SAC and SPA, with baseline conditions for these features discussed in the preceding sections. The Ramsar objectives are as follows:

E.129 To maintain the following habitats and geological features in favourable condition:

- Estuaries.

E.130 To maintain, in favourable condition, the habitats for the populations of:

- Grey seal (see paragraphs E.6 and E.56);
- Sea lamprey (see paragraphs E.6 and E.58);
- River lamprey (see paragraphs E.6 and E.60);
- Waterfowl assemblages, including dark-bellied brent goose, shelduck, wigeon, teal, mallard, pochard, greater scaup, goldeneye, oystercatcher, avocet, ringed plover, golden plover, grey plover, lapwing, knot, sanderling, dunlin, ruff, black-tailed godwit, bartailed godwit, whimbrel, curlew, redshank, greenshank, and turnstone (see paragraph E.123 *et seq*.);
- Wintering and passage shelduck, golden plover, knot, dunlin, black-tailed godwit, bar-tailed godwit and redshank (see paragraph E.123 *et seq*.);
- Invertebrate assemblages, including the tentacled lagoon worm *Alkmaria romijni*, and the lagoon sand shrimp Ga*mmarus insensibilis* (found in coastal lagoons; see paragraphs E.4 and E.29); and
- Natterjack toad *Bufo calamita* (found in coastal lagoons and 'grey dunes'; see paragraph E.135 below).

E.131 With particular reference to:

- Littoral sediment (coastal saltmarsh, sandflats, mudflats, tidal reedbed; see paragraphs E.4 and E.12 *et seq.*);
- Saline/coastal lagoons (see paragraphs E.4 and E.29);
- Sand dunes (see paragraphs E.4 and E.46 *et seq.*); and
- Standing open water and canals (see paragraph E.132 below).

Standing Open Water and Canals

E.132 The conservation objectives for this habitat (for extent) are presented in Table E.3 and as with the SAC habitat features, state that, subject to natural change, the conservation objective is to maintain the designated features in favourable condition, which is defined in part in relation to a balance of habitat extents (extent attribute). As with the estuary feature, in addition to habitat extent objectives, there are also site specific standards for quality which should be achieved to maintain this feature in favourable condition and these are described in full in Annex I. These include attributes including habitat structure, vegetation, channel form, water quality and presence of introduced species.

<u>Background information on standing open water and canals</u>

E.133 The most extensive area of this habitat is at Barton and Barrow (in the mid estuary) and Faxfleet and Haverfield Pits (in the inner estuary) comprising a complex of disused clay pits varying in size and salinity. The conservation objective for this feature (for extent) is provided in Table E.3. A drainage ditch was recorded on the landward side of the coastal defences at Horseshoe Point during the site specific survey (Volume 6, Annex 6.3.2: Phase 1 Intertidal, Sand Dune and Salt Marsh Report), although as part of coastal defence works at this location, this is to be infilled and a new drainage ditch created further inland of its current location (Environment Agency, 2011). This ditch does not occur within the boundary of the Ramsar site and therefore is not a qualifying feature within the Ramsar site.

E.134 Due to the crossover between the Humber Estuary SAC / SPA designated features and the designated Ramsar criteria and the similarities in the conservation objectives for these features/criteria, the HRA will assess adverse effects on the same designated features for the SAC / SPA and make appropriate reference to the Ramsar features/criteria.

Natterjack Toad

E.135 Conservation objectives for natterjack toad are presented in Table E.4. The main conservation objective for this species is to maintain the species in a favourable condition, as defined in part in relation to their population attributes. These include attributes such as toadlet production, presence and persistence of breeding ponds, extents and condition of appropriate terrestrial habitats (e.g. grey dune and dune slack habitats) and aquatic macrophyte cover in breeding ponds.

<u>Background information on natterjack toad</u>

E.136 Natterjack toad populations are well monitored and surveyed by the Lincolnshire Wildlife Trust and are currently only known to be present within the Saltfleetby – Theddlethorpe Special Area of Conservation and Site of Special Scientific Interest (approximately 8 km south of the cable route). Suitable natterjack habitat (i.e. 'grey dune' and dune slacks) was not recorded at Horseshoe Point or along the cable corridor (see Volume 3, Chapter 3: Ecology and Nature Conservation).

REFERENCES

Allen, J., Boyes, S., Burdon, D., Cutts, N., Hawthorne, E., Hemingway, K., Jarvis, S., Jennings, K., Mander, L., Murby, P., Proctor, N., Thomson, S. and Waters, R. (2003). *The Humber Estuary: A comprehensive review of its nature conservation interest.* English Nature Report Number 547, Peterborough.

Budd, G.C. (2008) *Burrowing amphipods and Eurydice pulchra in well-drained clean sand shores.* Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association

Catley, G., (2000). *Humber Estuary wetland bird survey*. Twelve months of high and low tide counts September 1998 to August 1999. Peterborough: English Nature Research Reports, No. 339.

Collier, M.P., Banks, A.N., Austin, G.E., Girling, T., Hearn, R.D. & Musgrove, A.J. (2005). *The Wetland Bird Survey 2003/04: Wildfowl and Wader Counts*. BTO/WWT/RSPB/JNCC, Thetford. Thetford.Colwell, M. A. and S. L. Landrum. 1993). Nonrandom shorebird distribution and fine-scale variation in prey abundance. Condor 95:104–114.

DCLG (2012) *National Planning Policy Framework*. Department of Communities and Local Government, March 2012.

Defra (2006) *Ramsar sites in England – A policy statement*. The Department for Environment, Food and Rural Affairs, November 2006.

English Nature (2003). The Humber Estuary European Marine Site, English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats & c.) Regulations 1994, Interim advice, April 2003.

Environment Agency (2009). http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcDataDownload.xml [Accessed 1 March 2013]. Environment Agency (2011) Tetney to Saltfleet Tidal Flood Defence Scheme. Appendix 6.3.5 Information in Support of Habitats Regulations Assessment. June 2011.

Gilbert, G., Gibbons, D.W. and Evans, J. (1998). Bird Monitoring Methods—a manual of techniques for key UK species. RSPB, Sandy.

Hemingway, K.L., Cutts, N.D., Allen, J.H. & S. Thomson, 2008. *Habitat Status of the Humber Estuary, UK*. Institute of Estuarine & Coastal Studies (IECS), University of Hull, UK. Report produced as part of the European Interreg IIIB HARBASINS project.

Humber Management Scheme, (2012). www.humberems.co.uk

JNCC (2011) *Habitat account – Coastal sand dunes and continual dunes*. 2110 Embryonic shifting dunes. Available online http://jncc.defra.gov.uk/protectedsites/sacselection/habitat.asp?FeatureIntCode=H2110

JNCC (2006a) Natura 2000 Standard Data Form. Coquet Island SPA Version 1.1, 05/05/06 http://jncc.defra.gov.uk/pdf/SPA/UK9006031.pdf

JNCC (2006b) Natura 2000 Standard Data Form. Farne Islands SPA Version 1.1, 05/05/06 http://jncc.defra.gov.uk/pdf/SPA/UK9006021.pdf

Mander, L. and Cutts, N. (2005a). Humber Estuary Low Water Count Programme 2003-2004. English Nature Report 656.

Mander, L. and Cutts, N. (2005b). Humber Estuary Low Tide Count 2003-2004: Newsletter No 10. June 2004. English Nature.

Marchant JH, J.H. (1983). BTO Common Birds Census Instructions, BTO Thetford.

Natural England (2012a). European Site Conservation Objectives for Farne Islands Special Protection Area Site Code: UK9006021. Available at http://www.naturalengland.org.uk/Images/UK9006021-Farne-Islands-SPA_tcm6-32231.pdf

Natural England (2012b). European Site Conservation Objectives for Coquet Island Special Protection Area Site Code: UK9006031. Available at http://www.naturalengland.org.uk/Images/UK9006031-Coquet-Island-SPA_tcm6-32230.pdf

Rayment, W.J. (2008). *Hediste diversicolor and Macoma balthica in sandy mud shores.* Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 30/01/2012]. Available from: http://www.marlin.ac.uk/habitatbenchmarks.php?habitatid=209&code=2004

Royal Haskoning (2010). *Saltmarsh recovery monitoring survey Technical Report for Thanet Offshore Wind Ltd.* Technical Report no. 9T6750/R0021/RK.

SCOS (2011) SCOS Main Advice: Scientific Advice on Matters Related to the Management of Seal Populations: 2011.

Shepherd, I.G., Hayhow, S.J. & Roden, A., (1982). *Birds of Pyewipe mudflats*. Hull: Department of Zoology, University of Hull.

Thaxter, C.B., Sansom, A. Thewlis, R.M., Calbrade, N.A, Ross-Smith, V.H., Bailey, S., Mellan, H.J. & Austin, G.E. (2010). Wetland Bird Survey Alerts 2006/2007: Changes in numbers of wintering waterbirds in the Constituent Countries of the United Kingdom, Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs). BTO Research Report 556. BTO, Thetford.

Tyler-Walters, H. (2008) Pioneer saltmarsh. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 18/10/2012]. Available from: http://www.marlin.ac.uk/habitatbenchmarks.php?habitatid=25&code=2004.

ANNEX F – SUMMARY OF HUMBER ESTUARY SPA DATA

Table of Contents

Table of Figures

Table of Tables

Introduction

F.1 Figure F.1 presents a distribution map of WeBS low tide sectors, showing key locations referenced in the main report and this annex. Table F.1 presents the conservation status for each species at the Humber Estuary SPA level, with reference to the cited SPA population and the current trends, reflected by results from the most recent estuary-wide WeBS Core Counts since 2005/06 and the presence or absence of WeBS alerts (Thaxter *et al.* 2010).

F.2 Table F.2 presents finer scale data recorded from WeBS core counts of the sectors that overlapped or were adjacent to the cable landfall location with peak counts placed within the context of the overall SPA population. Table F.3 presents results of WeBS low tide counts in 2003/04, as well as results of ongoing surveys covering the cable landfall location within the context of the cited SPA population, and the best estimate of current SPA population, taken from estuary-wide WeBS core counts.

F.3 Figure F.1 and Table F.1 to Table F.3 are also presented in Annex E: Background Information on Designated Sites and Qualifying Features for Humber Assessment and have been included here for ease of reference in the species accounts.

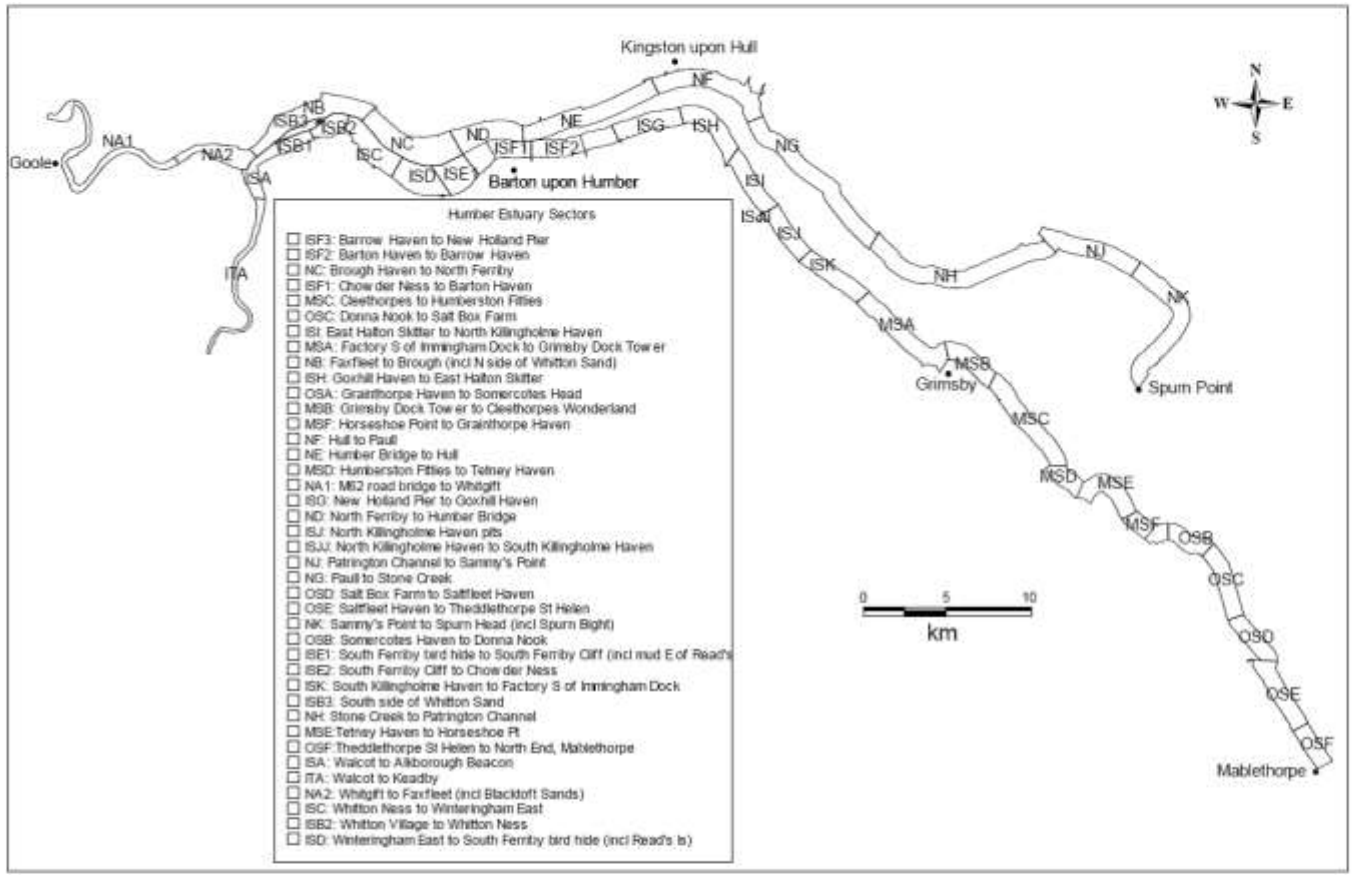


Figure F.1 Humber estuary sectors as used in the WeBS core counts and low tide counts.

Table F.1 Trends and conservation status of Humber Estuary SPA qualifying species.

Species	Season	Cited SPA Pop.	Humber Estuary Complex WeBS Count		% change since design-nation	Trend	2010 WeBS Alert and period of concern
			5 year peak mean	Month			
Article 4.1 qualification							
Bittern	B	2 M	-	-	-	n/a	-
	W	4 I				n/a	-
Marsh Harrier	B	10 F	-	-	-	n/a	-
Avocet	B	64 P	639	Aug	399%	++	-
	W	59 I			983%	++	-
Little tern	B	51 P	52	May	-49%	-	-
Hen harrier	W	8 I	-	-	-	n/a	-
Bar-tailed godwit	W	2,752 I	5,926	Mar	115%	++	MEDIUM (short-term)
Golden plover	W	30,709 I	48,653	Nov	58%	++	-
Ruff	P	128 I	64	Aug	-50%	--	-
Common tern: Coquet Island	B	740 P	7,000	Aug	n/a	n/a	n/a
Common tern: Farne Islands	B	230 P					
Article 4.2 qualification							
Dunlin	W	22,222 I	19,493	Jan	-12%	o	MEDIUM (Medium/long-term since designation)
	P	20,269 I			-3.8%	o	
Knot	W	28,165 I	38,388	Jan	36%	+	-
	P	18,500 I			107%	++	-
Black-tailed godwit	W	1,113 I	4,180	Oct	276%	++	-
	P	915 I			357%	++	-
Shelduck	W	4,464 I	5,283	Aug	18%	o	-
Redshank	W	4,632 I	4,428	Sep	-4.4%	o	MEDIUM (short-term)
	P	7,462 I			-41%	-	
Article 4.2 assemblage qualification only							
Teal	W	2,322 I	3,170	Jan	36%	-	-
Mallard	W	2,456 I	2,000	-	-19%	o	HIGH/MEDIUM (Long-term since designation)
Ringed plover	W	403 I	2,505	May	522%	++	MEDIUM (Short/medium tern since designation)
	P	1,766 I			42%	+	

Species	Season	Cited SPA Pop.	Humber Estuary Complex WeBS Count		% change since design-nation	Trend	2010 WeBS Alert and period of concern
			5 year peak mean	Month			
Lapwing	W	22,765 I	18,756	Nov	-18%	o	HIGH/MEDIUM (medium-term since designation)
Curlew	W	3,253 I	4,239	Mar	30%	+	-
Turnstone	W	629 I	553	Nov	-12%	o	-
Pochard	W	719 I	400	-	-44%	-	MEDIUM (medium-term since designation)
Scaup	W	127 I	50	-	-61%	--	-
Dark-bellied brent goose	W	2,098 I	4,586	Jan	119%	++	-
Goldeneye	W	467 I	371	Nov	-21%	o	-
Sanderling	W	486 I (W)	970	Aug	100%	++	MEDIUM (Short/medium tern since designation)
	P	818 I (P)			19%	o	
Oystercatcher	W	3,503 I	3,624	Dec	3.5%	o	MEDIUM (since designation)
Wigeon	W	5,044 I	4,400	-	-13%	o	MEDIUM (Medium/long-term since designation)
Whimbrel	W	113 I	60	Aug	-47%	-	-
Grey plover	W	1,704 I	2,879	Apr	69%	++	-
Greenshank	W	77 I	41	Sep	-47%	-	-

B = breeding season; W = winter; P = passage. o = stable (<25% change since citation); + / - = increase/decline of 25-50% since citation; ++ / -- = increase/decline of 50-100% (or greater). WeBS alert short term = 5-year; medium-term = 10-year; long-term = 25 year or maximum if less. Designation populations are those presented in Stroud et al. (2001).

Table F.2 WeBS Core Counts results from the Humber Estuary and relevant sectors for each SPA qualifying species.

Species	Season	Humber Estuary Complex WeBS Count			Tetney to Horseshoe Pt WeBS Sector Population		% Cited SPA Population (Sector Pop.)	Horseshoe Pt to Grainthorpe WeBS Sector Population		% Cited SPA Population (Sector Pop.)
		5 year peak count	5 year peak mean	Month	peak count	Month	5 year peak count	5 year peak count	Month	5 year peak
Article 4.1 qualification										
Bittern	B	-	-	-	0	-	-	0	-	-
	W						-			
Marsh Harrier	B	-	-	-	0	-	-	0	-	-
Avocet	B	1,153 I	639 I	Aug	0	-	-	1	May/Jul	0.8%
	W						-			1.7%
Little tern	B	59	52	May	4	May	3.9%	8	Jun	7.8%
Hen harrier	W	-	-	-	0	-	-	0	-	-
Bar-tailed godwit	W	5,926	5,926	Mar	270	Dec	9.8%	330	Jan	12.0%
Golden plover	W	50,188	48,653	Nov	0	-	-	3,960	Oct	12.9%
Ruff	P	84	64	Aug	0	-	-	8	Sep/Jan	6.3%
Common tern	B	7,000	7,000	Aug	0	-	-	220	Aug	11.3% *
Article 4.2 qualification										
Dunlin	W	26,305	19,493	Jan	116	Dec	0.5%	940	Mar	4.2%
	P						0.5%			4.6%
Knot	W	41,772	38,388	Jan	3,100	Jan	11.0%	4,500	Jan	16.0%
	P						16.8%			24.3%
Black-tailed godwit	W	5,323	4,180	Oct	0	-	-	23	Nov	2.1%
	P						-			2.5%
Shelduck	W	5,804	5,283	Aug	42	Dec	0.9%	320	Dec	7.2%
Redshank	W	4,716	4,428	Sep	18	Jan	0.4%	697	Sep	15.0%
	P						0.2%			9.3%
Article 4.2 assemblage qualification only										
Teal	W	3,739	3,170	Jan	0	-	-	34	Aug	1.5%
Mallard	W	-	<2,000	-	2	May	0.1%	45	Dec	1.8%
Ringed plover	W	2,505	2,505	May	778	May	193.1%	54	May	13.4%
	P						44.1%			3.1%

Species	Season	Humber Estuary Complex WeBS Count			Tetney to Horseshoe Pt WeBS Sector Population		% Cited SPA Population (Sector Pop.)	Horseshoe Pt to Grainthorpe WeBS Sector Population		% Cited SPA Population (Sector Pop.)
		5 year peak count	5 year peak mean	Month	peak count	Month	5 year peak count	5 year peak count	Month	5 year peak
Lapwing	W	27,421	18,756	Nov	0	-	-	1,060	Oct	4.7%
Curlew	W	5,180	4,239	Mar	96	Jan	3.0%	481	Sep	14.8%
Turnstone	W	553	553	Nov	0	-	-	38	Nov	6.0%
Pochard	W	-	<400	-	0	-	-	0	-	-
Scaup	W	-	<50	-	0	-	-	0	-	-
Dark-bellied brent goose	W	4,586	4,586	Jan	1,130	Jan	53.9%	2,660	Feb	126.8%
Goldeneye	W	577	371	Nov	0		-	0	-	-
Sanderling	W	970	970	Aug	158	May	32.5%	54	Feb	11.1%
	P						19.3%			6.6%
Oystercatcher	W	3,468	3,624	Dec	1,020	May	29.1%	2,400	Jan	68.5%
Wigeon	W	-	<4,400	-	0	-	-	41	Oct	0.8%
Whimbrel	W	107	60	Aug	1	May	0.9%	1	Sep/Oct	0.9%
Grey plover	W	3,530	2,879	Apr	122	Dec	7.2%	610	Sep	35.8%
Greenshank	W	54	41	Sep	0	-	-	3	Aug	3.9%

** = combined Coquet Island and Farne Islands cited SPA populations.*

Table F.3 WeBS Low Tide Count 2003/04 results, and site-specific 2011/12 cable route survey results for each SPA qualifying species.

Species	Season	WeBS Low Tide Counts 2003/04		2011-12 Horseshoe Point cable route surveys			
		Peak count	Sector and Month	Survey peak count	Month	% Cited SPA Population	% WeBS Count 5 year peak mean
Article 4.1 qualification							
Bittern	B	0	-	0	-	0%	n/a
	W						
Marsh Harrier	B	0	-	1	Various	10%	n/a
Avocet	B	0	-	2	May	1.6%	0.3%
	W						
Little tern	B	0	-	0	-	0%	0%
Hen harrier	W	0	-	1	Jan/Dec/Mar	12%	n/a
Bar-tailed godwit	W	29	MSF, Jan	794	Nov	29%	13%
Golden plover	W	2,300	MSF, Jan	8,000	Nov	26%	16%
Ruff	P	2	MSE2, May/Aug	3	Sep	2.3%	4.7%
Common tern	B	10	MSF, Aug	2	Jul	0.1%*	<0.1%
Article 4.2 qualification							
Dunlin	W	380	MSF, Dec	2,050	Oct	9.2%	10.5%
	P					10.1%	
Knot	W	7,300	MSF, Jan	3,000	Nov	11%	7.8%
	P					16%	
Black-tailed godwit (Iceland breeding)	W	2	MSE2, Aug	0	-	0%	0%
	P					0%	
Shelduck	W	266	MSF, Dec	52	Feb	1.2%	1.0%
Redshank	W	248	MSF, Dec	87	Oct	1.9%	2.0%
	P					1.2%	
Article 4.2 assemblage qualification only							
Teal	W	97	MSF, Dec	6	Aug	0.3%	0.2%
Mallard	W	10	MSF, Oct	3	Apr	0.1%	<0.1%
Ringed plover	W	53	MSE2, Aug	120	Sep	30%	4.8%
	P					6.8%	
Lapwing	W	5,800	MSF, Jan	362	Nov	1.6%	1.9%
Curlew	W	98	MSF, Dec	74	Sep	2.3%	1.7%

<table>
<tr><th rowspan="2">Species</th><th rowspan="2">Season</th><th colspan="2">WeBS Low Tide Counts 2003/04</th><th colspan="4">2011-12 Horseshoe Point cable route surveys</th></tr>
<tr><th>Peak count</th><th>Sector and Month</th><th>Survey peak count</th><th>Month</th><th>% Cited SPA Population</th><th>% WeBS Count 5 year peak mean</th></tr>
<tr><td>Turnstone</td><td>W</td><td>27</td><td>MSE2, Jan/Aug</td><td>87</td><td>Oct</td><td>14%</td><td>16%</td></tr>
<tr><td>Pochard</td><td>W</td><td>0</td><td>-</td><td>0</td><td>-</td><td>0%</td><td>0.0%</td></tr>
<tr><td>Scaup</td><td>W</td><td>0</td><td>-</td><td>0</td><td>-</td><td>0%</td><td>0.0%</td></tr>
<tr><td>Dark-bellied brent goose</td><td>W</td><td>803</td><td>MSF, Nov</td><td>835</td><td>Mar</td><td>40%</td><td>18%</td></tr>
<tr><td>Goldeneye</td><td>W</td><td>0</td><td>-</td><td>0</td><td>-</td><td>0%</td><td>0.0%</td></tr>
<tr><td rowspan="2">Sanderling</td><td>W</td><td rowspan="2">26</td><td rowspan="2">MSE2, Aug; MSF Dec</td><td rowspan="2">150</td><td rowspan="2">Jan</td><td>31%</td><td rowspan="2">15%</td></tr>
<tr><td>P</td><td>18%</td></tr>
<tr><td>Oystercatcher</td><td>W</td><td>2,400</td><td>MSF, Aug</td><td>3,300</td><td>Nov/Feb</td><td>94%</td><td>91%</td></tr>
<tr><td>Wigeon</td><td>W</td><td>300</td><td>MSF, Oct</td><td>13</td><td>Jan</td><td>0.3%</td><td><0.3%</td></tr>
<tr><td>Whimbrel</td><td>W</td><td>3</td><td>MSF, Aug</td><td>4</td><td>Jul</td><td>3.5%</td><td>6.7%</td></tr>
<tr><td>Grey plover</td><td>W</td><td>168</td><td>MSF, Mar</td><td>885</td><td>Apr</td><td>52%</td><td>31%</td></tr>
<tr><td>Greenshank</td><td>W</td><td>3</td><td>MSF, Sep</td><td>7</td><td>Aug</td><td>9.1%</td><td>17%</td></tr>
</table>

** = combined Coquet Island and Farne Islands cited SPA populations*

Bittern

Key Sites: Barton to New Holland Clay Pits complex, Blacktoft Sands (Allen *et al.* 2003)

Seasonality

F.4 The bittern is recorded throughout the year in the estuary and an influx from north and east European populations into Britain may occur in autumn or winter (Allen *et al.* 2003).

Distribution

F.5 In the UK, the species breeds regularly in reedbeds. In the Humber Estuary in the past, breeding and wintering bitterns were generally confined to the chain of flooded clay pits and extensive reedbeds along the Humber south bank from west of Barton-upon-Humber to New Holland, in the Inner Estuary (Allen *et al.* 2003).

Population trends and status

F.6 Although WeBS does not provide reliable counts for this species, the population within the Humber Estuary was estimated to be at least five booming (breeding) males in 2010 in a RSPB national survey (RSPB, 2012). No trends are available for this population. Numbers of non-breeding bitterns in Britain vary each year with a larger influx when severe weather affects the near continent. The population has suffered from maturation and drying of reedbeds, changes to food supply, lowering of water tables due to high levels of ground water abstraction and local pollution (JNCC 2007).

Horseshoe Point landfall site

F.7 At the Horseshoe Point landfall site, the intertidal zone was found to be dominated by sandy substrates, which are unsuitable for bittern. Habitat is more suitable within the inner reaches of the estuary between the Humber Bridge and Trent Falls, which are dominated by common reed. No bitterns were recorded during any baseline survey, and this is likely to be a reflection of the unsuitability of habitat found within the survey area.

Marsh Harrier

Key Sites: Blacktoft Sands and other sites around the estuary (Allen *et al.* 2003)

Seasonality

F.8 Marsh harriers are migratory, normally arriving in the UK in April/May. The young leave in August and the adult birds leave in September/October, although some may remain throughout the winter.

Distribution

F.9 Marsh harriers nest in open freshwater wetlands with dense, tall vegetation, although in some locations they may breed in hedges and fields (Hagemeijer & Blair 1997). In Britain, pairs breed in reedbeds and increasingly in intensive arable farmland (Gibbons *et al.* 1993). Marsh Harriers hunt over many types of open areas, including reedbeds, grazing and saltmarshes, heathlands and farmland. In 2002 a total of twelve pairs of marsh harriers nested on the Humber, of which two pairs were found within the Blacktoft Sands Nature Reserve in the inner estuary. The remaining birds were located in reedbeds along the Humber margins (Allen *et al.* 2003).

F.10 The national survey in 2005, recorded 25 pairs around the Humber. Four pairs were on the RSPB reserves at Blacktoft Sands and Read's Island and two pairs at the Lincolnshire Wildlife Trust reserve at Far Ings. Nine pairs were on or close to the south shore of the Humber in North Lincolnshire and the remaining 10 were on or close to the north shore in East Yorkshire.

Population trends and status

F.11 Marsh harrier is an uncommon breeder in Britain with an estimated 201 pairs (Holling *et al*, 2011). The species has been increasing nationally over the past 40 or so years, and in all areas of the UK numbers have been rising steadily such that the current population is possibly the largest in at least 200 years (Brown & Grice 2005). From results of previous surveys, it also appears that the Humber population has also grown.

Horseshoe Point Landfall Site

F.12 The sandy, muddy substrate found at Horseshoe Point is generally not suitable for marsh harriers, with birds more likely to be found in upriver freshwater or brackish habitat.

F.13 Single marsh harriers were recorded sporadically throughout the year during cable route surveys in 2011/12, mainly at low tides. Although it is unclear whether these birds are on passage or form part of the breeding SPA population, the lack of suitable breeding habitat within the cable route survey area means it is unlikely that the site would be particularly valuable to the SPA population.

Avocet

Key Sites: Blacktoft Sands & Read's Island (Inner Estuary) (Allen *et al.,* 2003).

Seasonality

F.14 In the Humber, avocets arrive in late February and March and eggs are usually laid in May. After the breeding season, avocets form flocks, which mostly move to wintering grounds further south, and numbers on the Humber are very low during mid winter (Allen *et al.* 2003). The Humber is at the extremity of the species' wintering range.

Distribution

F.15 The avocet's preferential habitat is mudflats, lagoons and sandy beaches. Breeding birds in the Humber are confined to saline lagoons, mainly at Blacktoft Sands and Read's Island (Allen *et al.* 2003), although the range is likely to have expanded somewhat in recent times.

Population trends and status

F.16 The British avocet breeding population has expanded since the 1970s and has steadily increased to 1,492 pairs in 2005-09 (Holling *et al*, 2011). Many of the areas used by avocets are in the ownership of nature conservation organisations and are subject to active conservation management so as to facilitate the specific habitat requirements of this species.

F.17 A sector peak maximum of 238 individuals (ISD-Read's Island) was recorded in June 2004, with an overall peak of 283 birds in the Humber Estuary (Mander and Cutts, 2005). More recent WeBS core counts have recorded a five year peak mean count of 539 individuals in August within the estuary.

Horseshoe Point landfall site

F.18 Due to unsuitable habitat, avocets are generally absent from the Horseshoe Point area, with a five year peak mean count of only one bird on the adjacent WeBS core count sector during summer. Only two birds were recorded during cable route surveys in May 2012, showing that it is of little value to the species.

Little Tern

Key Sites: Easington Lagoons, Donna Nook (Allen *et al.* 2003).

Seasonality

F.19 Little terns begin to arrive in the Humber in late April and numbers build up gradually in the next few weeks. The breeding ground is deserted by August and birds move out of the area in early September (Allen *et al.* 2003).

Distribution

F.20 The species can breed in loose colonies on open sandy/shingly beaches. In the past there have been five regular little tern breeding colonies on the Humber, with the main one at Easington lagoons (Cruickshanks *et al.* 2010). Unvegetated sandy areas at Donna Nook and Tetney Marshes, Spurn Point and Saltfleetby to Theddlethorpe dunes have also provided suitable breeding grounds for little tern (Allen *et al.* 2003; Cruickshanks *et al.* 2010).

F.21 Cruickshanks *et al.* (2010) reports that little terns are particularly vulnerable as breeding species. Other themes include a general feeling of uncertainty over the impacts of recreational disturbance and a suspicion that the effects may have been underestimated e.g. Saltfleetby-Theddlethorpe National Nature Reserve where the little tern nested during the foot and mouth outbreak but deserted the site once the restrictions were lifted.

Population trends and status

F.22 No Humber locations raised any young in 2008 and no breeding attempts at all recorded along the south shore. A total of 26 pairs bred at Easington in 2009, but no young were raised (Cruikshanks *et al.* 2010). The transitory nature of tern colonies means that an assessment of trends is difficult, although the national population shows a marked decline and a tendency for birds to congregate within fewer, larger colonies (Brown & Grice 2005). There is generally incomplete coverage from WeBS surveys, where tern species are not primary targets.

F.23 Little terns formerly bred in nationally important numbers on Tetney Marshes and the rapid rise in numbers in the 1980s was due to the construction of a surface track across the saltmarsh when the oil pipeline was laid from offshore to the Tetney storage tanks in the 1970s (Allen *et al.* 2003). As the track became vegetated, covered in silt or eroded, this led to a decline and almost complete disappearance of little terns from Tetney. In 2002, 16 pairs of little tern nested on Tetney Marshes following disturbance of the colony down the coast at Rimac. However, weather conditions led to the complete failure of the colony (Wellock 2003; Schmitt 2003). It is believed that the colony at Donna Nook has disappeared due to a lack of protection from disturbance.

Horseshoe Point landfall site

F.24 Small numbers of terns have been recorded in summer months during WeBS core counts (a five year peak mean of eight birds in the adjacent sector and four birds in the overlapping sector), although there is no evidence of any breeding taking place. Since the loss of the Donna Nook and Tetney Marshes colonies, it is likely that numbers have significantly reduced in the locality, with individuals present likely to be birds feeding or loafing away from the closest colonies. No birds were recorded during cable route surveys in 2011/12.

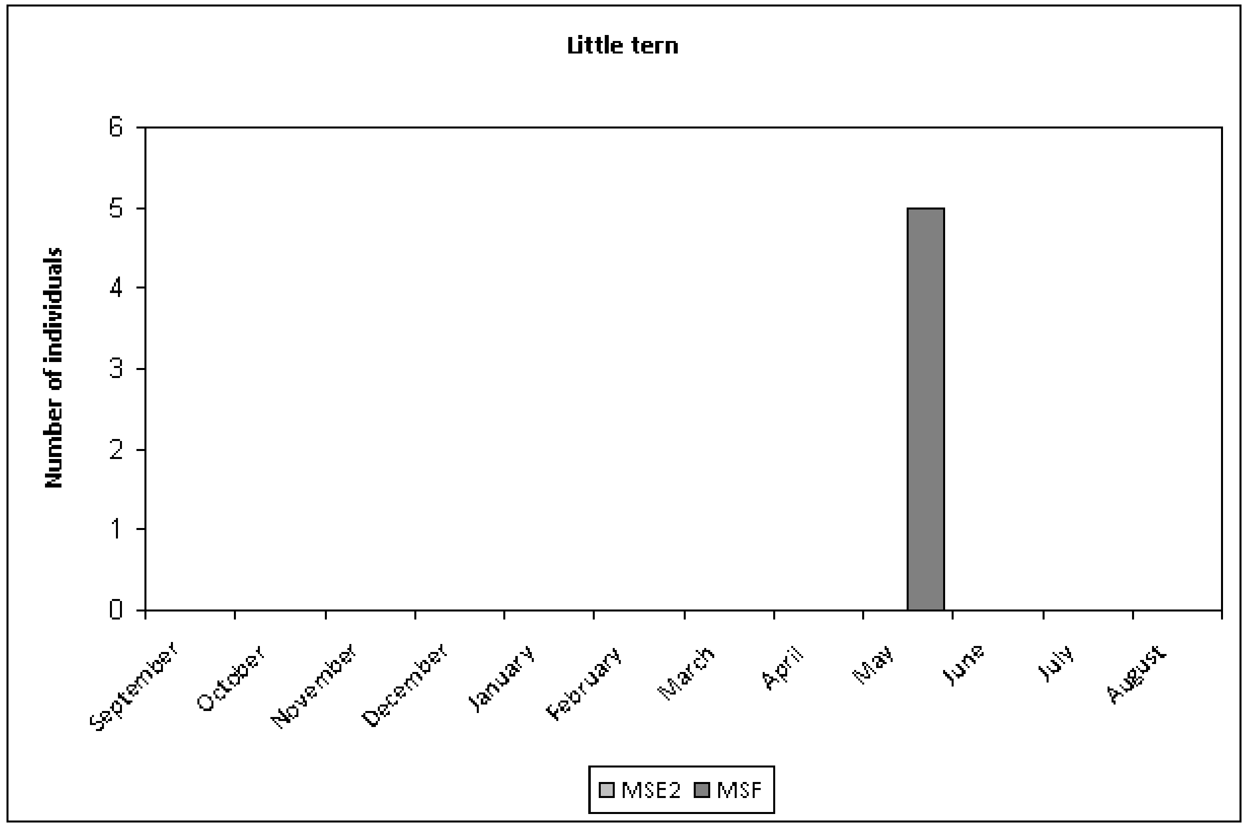


Figure F.2 Little tern WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site (MSE2 and MSF on Figure 1.

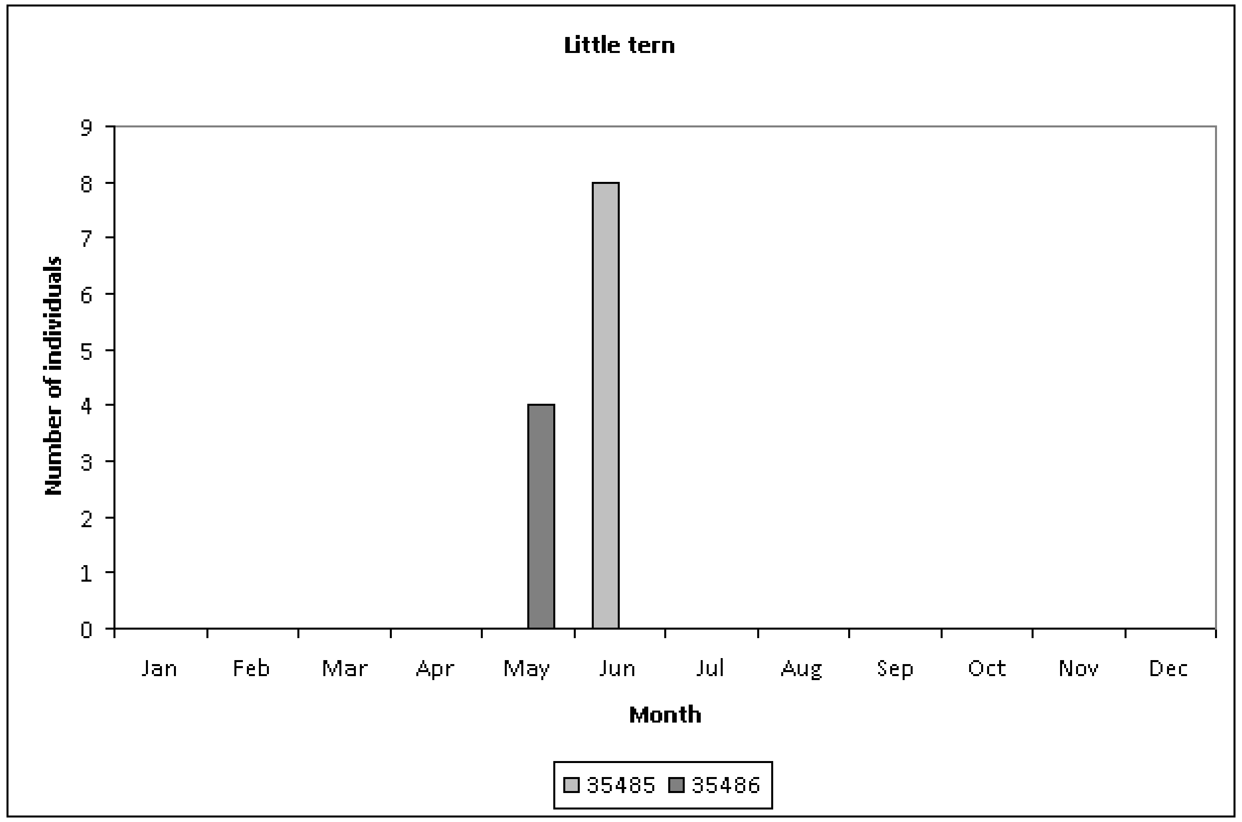


Figure F.3 Little tern WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07, and May 2009 only and therefore shows actual counts).

Hen Harrier

Key Sites: Blacktoft Sands, Welwick and Saltfleetby (Allen *et al.* 2003).

Seasonality

F.25 Hen harriers generally start to arrive at the Humber in late September, peaking in October and passage can continue into early November. At Blacktoft Sands, the wintering population generally peaks in January/ February, with numbers declining to the end of April, when birds leave the site for their breeding grounds (RSPB 2001; RSPB, 2002).

Distribution

F.26 In the Humber Estuary hen harrier are regularly seen at Spurn Head during the autumn passage but generally roost at Welwick, Blacktoft Sands and Saltfleetby during the winter season. Data from 2000/01 recorded a minimum of four wintering birds have been present at Salfleetby to Theddlethorpe Dunes, east of the cable landfall site (Allen *et al.* 2003). These birds disperse to hunt during the day, including to the adjacent marshes of the estuary and inland. A roost is located at Saltfleetby, with maxima of between four and five birds regularly recorded (Allen *et al.* 2003).

Population trends and status

F.27 This species is not covered by WeBS surveys. The Humber population is generally evenly distributed between Blacktoft, Welwick and Saltfleetby, and was estimated by Allen *et al.* (2003) to be around 15 birds, but with some variation in this figure on a yearly basis. Wintering hen harriers within the Humber have been declining over recent years, with roosting birds present at Blacktoft Sands on just 16 dates between January and April 2008 (Cruickshanks *et al.* 2010).

Horseshoe Point landfall site

F.28 At the Horseshoe Point landfall site, the sandy substrate is generally unsuitable for hen harrier, although nearby marshes and agricultural land may be used. Single individuals were recorded within the cable landfall survey area in January 2011 and March 2012 (a total of six records), within and close to the marshland area. The site may therefore form part of an occasional range of the winter SPA population.

Bar-Tailed Godwit

Key Sites: Spurn Bight, Cleethorpes and Tetney (Allen *et al.* 2003)

Seasonality

F.29 Bar-tailed godwits arrive on the Humber at the beginning of September, and numbers increase to reach their peak in January (Allen *et al.* 2003). The departure in spring begins in February and numbers drop dramatically in March, although towards the end of April and beginning of May there are small passage flocks present.

Distribution

F.30 Bar-tailed godwits occur almost exclusively in the outer estuary (Catley, 2000). On the south bank, the largest roosts are found between Cleethorpes and Humberston Fitties and at Tetney, with birds dispersing from these roosts to adjacent sectors to feed (Catley, 2000; Eco Surveys, 1991). The highest feeding concentrations on the south shore occur between Cleethorpes and Humberston Fitties.

F.31 Bar-tailed godwits favoured the outer estuary during low tide counts, and peaked in January 2004. The highest densities occurred at Cleethorpes, Pyewipe, Stone Creek and Spurn Bight (Mander and Cutts, 2005). Small numbers of non-breeding first-year birds usually spend the summer on the Humber and possibly moult between the end of June and the end of August.

Population trends and status

F.32 Bar-tailed godwit SPA numbers have fluctuated over time and shown a high degree of inter-annual variation making interpretation difficult; however, there has been a sharp decline since the turn of the century (Thaxter *et al.* 2010). Accordingly a WeBS short-term Medium-Alert has been triggered. Both the regional and national trends follow a similar pattern of fluctuation over time and a high degree of inter-annual variation complicating interpretation of comparisons. The decline underpinning the Alert is considered by Thaxter *et al.* (2010) to be within the variation typical for this site and so should not give undue cause for concern. A five year peak mean WeBS core count of 5,926 individuals has represented an increase over the cited SPA population of 115%, confirming the conclusions drawn by Thaxter *et al.* (2010) (Table F.1).

Horseshoe Point landfall site

F.33 NE has highlighted that a low tide roost of between four and 600 bar-tailed godwits may be present near to the cable landfall site. The Horseshoe Point WeBS core count sector recorded a peak of 270 individuals in December, and the adjacent Grainthorpe Haven sector recorded a peak of 330 individuals in January, representing on average around 10% of the cited SPA population in each sector. WeBS low tide counts in 2003/04 recorded a much lower peak of 29 individuals in sector MSF in January, which may reflect the inter-annual variation in numbers described for this species.

F.34 During surveys at the cable landfall site in 2011/12, a peak count of nearly 800 individuals was recorded in November, representing 29% of the cited SPA population or 13% of the most recent WeBS core count population for the Humber Estuary. Although present on each survey from September to May, peak count size varied, at times being as low as 20 individuals. Birds were absent at the site during summer months, from late May onwards. The species was recorded widely across the mudflats during low and rising tides.

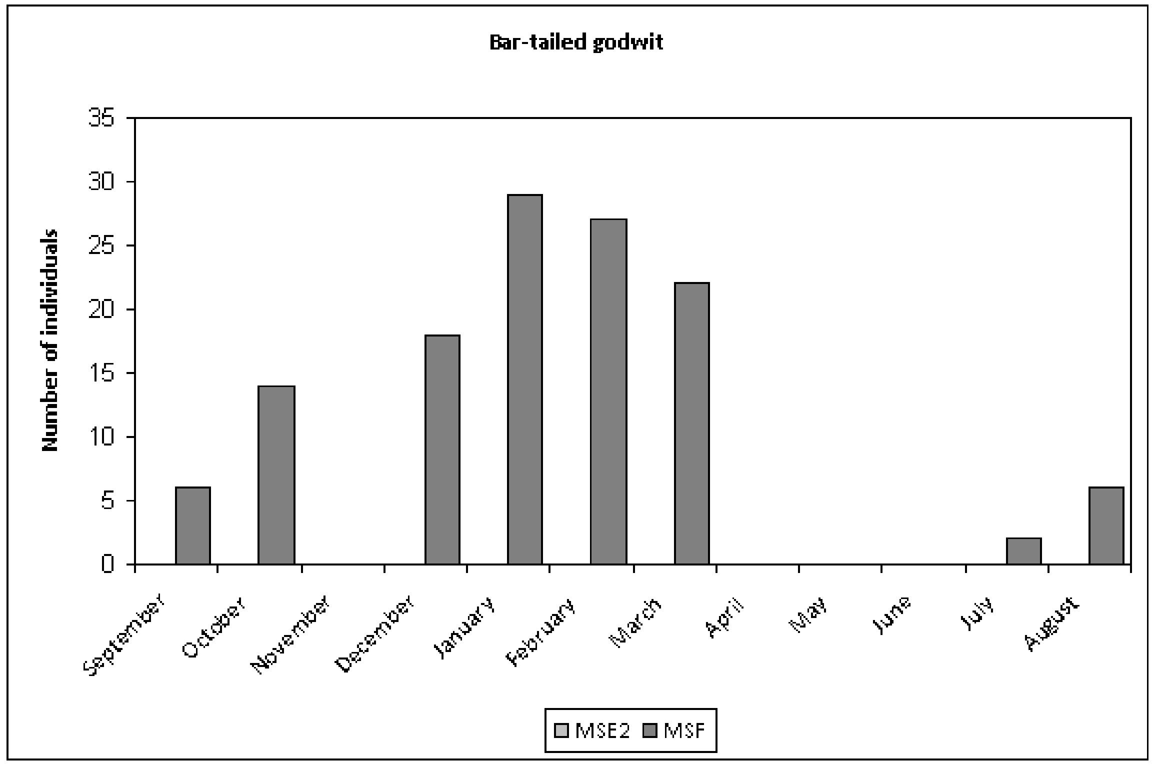


Figure F.4 Bar-tailed godwit WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site

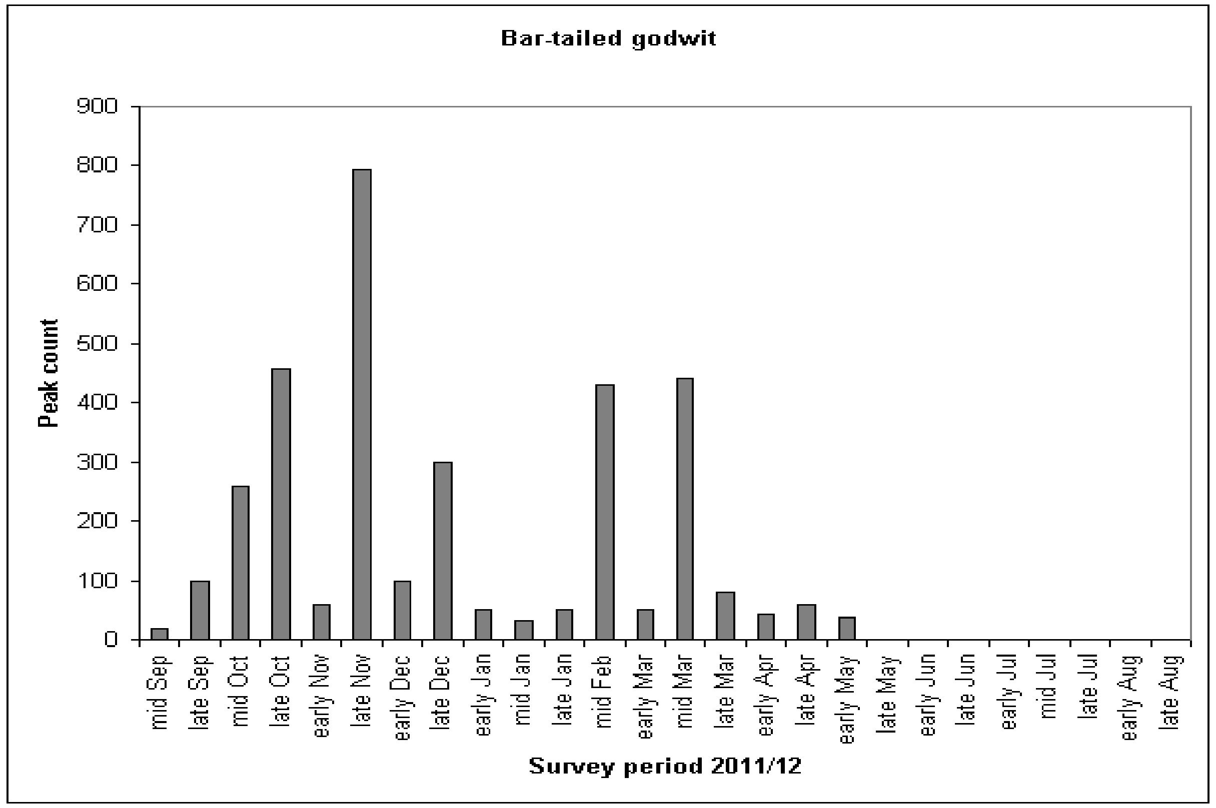


Figure F.6 Bar-tailed godwit peak flock size during cable route surveys at Horseshoe Point landfall site, 2011/12.

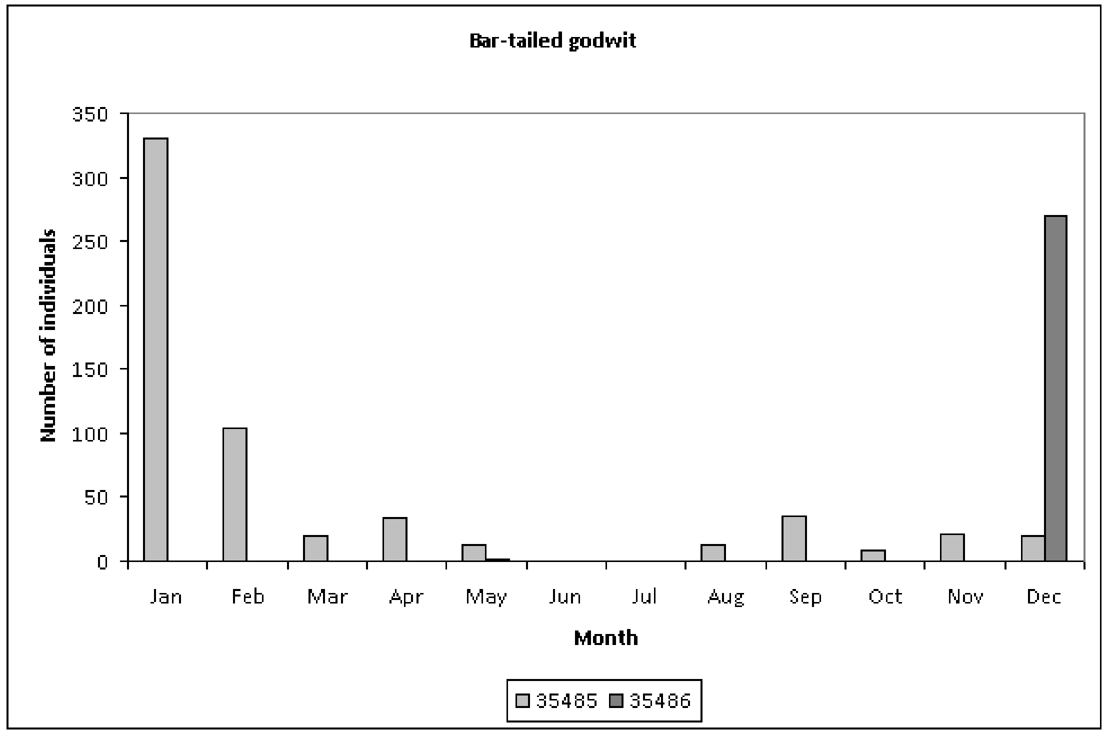


Figure F.5 Bar-tailed godwit WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

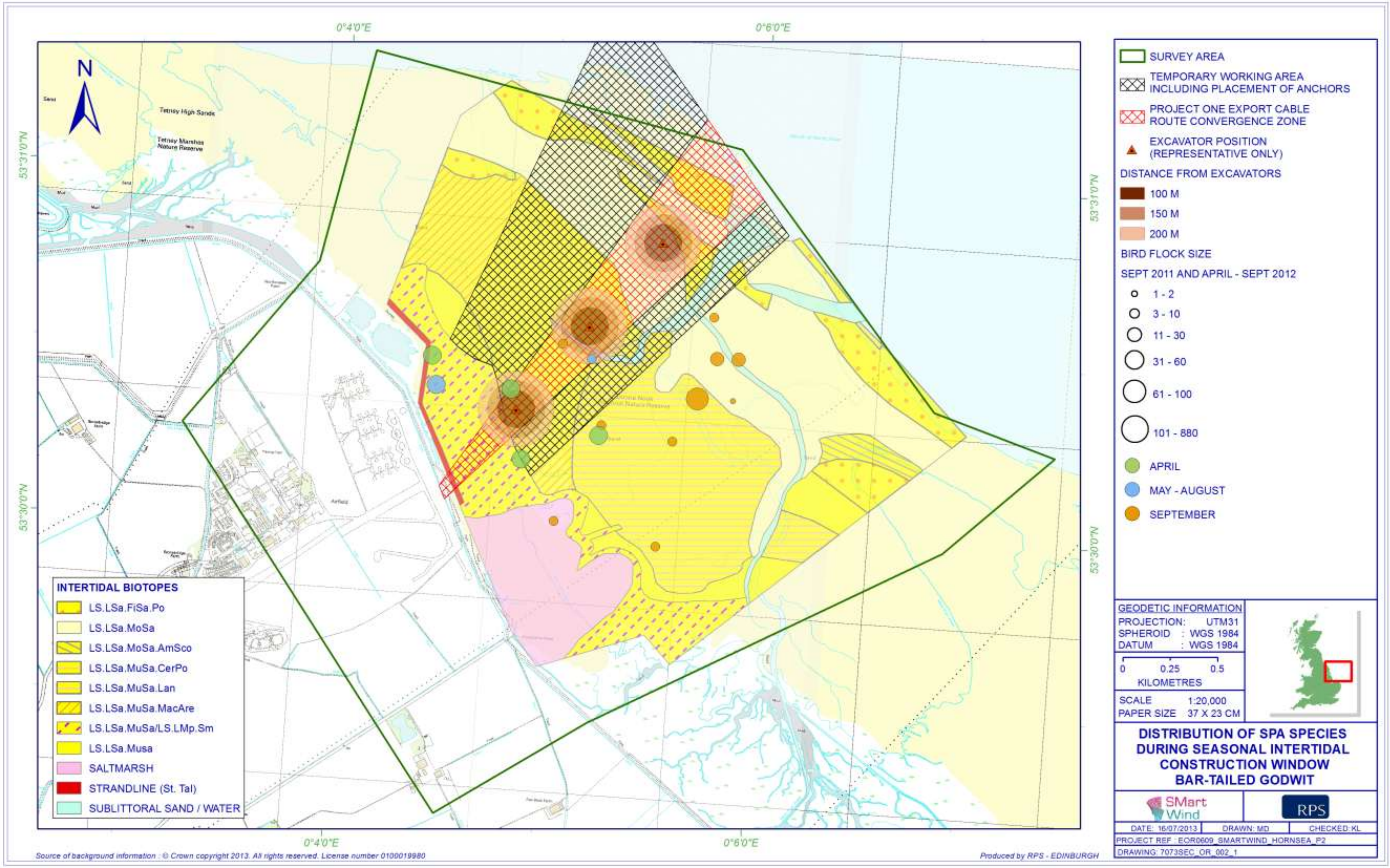


Figure F.7 Bar-tailed godwit raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Golden Plover

Key Sites: Brough, Winteringham, Saltend, Cherry Cobb, Welwick, Pyewipe (Allen *et al.* 2003).

Seasonality

F.35 Golden plovers arrive within the Humber SPA during late June and July (then undergo moult), and numbers build-up progressively in the early autumn, but often with a small drop during October as passage flocks move on, followed by the arrival of larger wintering flocks into the Humber during November (Allen *et al.* 2003). This period of peak usage is maintained into January although this depends on weather conditions, as in extreme hard weather conditions birds move south.

F.36 Cold weather to the north may also cause an influx of flocks into the Humber Estuary, whilst warm winters can mean an early departure in January. Only small numbers use the Humber on spring passage, but significant passage flocks occur during the autumn.

Distribution

F.37 The intertidal mudflat areas of the Humber are important as roosting and loafing sites for this species, with feeding often undertaken some distance inland. Golden plover occur in large numbers on the mudflats, particularly during migration periods. Birds show significant diurnal movements within the estuary, with usage generally higher at low tide with birds dispersing on adjacent farmland at high tide to roost or feed (Catley, 2000).

F.38 East of the Humber Bridge large numbers of golden plover frequent the area between New Holland and East Halton Skitter on the south shore. Adjacent fields are used as high water roosts. The waterfowl feeding study along the south bank in 1989/1990 (Eco Surveys, 1991) found that flocks used the intertidal zone as a day time roost when mud was available and that the only stretch on which birds fed in any numbers was Grainthorpe.

F.39 On the Humber, there is considerable interchange between flocks within different areas of the estuary, including between banks (Catley, 2000), although the species tend to be faithful to only a few key areas for feeding and roosting. These areas tend to be situated in large areas of agricultural land, or on extensive intertidal mudflats, and as such have been subject to relatively few long-term disruption events.

Population trends and status

F.40 The number of golden plover on the Humber Estuary SPA has been increasing throughout the reported period (Thaxter *et al.* 2010). Golden plovers were present in record numbers over the entire estuary during low tide counts in 2003/04, with 47,700 recorded in December (Mander and Cutts, 2005). A five year peak mean count in November of 48,653 individuals from the most recent set of WeBS core counts represents an increase of 58% from the cited SPA population (Table F.1).

Horseshoe Point landfall site

F.41 No golden plover were recorded during WeBS core count surveys within the Horseshoe Point sector in December, January and May, although a relatively large number were recorded in the adjacent Grainthorpe Haven sector (a peak of 3,960 birds in October, representing 13% of the cited SPA population (Table F.2). The species was mainly present between October and February in this sector, with much smaller counts between March and July. A peak of 2,300 individuals were recorded during low tide counts in sector MSF in January (Table F.3), which represents 7.5% of the cited SPA population. Similar numbers were recorded in the previous two months, although golden plovers were largely entirely absent in MSE2 (peak of 2 birds in November). There were no records between March and June inclusive at either sector.

F.42 Surveys at the cable landfall site in 2011/12 recorded a peak count estimate of approximately 8,000 birds in November, representing 26% of the cited and 16% of the current SPA populations respectively. It was apparent that this period represented the main autumn passage movement, with large numbers also recorded in October (c.4,000 individuals), but by late November, a decrease to around 700 birds. Numbers were very low throughout winter in the landfall site area, and spring passage produced a much smaller peak flock size of only 46 birds in late April.

F.43 Although some flocks congregated on land within the survey area, the majority of large flocks were located in the middle of the survey area just below mean high water and approximately 450 m from land.

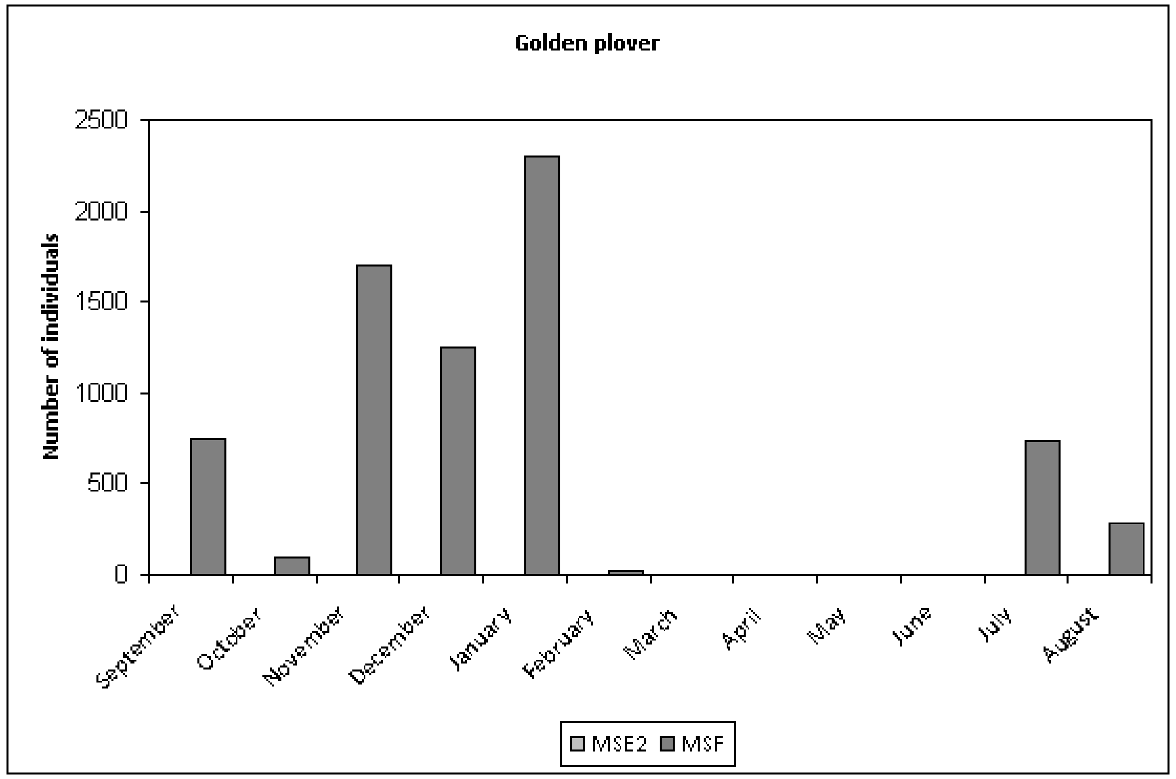


Figure F.8 Golden plover WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

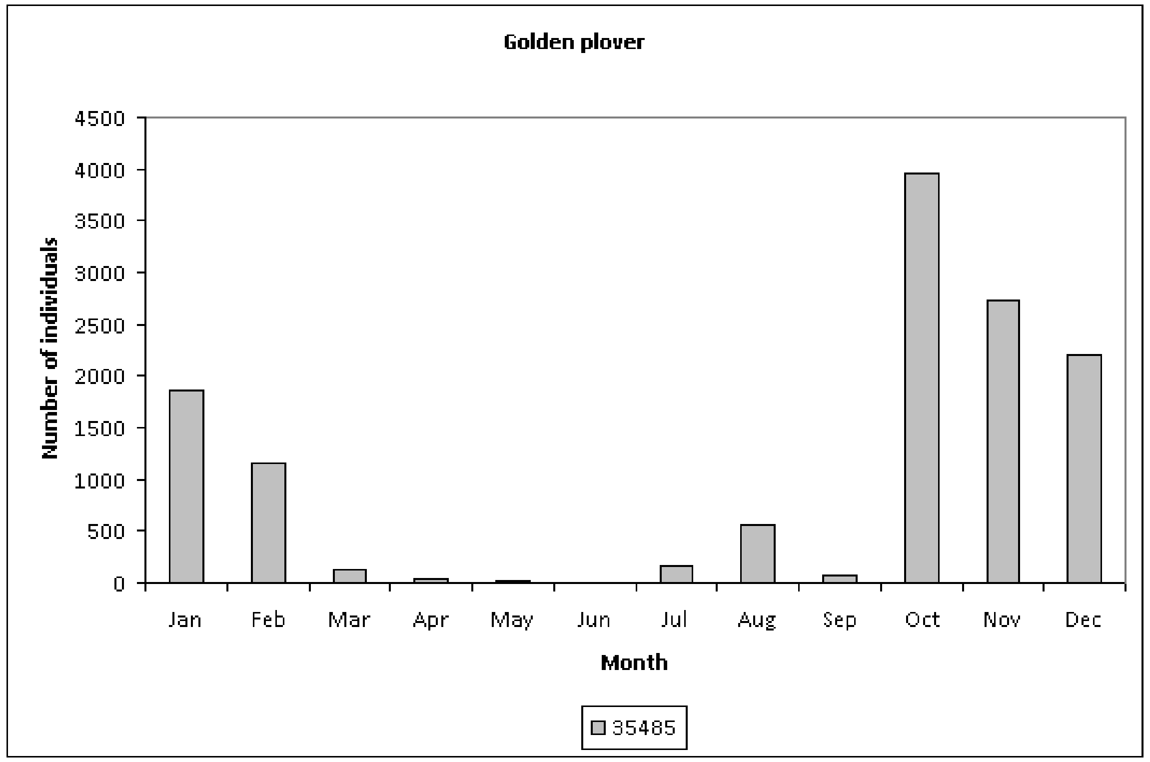


Figure F.9 Golden plover WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

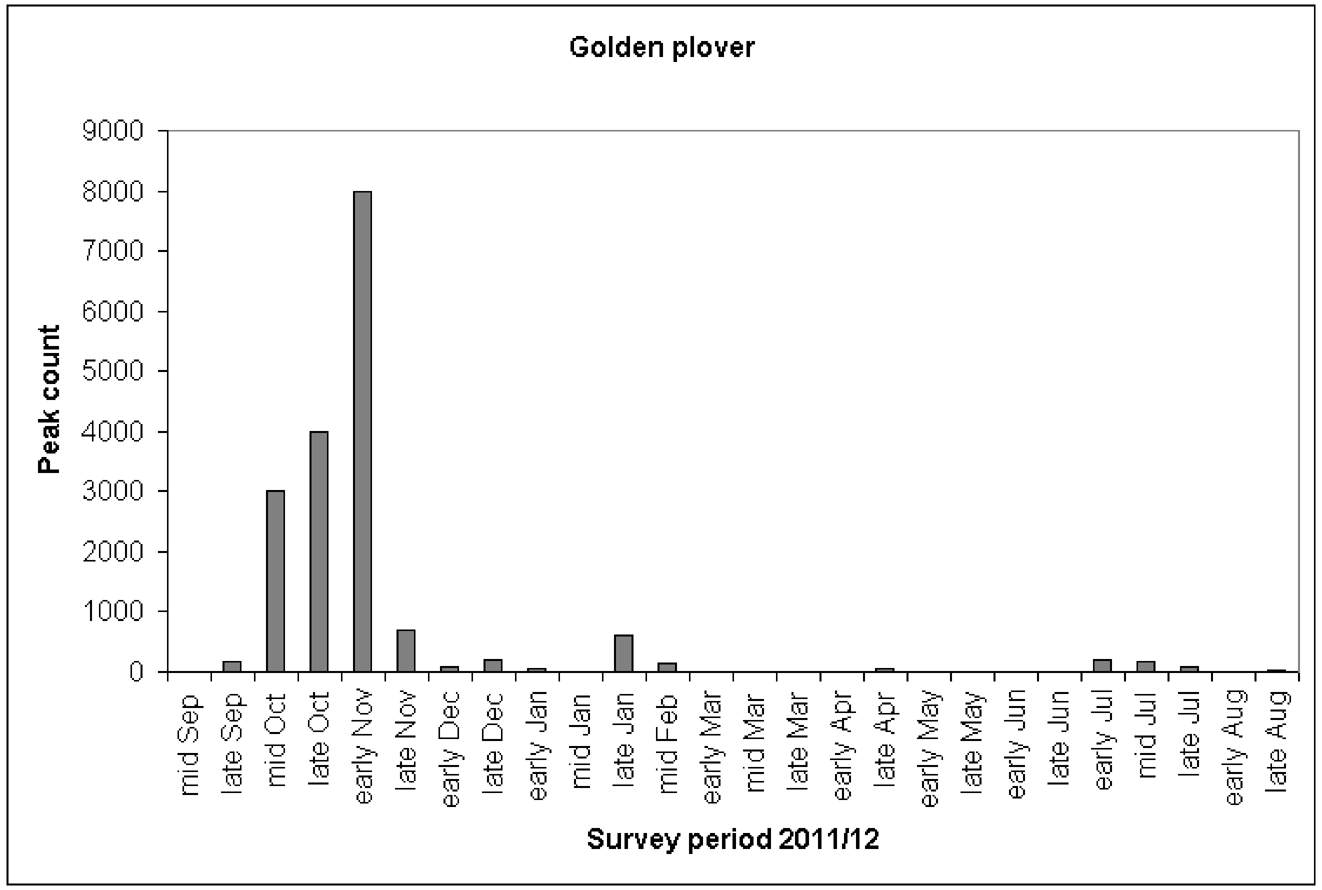


Figure F.10 Golden plover peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

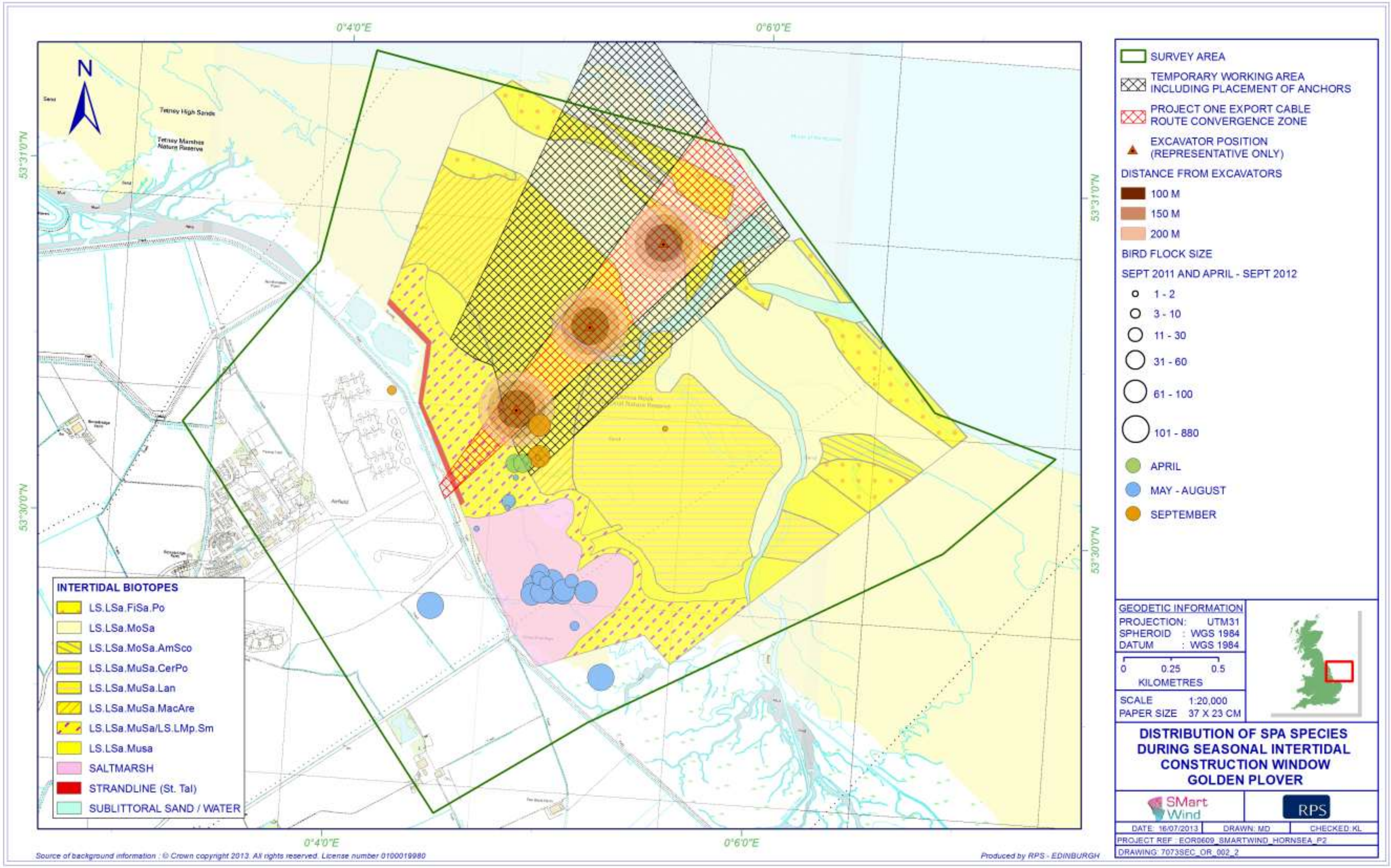


Figure F.11 Golden plover raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Ruff

Key Sites: Blacktoft Sands (wintering and passage), Brough Airfield (passage and possibly summering) (Allen *et al.* 2003).

Seasonality

F.44 The main ruff migration months are August and October on the Humber Estuary with the peak occurring in the latter month. Numbers begin to decrease as the autumn passage ceases and numbers remain low for the winter (Allen *et al.* 2003).

Distribution

F.45 Tasker & Milsom (1979) found that on the north bank of the outer estuary, the species is predominantly found during autumn passage, occurring on virtually all mudflats. During autumn peak passage in October, analysis of WeBS core counts from 1998-1999 show that sectors ISA (Walcot to Alkborough Beacon) and NA (M62 to Faxfleet) including Blacktoft Sands supported large numbers of the species. Occasionally, solitary individuals are recorded during winter on the north bank of the outer Humber, and there are also small numbers that winter on the south side of the estuary (Eco Surveys, 1991).

Population trends and status

F.46 This species was not included in Thaxter et al's (2010) WeBS Alert report for the Humber Estuary. However, a five year mean peak of the most recent WeBS core counts across the estuary recorded 64 birds in August, which represents a decrease of 50% from the cited SPA passage population (Table F.3), suggesting that the population may have declined, at least in the short- to medium-term, although this may reflect possible differences in surveys being able to record passage movements.

Horseshoe Point landfall site

F.47 No ruffs were recorded during WeBS core count surveys within the Horseshoe Point sector, and only a small number were recorded in the adjacent Grainthorpe Haven sector (a peak of eight birds in September and January, representing 6.3% of the cited SPA population, (Table F.2). The species was absent in most other months, with only single individual peaks in April and May. A peak of two individuals was recorded during low tide counts in sector MSE2 in May and August (Table F.3).

F.48 A single record of three birds was made in September 2011 (autumn passage) during surveys at the cable landfall site in 2011/12.

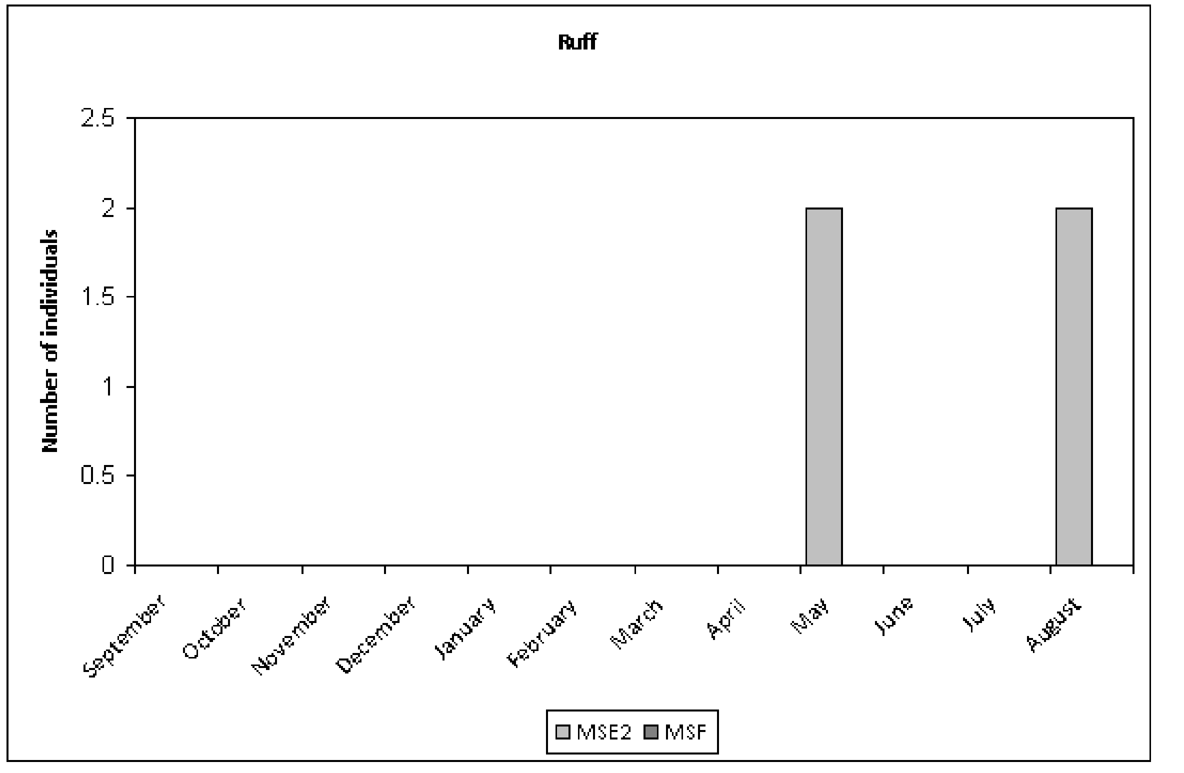


Figure F.12 Ruff WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

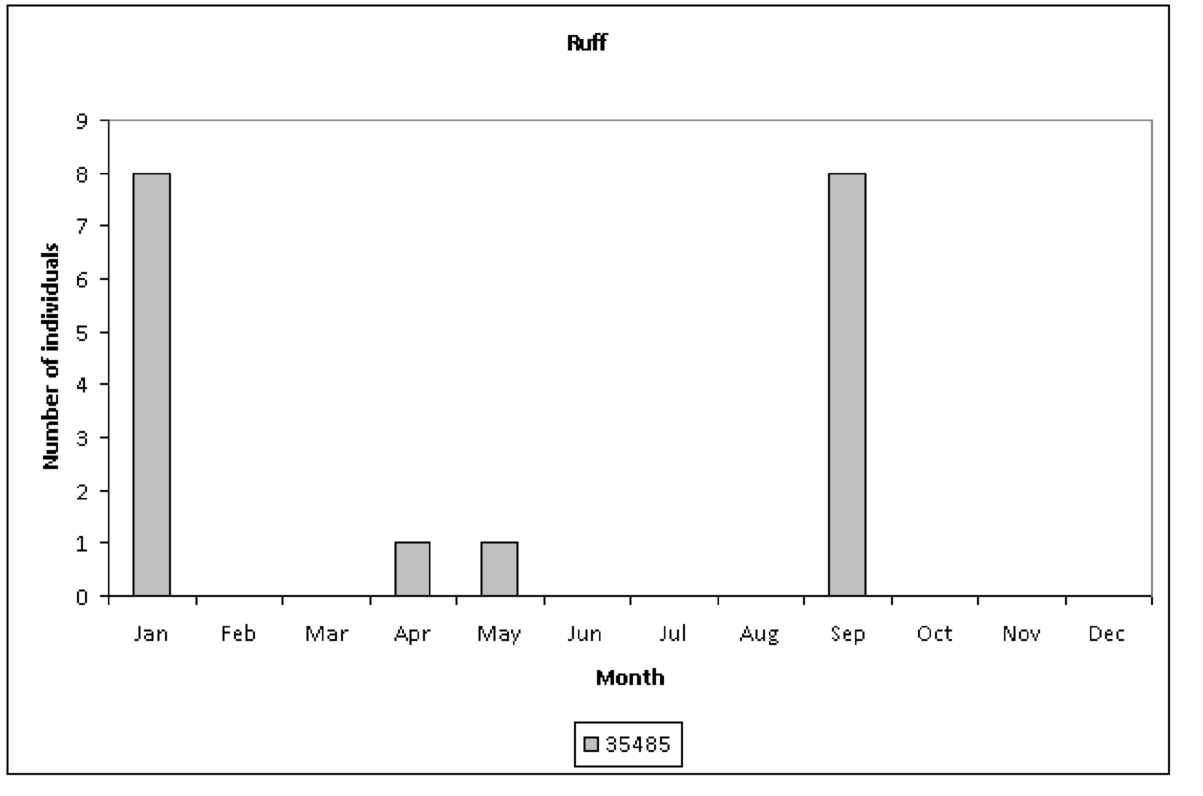


Figure F.13 Ruff WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07, and May 2009 only and therefore shows actual counts).

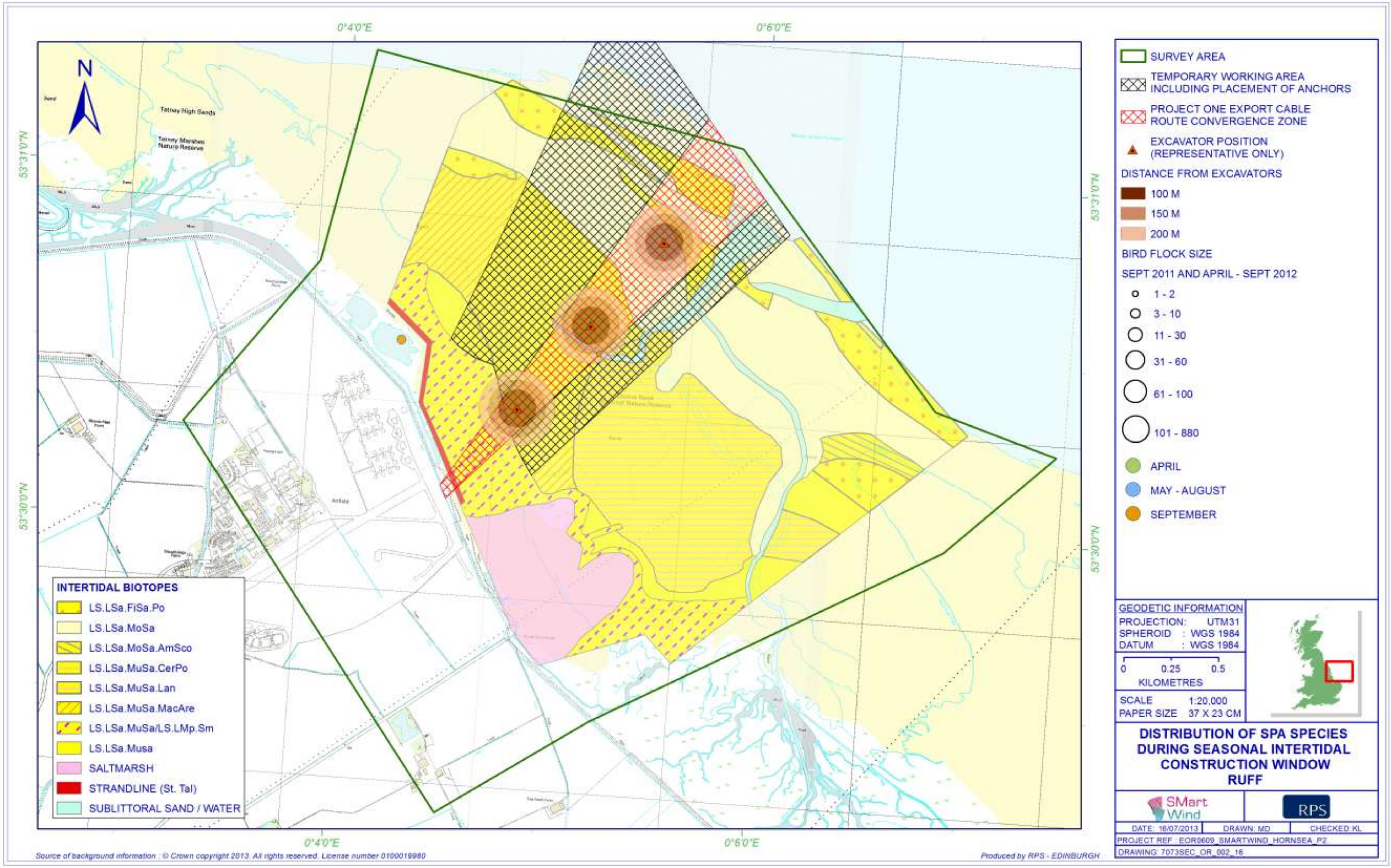


Figure F.14 Ruff raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Dunlin

Key Sites: Saltend to Spurn, Pyewipe and Read's Island (Allen *et al.* 2003).

Seasonality

F.49 Dunlins of the Calidris alpina race arrive in Britain mainly from late October having moulted in the Wadden Sea (Prater 1981). These birds remain on the Humber until February (Eco Surveys, 1991). In the Humber, the total dunlin population first peaks in October/November and the maximum peak occurs in January (Allen *et al.* 2003).

Distribution

F.50 The dunlin is a widespread species around the Humber at low water, but the largest concentrations are predominantly found between Saltend and Spurn, around Read's Island and on Pyewipe Flats (Allen *et al.* 2003).

F.51 Dunlin may form large roosting flocks at high water in the Humber, although many birds remain along the tideline. On the south shore, birds which feed around Read's Island gather at high tide to roost (Catley, 2000). Feeding birds from the outer estuary roost at Cleethorpes and Skidbrooke.

F.52 There is strong evidence of seasonal variations in the distribution of feeding birds in the Humber Estuary (Tasker and Milsom 1979; Catley, 2000; Allen *et al.* 2003), with the most important site being the intertidal area between Saltend and Spurn on the north shore. On the south shore, highest feeding concentrations occur around Read's Island and Pyewipe flats but large numbers are also found between East Halton to Immingham Dock, Cleethorpes, Grainthorpe and Saltfleet-Skidbrooke.

F.53 Dunlins occurred in large numbers on the outer estuary during low tide counts in 2003/04; although Salt End to Spurn held the highest densities, they were also common further upstream as far as Broomfleet (Mander and Cutts, 2005). The June count indicates the presence of a small summering population in the outer estuary, which may be first- year birds that have failed to come into full summer plumage.

Population trends and status

F.54 Numbers of dunlin have shown a distinct decline since the turn of the century within the SPA (Thaxter *et al.* 2010). Accordingly, WeBS Medium-Alerts have been triggered for the short- and medium-terms and for the period since designation. This corresponds with regional and national declines, suggesting a broader scale change rather than site-specific pressures. A five year peak mean count in January of 19,493 individuals from the most recent set of WeBS core counts represents a decrease of 12% over the cited SPA wintering population (Table F.1), backing up the conclusions of Thaxter *et al.* (2010).

Horseshoe Point landfall site

F.55 The Horseshoe Point WeBS core count sector recorded a peak population of 116 dunlin in December 2006, equating to 0.5% of the cited SPA wintering population. Numbers were greater in the adjacent WeBS sector, with a peak of 940 birds in September (4.2% of the SPA population). Evidence from both sectors would suggest that the wider area is used mainly from October until March, with no birds recorded in June or July. Low tide counts recorded a peak of 380 birds in sector MSF in December 2003. No birds were recorded between April and June, and passage numbers increased in July and August.

F.56 NE reported that up to 2,000-3,000 dunlin have been recorded close to the cable landfall survey area. Surveys at the cable landfall site in 2011/12 recorded a peak flock size of 2,050 birds in late October during autumn passage (around 10% of the cited SPA passage population). Numbers were lower but relatively stable throughout the winter survey period with a second peak of 1,311 birds on spring passage. The species was largely absent during the breeding season.

F.57 Birds were recorded throughout the survey area but were predominantly observed above mean high water mark on muddy substrates.

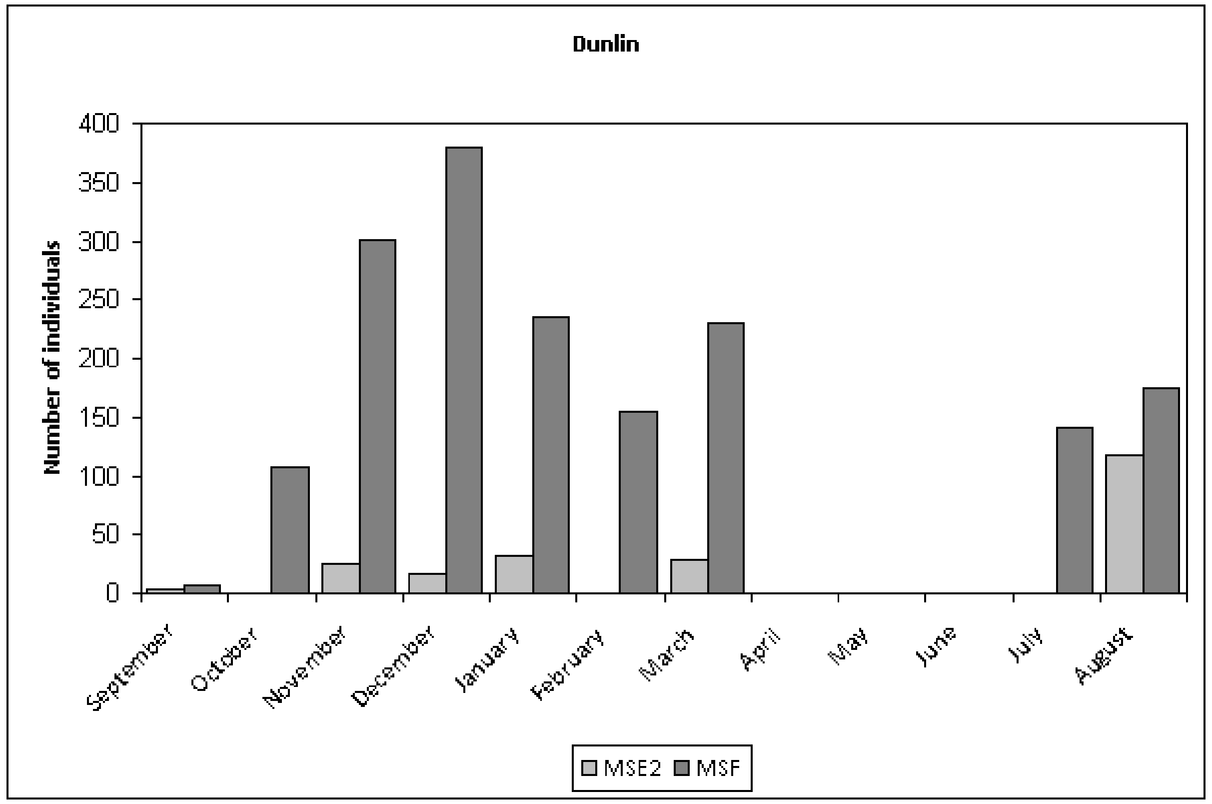


Figure F.15 Dunlin WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

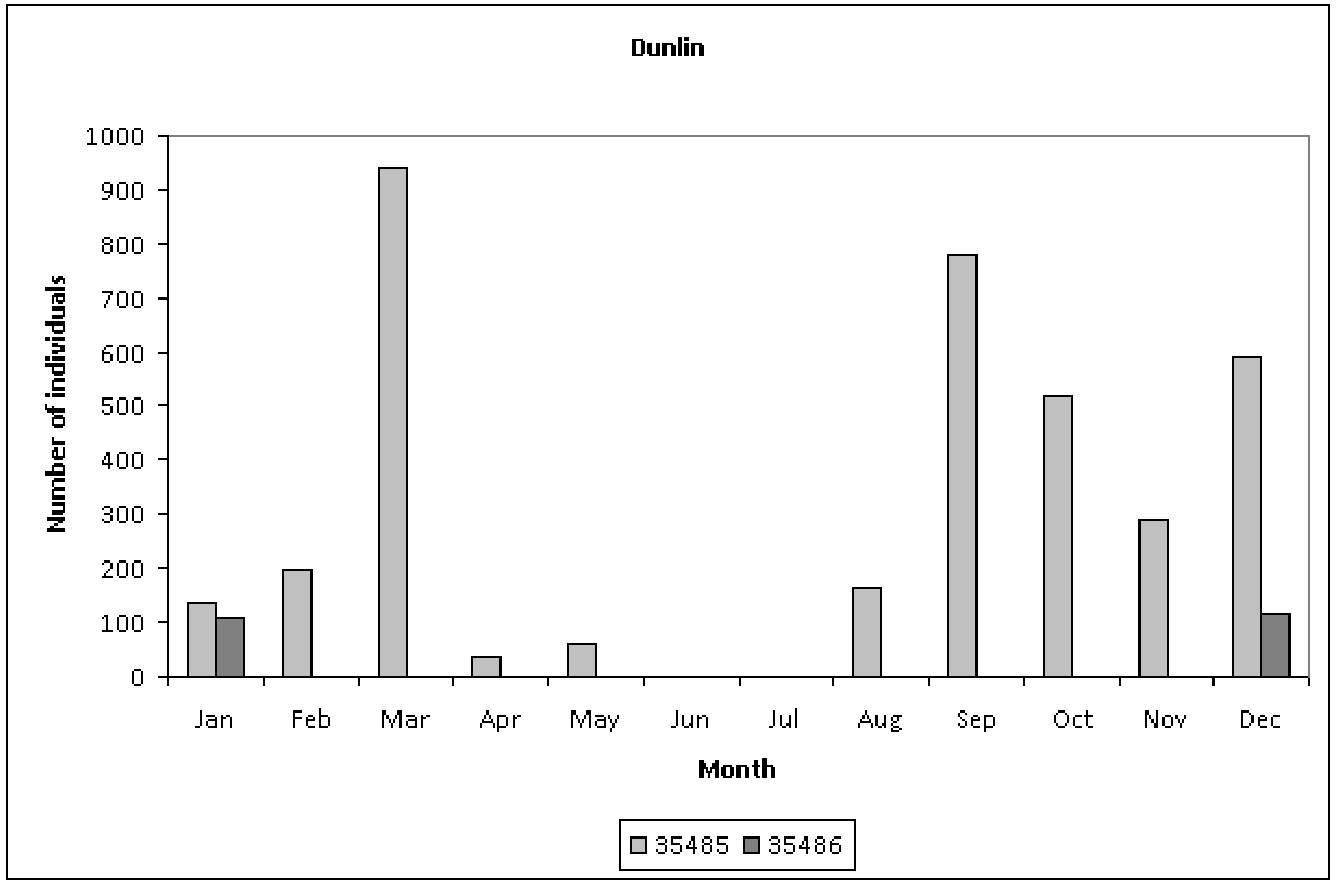


Figure F.16 Dunlin WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

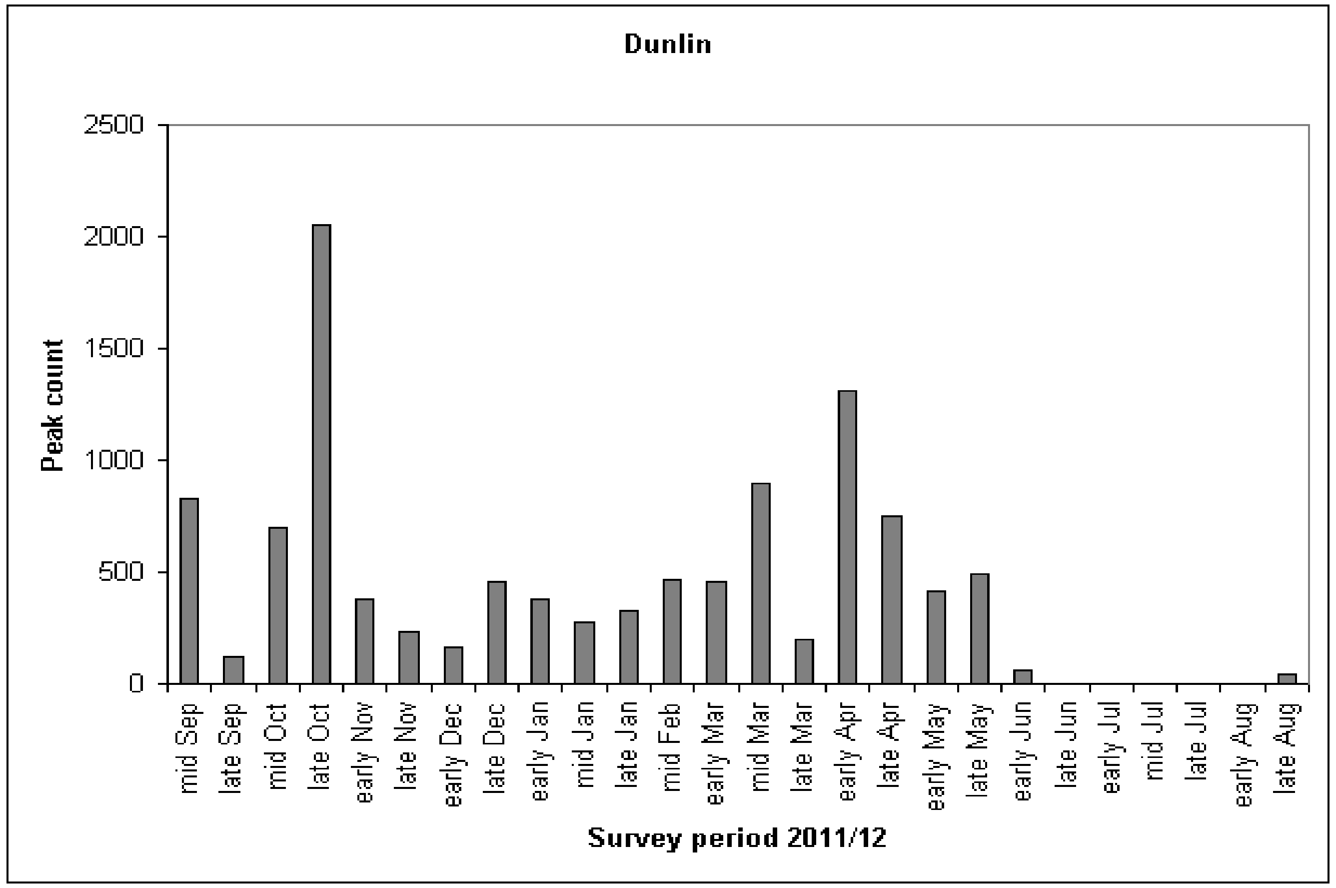


Figure F.17 Dunlin peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

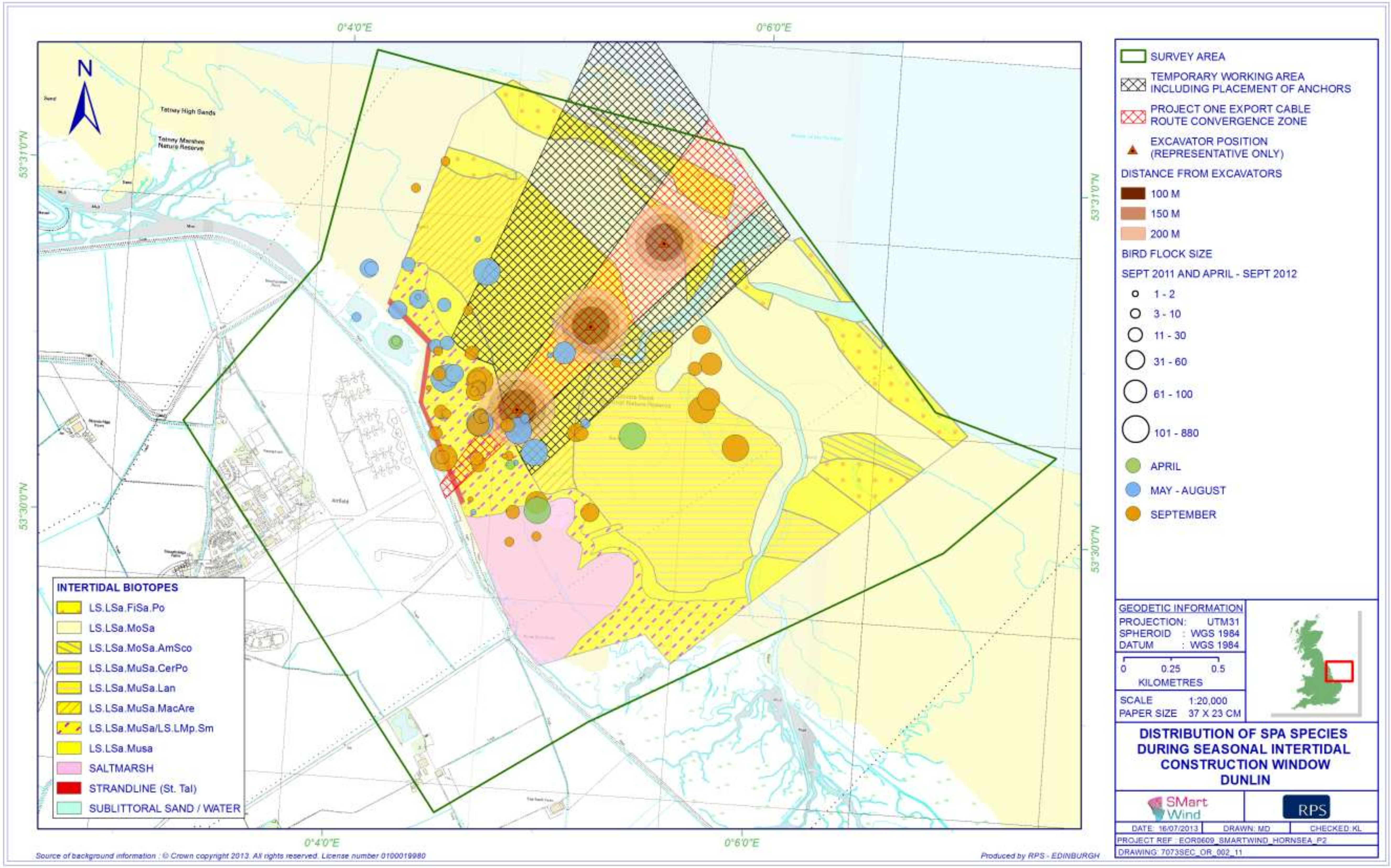


Figure F.18 Dunlin raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only.

Knot

Key Sites: Cleethorpes to Grainthorpe (south shore) and Spurn Bight (north shore) (Allen *et al.* 2003).

Seasonality

F.58 The main influx of knot occurs between September and November, and the population on the estuary remains stable through December before a mid winter peak in January, when large flocks from the Wadden Sea move into the British Isles (Allen *et al.* 2003). This peak is followed by a fall in mid February, with a further very large fall in mid March. Beyond this, the population falls to zero by the first week of June. No birds are then present until the end of July when the autumn passage begins (Catley, 2000).

Distribution

F.59 Knot are highly mobile but are found mainly in the outer estuary, where large intertidal movements occur between feeding and roosting areas on the north and south shores (Catley, 2000). These movements are likely to be the result of poor weather conditions, tidal conditions or disturbance to foraging birds (Allen *et al.* 2003). During the late winter and spring, knot prefer to roost on the south shore from Cleethorpes to Grainthorpe (Catley, 2000). Eco Surveys (1991) suggest that on spring high tides, when intertidal roost sites are inundated by the tide, or when key roosts are disturbed, knot vacate the estuary, generally heading south.

F.60 Eco Surveys (1991) found major feeding sites located on the south shore at Cleethorpes and the Grainthorpe Basin, with smaller flocks using Pyewipe Flats and the Skidbrooke-Saltfleet reach.

Population trends and status

F.61 There have been relatively high numbers of knot recorded on the SPA since the turn of the century (Thaxter *et al.* 2010). A five year peak mean count in January of 38,388 individuals from the most recent set of WeBS core counts represents an increase of 18% from the cited SPA population (Table F.1).

F.62 During low tide counts, the largest numbers of knot for over five years were observed in November 2003, with over 50,000 present in the outer estuary. A total of 1,130 knot were present in June 2004, which was unusual as generally only a few birds are recorded during the summer months on the Humber (Mander and Cutts, 2005). An early arrival of migrants or the interactions between the Wash (where a population of first-summer birds are found) and the Humber are possible explanations.

Horseshoe Point landfall site

F.63 A five year peak mean count of 3,100 individuals was recorded during WeBS core count surveys within the Horseshoe Point sector in January 2010, equating to around 11% of the cited SPA population (Table F.2) The adjacent sector held even higher peak counts, with 4,500 birds in the same month (16% of the SPA population). Numbers were generally high between November and February, decreasing to very low numbers generally between April and August in both sectors.

F.64 During 2003/04 low tide counts, a high peak of 7,300 individuals was estimated in sector MSF in January 2004 (Table F.2), with a similar seasonal distribution pattern to the core counts. Numbers in sector MSE2 peaked at 3,200 birds in February, giving an overall peak of 6,800 birds in the two sectors in that month, which equals 24% of the cited SPA wintering population.

F.65 More locally, surveys at the cable landfall site in 2011/12 recorded a peak count of 3,000 birds in November, which equates to 10% of the cited SPA population, or around 8% of the current SPA population (Table F.3) Numbers during winter months were lower, with an average peak flock size of around 500 birds. There was no apparent peak during spring passage, and the species was largely absent during summer months.

F.66 Birds were located widely within the survey area, although some of the largest flocks were to be found well below mean high water mark at low tide.

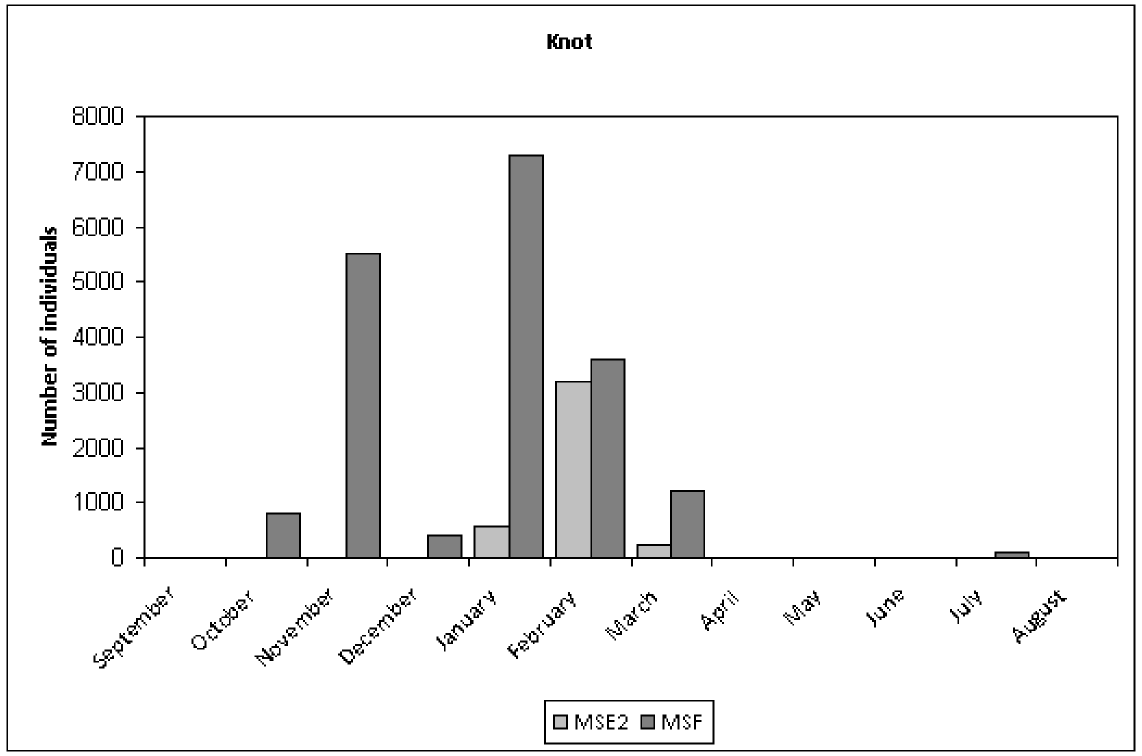


Figure F.19 Knot WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

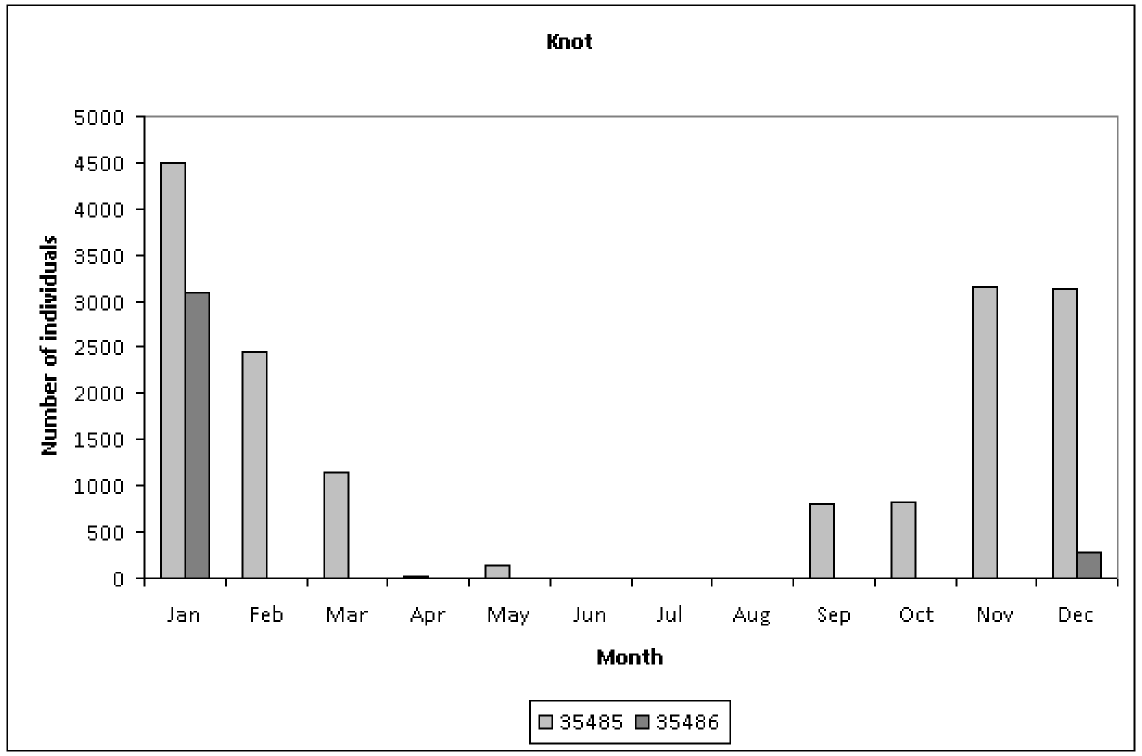


Figure F.20 Knot WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

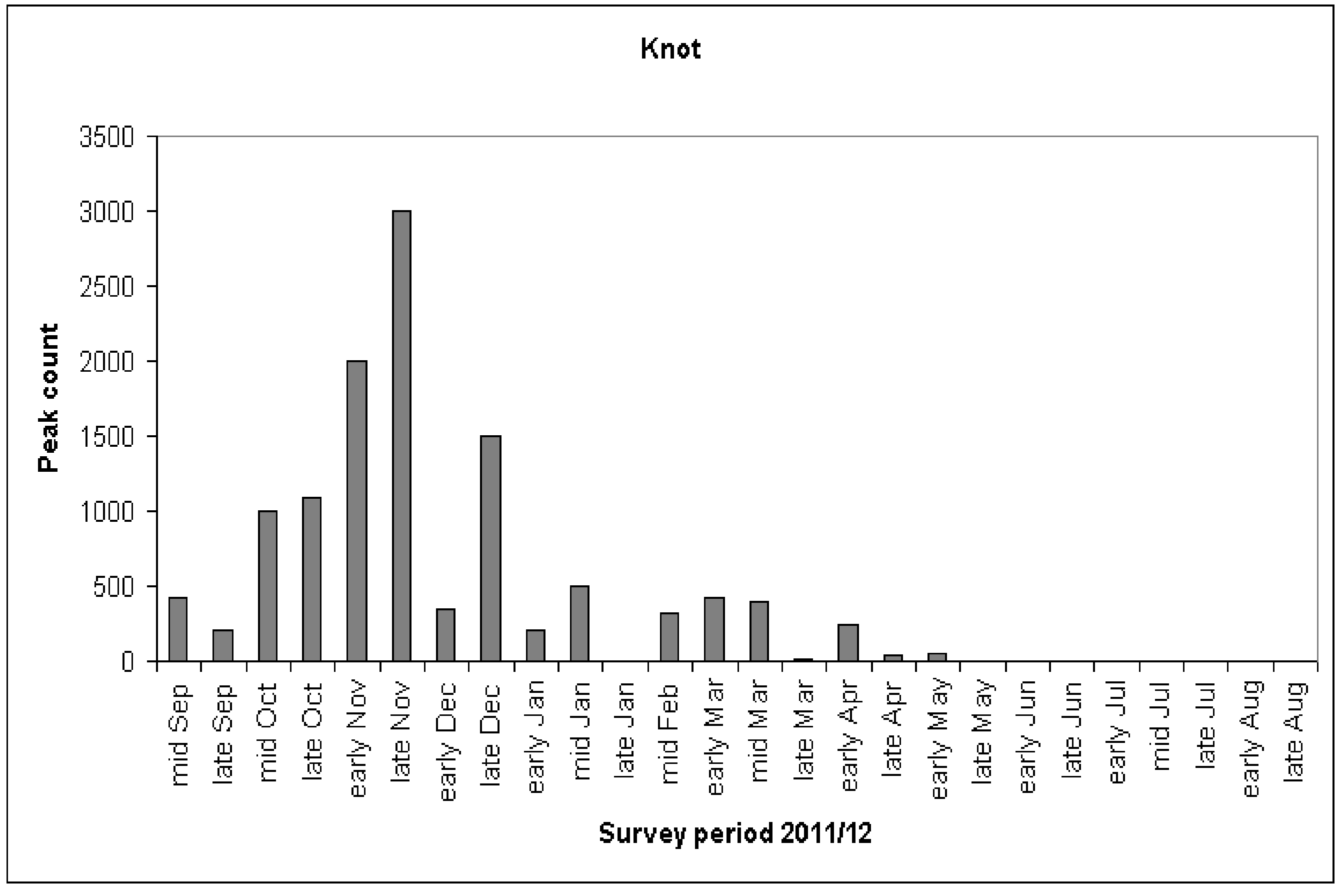


Figure F.21 Knot peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

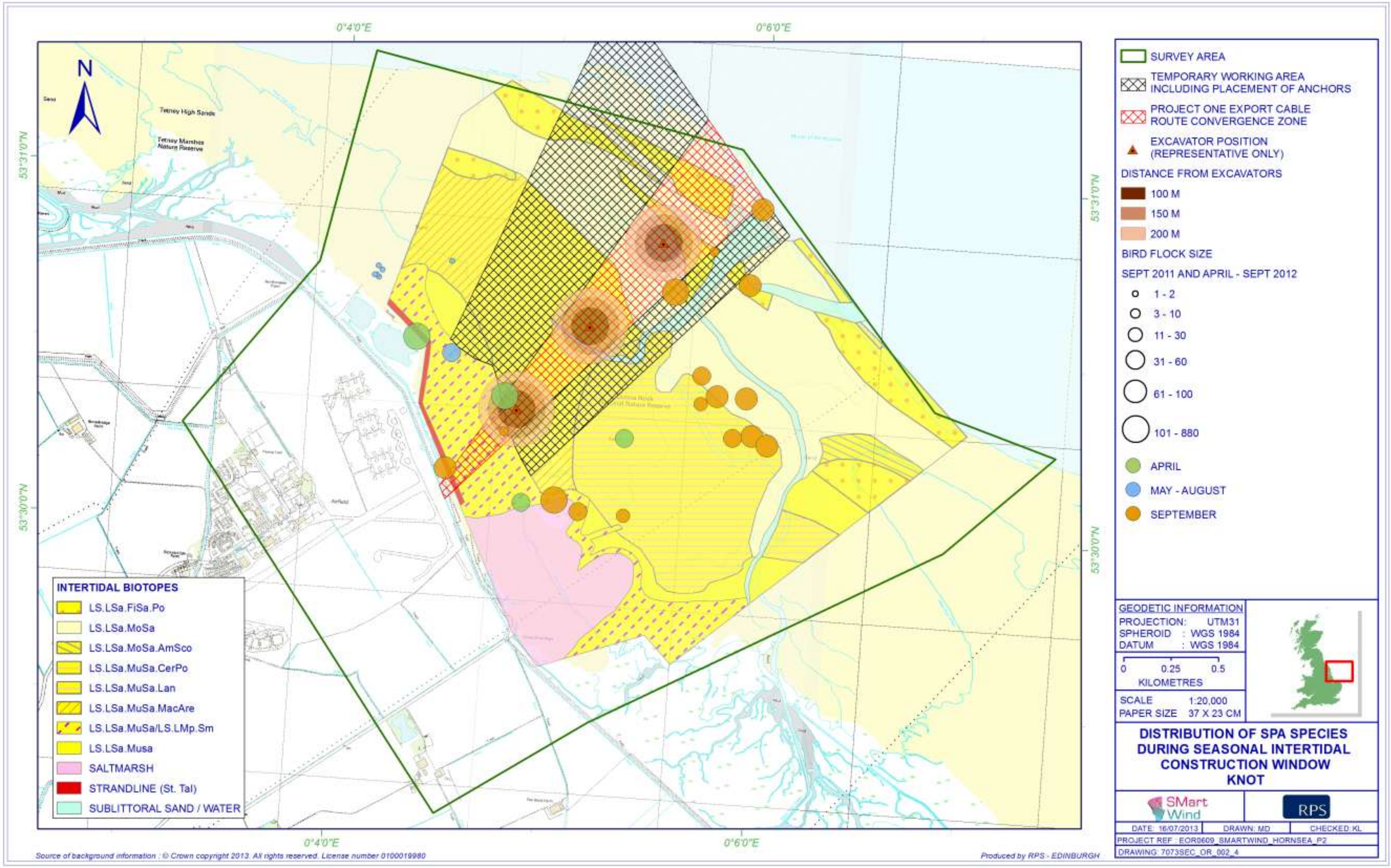


Figure F.22 Knot raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Shelduck

Key Sites: Whitton to Barrow Haven (including Read`s Island), Brough to Faxfleet, Foulholme to Cherry Cobb, Grainthorpe Haven and Pyewipe (Allen *et al.* 2003).

Seasonality

F.67 Shelduck are present on the Humber Estuary throughout the year, peak counts often occurring during autumn passage as birds cross the North Sea from July to September.

Distribution

F.68 The shelduck has a widespread distribution on the Humber, although concentrations can occur in the outer estuary at Grainthorpe Basin, Skidbrooke-Saltfleet and Tetney basin (Eco Surveys, 1991; Tasker & Milsom 1979). Birds feed in groups where there are extensive areas of intertidal flats. Large numbers of moulting shelduck are also found on the estuary during July and August. They are concentrated to the west of the Humber Bridge, particularly around Whitton Sands and Brough (Cruickshanks *et al.* 2010).

F.69 Low tide counts in 1998/1999 identified the estuary upstream of the Humber Bridge to be the main breeding area for the species with the total number estimated to be around 150 pairs (Allen *et al.* 2003).

F.70 Three shelduck territories were recorded during breeding bird surveys along the cable route in 2011, but any effects due to construction activities are unlikely to be significant to the much larger SPA population.

Population trends and status

F.71 Numbers of Shelduck on the Humber Estuary SPA have been increasing during recent winters despite declines in the regional and national WeBS totals (Thaxter *et al.* 2010). The most recent WeBS core counts have indicated an increase in around 18% since the SPA citation (Table F.1).

F.72 During summer, a WeBS low tide count sector peak maxima of 1,929 (NG-Paull to Stone Creek) was recorded in June 2004, with an overall peak of 3,788 birds in the Humber Estuary (Mander and Cutts, 2005). The low tide count on this section also revealed the presence of a total of 17 broods. Elsewhere on the estuary, two breeding pairs with 17 young were recorded on Read's Island. Birds may well stage on the upper estuary for variable periods between June and August and thus increase the total number of adults present.

Horseshoe Point landfall site

F.73 A five year peak mean of 42 individuals was recorded during WeBS core counts in December, which is 0.9% of the cited SPA population and 0.7% of the most recent estuary-wide counts (Table F.2). The adjacent sector held 320 birds the same month, which is 7.2% of the cited SPA population. Low tide counts recorded a peak of 266 birds in sector MSF, also in December.

F.74 During surveys within the cable landfall point in 2011/12, a peak flock size of 52 birds was recorded in mid February, or 1% of the cited SPA population. A smaller peak of 34 birds was recorded in October 2011. In the intervening winter period, numbers were considerably smaller, and in summer months the area was likely to have been used by at least one breeding pair.

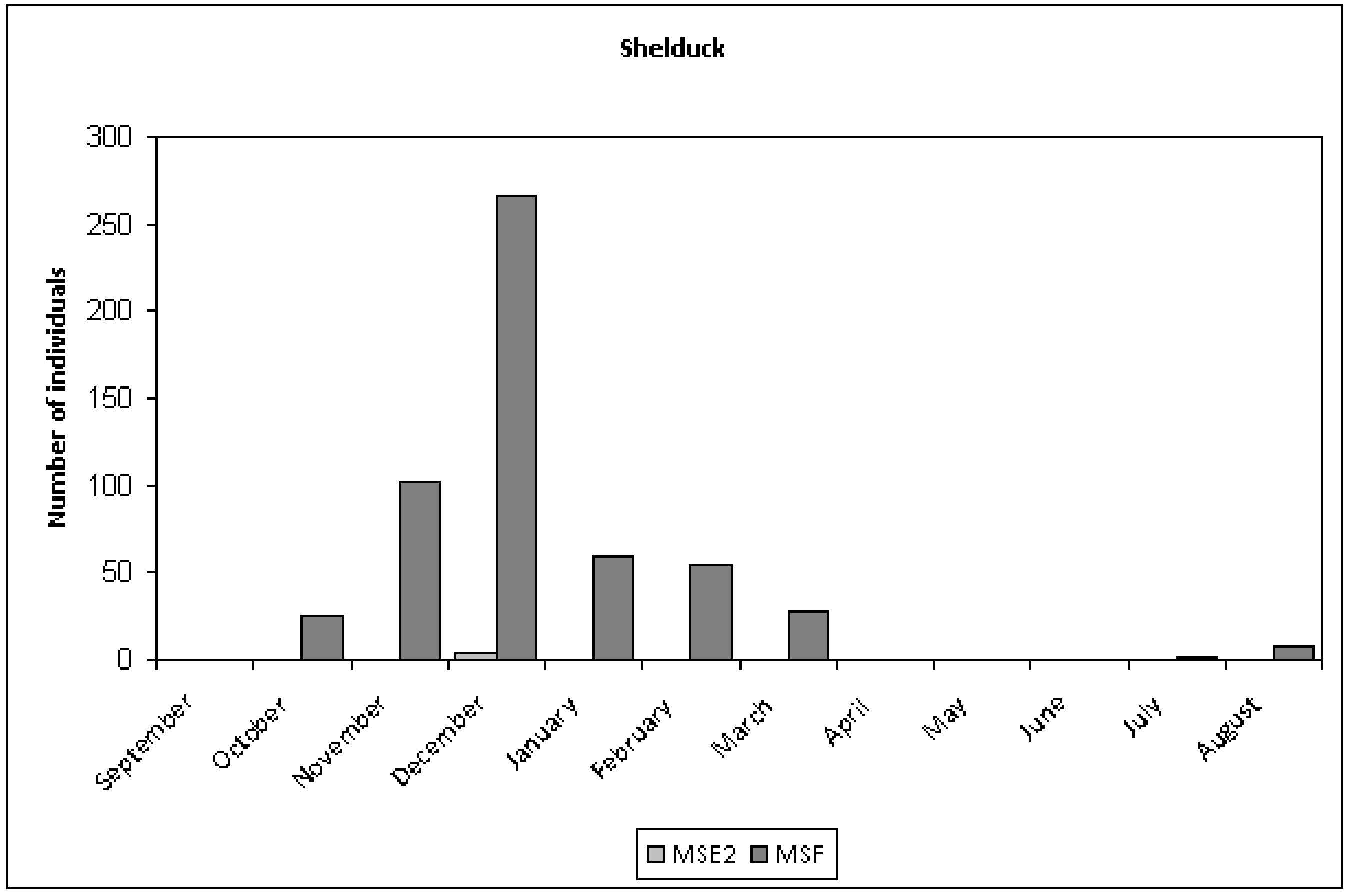


Figure F.23 Shelduck WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

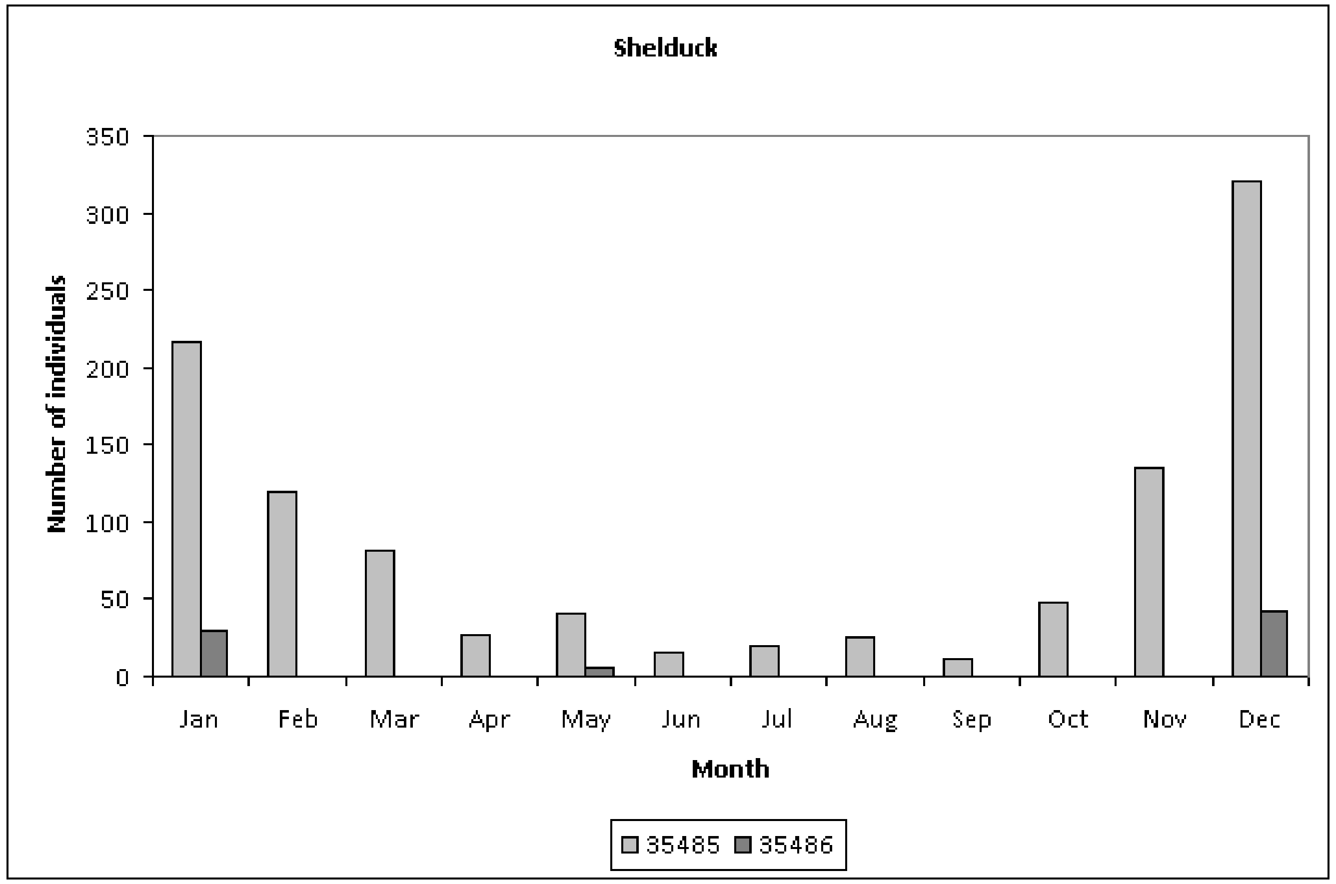


Figure F.24 Shelduck WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

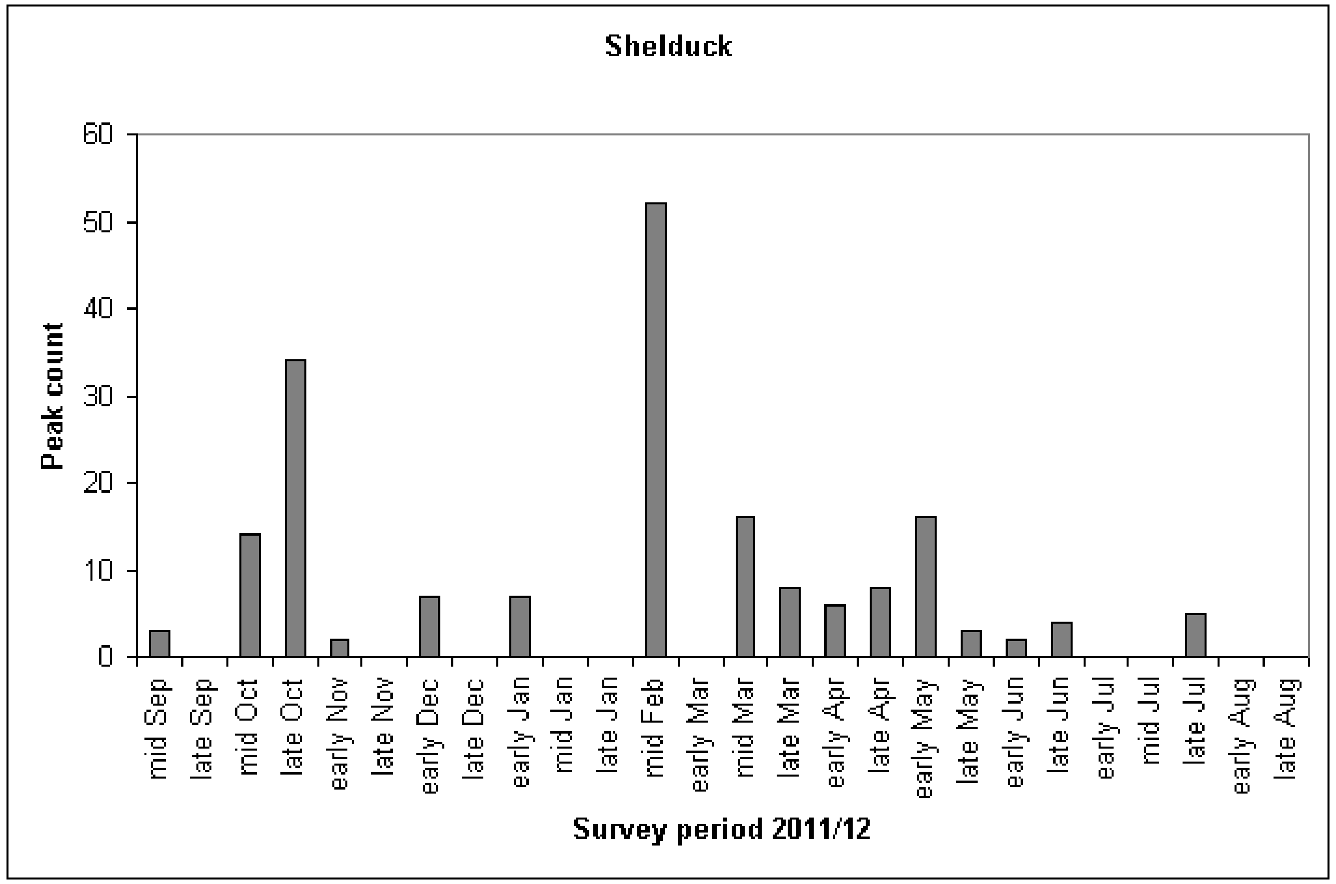


Figure F.25 Shelduck peak count during cable route surveys at Horseshoe Point landfall site, 2011/12.

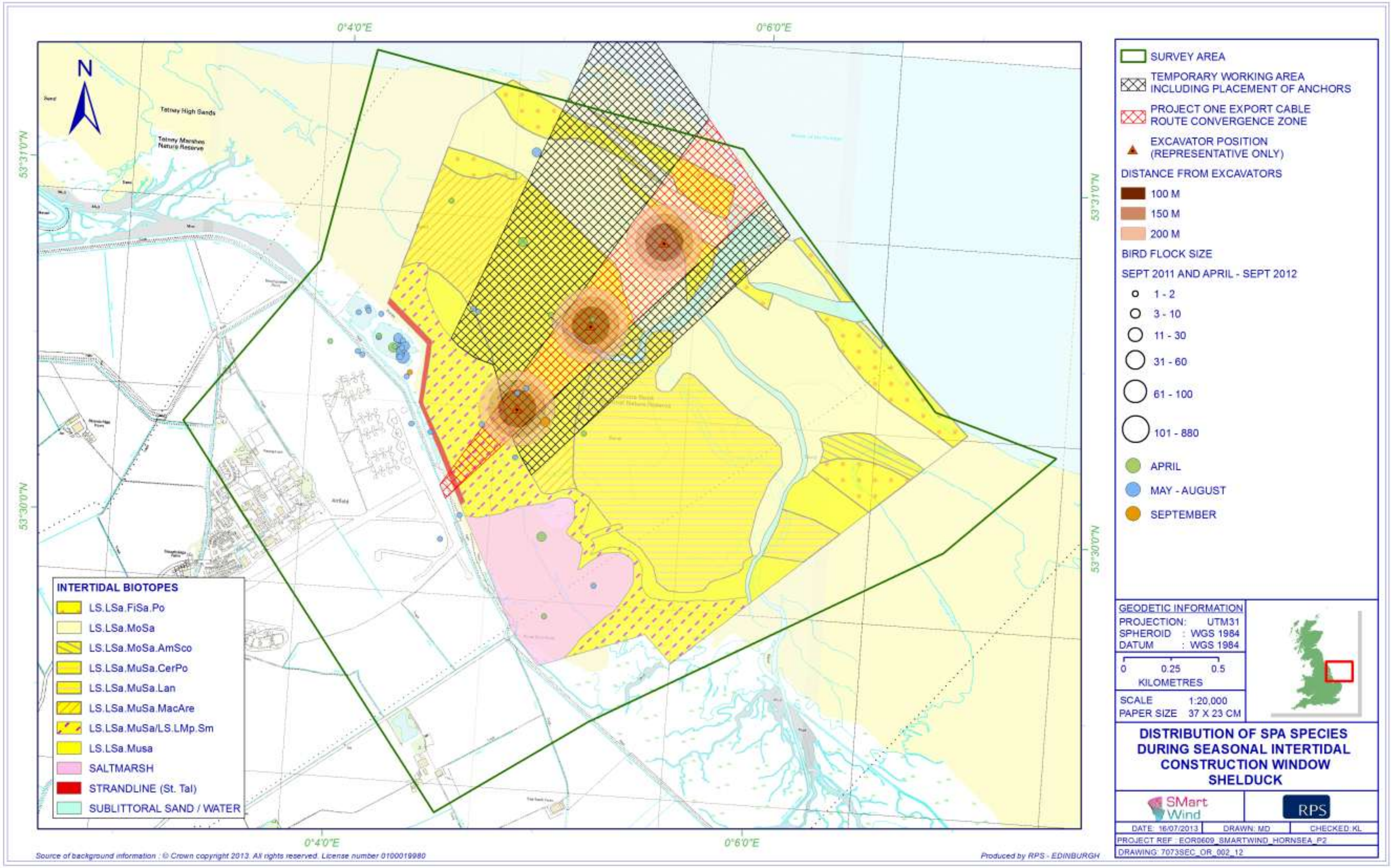


Figure F.26 Shelduck raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Redshank

Key Sites: Pyewipe, Spurn, Cherry Cobb and East Halton Skitter to Grimsby Dock Tower (Allen *et al.* 2003).

Seasonality

F.75 In the Humber Estuary Allen *et al.* (2003) described an autumn redshank passage peak in September/October with fairly stable wintering populations, followed by a rapid increase in the number of redshank in April corresponding with the spring passage of what are presumed to be Icelandic birds (Prater, 1981).

Distribution

F.76 Redshank are widespread across the Humber Estuary in winter and are predominantly observed feeding on the mid to upper shore with a preference for muddy river channels and saltmarsh (Allen *et al.* 2003). On the south shore major roosts are found from Killingholme Pits to the Grainthorpe area.

F.77 The low tide count programme in 1998/99 revealed between-month variations in the distribution of redshank with some reaches of the estuary appearing to be irregularly important for the species (Catley, 2000). Spurn Bight is the stronghold for this species during the autumn with half of the Humber population present at low tide. Other sites that host large numbers Include Cleethorpes to North Cotes Point and Sunk Island (Stone Creek to Patrington Channel) and Saltend.

F.78 Saltmarshes are an important breeding habitat for redshank in Britain and the pattern of distribution of redshank across the estuary matched the distribution of saltmarsh areas on the outer shores (Mander and Cutts, 2005b). During summer, an overall peak of 138 birds in the Humber Estuary was recorded in June 2004 (Mander and Cutts, 2005b).

F.79 Two redshank territories were recorded during breeding bird surveys along the cable route in 2011, but any effects due to construction activities are unlikely to be significant to the much larger SPA population.

Population trends and status

F.80 The number of redshanks within the SPA has generally declined sharply since the turn of the century and accordingly a WeBS short-term Medium-Alert has been triggered (Thaxter *et al.* 2010). This recent decline parallels those observed at the regional and national levels, and so has probably been driven by broader-scale change rather than site-specific pressures. The most recent WeBS core counts show a decline of only around 4% since citation date, although as this peak was in September, it likely consists of passage individuals, and so a decline of 41% from the cited passage population is probably more realistic (Table F.1).

Horseshoe Point landfall site

F.81 Redshank feed on marine polychaete worms, crustaceans and molluscs and favour areas that have abundant invertebrate prey species, including Tetney Marshes (Cruckshanks *et al.* 2010). The saltmarshes at Tetney and Grainthorpe Havens also provide an important communal roosting site for redshank. In addition, Donna Nook is of particular importance on very high spring tides when Tetney and Grainthorpe are completely covered by water (Cruickshanks *et al.* 2010).

F.82 Despite the potential importance, a peak count of only 18 individuals was recorded within the Tetney-Horseshoe Point WeBS core count sector in January, although it should be emphasised that surveys were only conducted in December (zero birds), January and May (13 birds). In the adjacent sector a five year peak mean of 697 individuals were recorded in September, which equates to 9.3% of the cited SPA population (Table F.2). This was a large increase on the figures for June to August, where an average of only 113 birds was recorded.

F.83 A much smaller peak of 248 individuals was recorded locally during WeBS low tide counts (Sector MSF, December, Table F.3) which perhaps demonstrates that the area is more important as a roost site at high tide.

F.84 A peak flock size of 87 individuals was recorded within the cable route survey area in October 2011, which represents 1.2% of the cited passage SPA population (Table F.3). Numbers were generally stable from September to late March, but decreased significantly during summer months, with few individuals recorded.

F.85 Birds were more commonly located close to land, although larger flocks were recorded in the middle of the estuary.

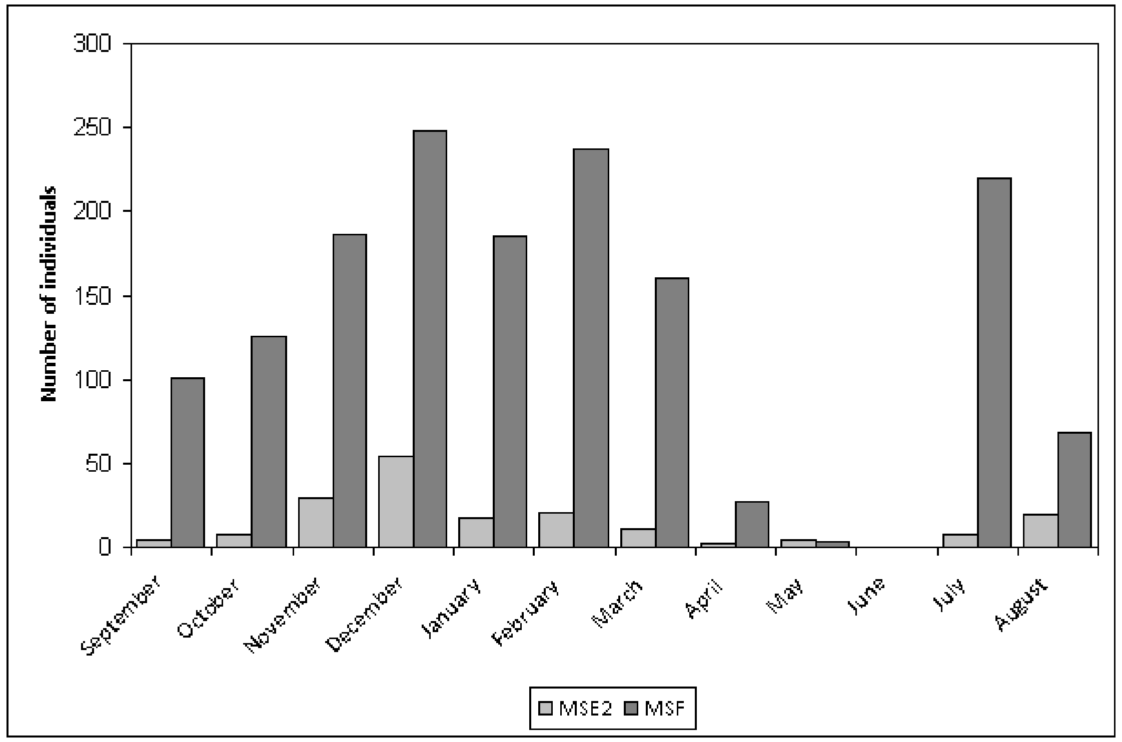


Figure F.27 Redshank WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

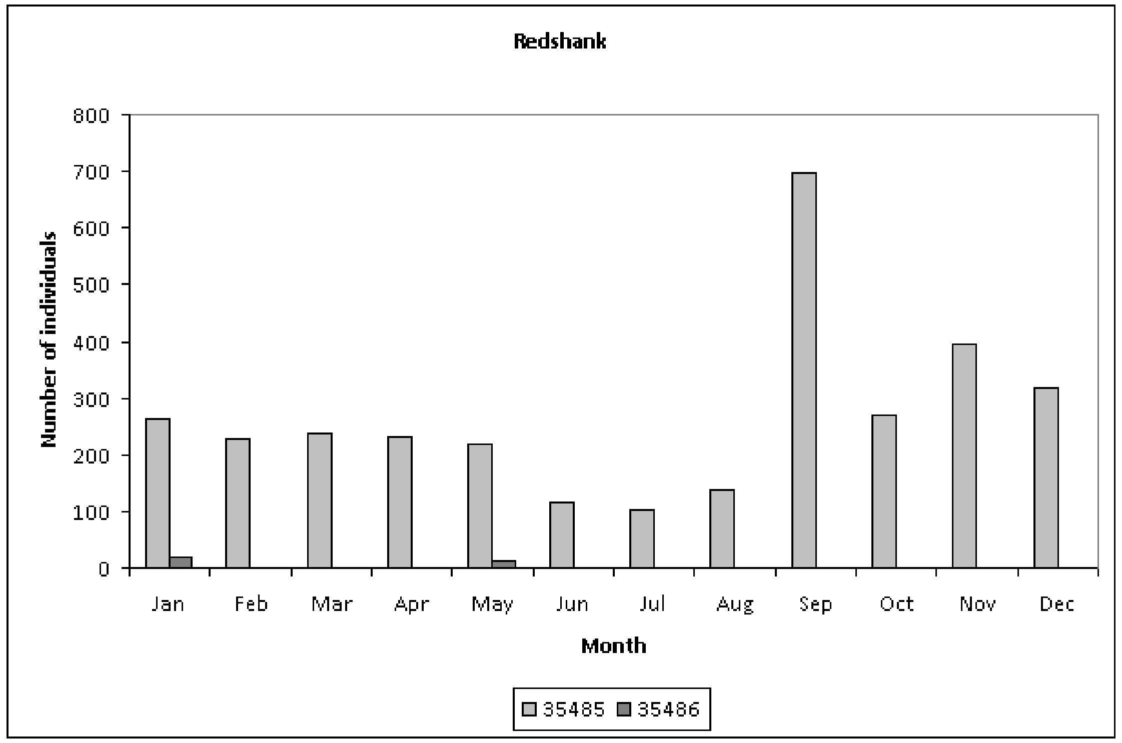


Figure F.28 Redshank WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

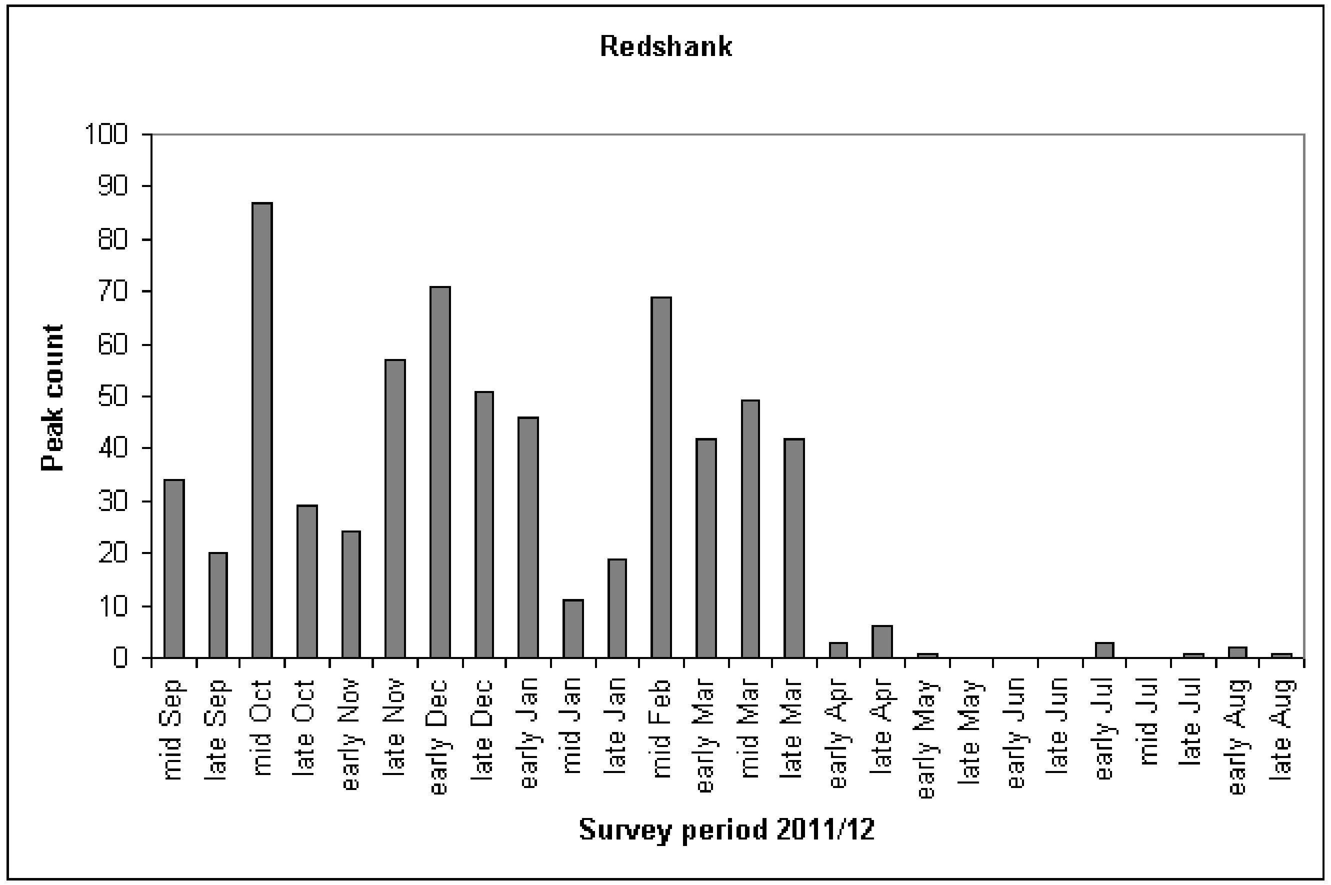


Figure F.29 Redshank peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

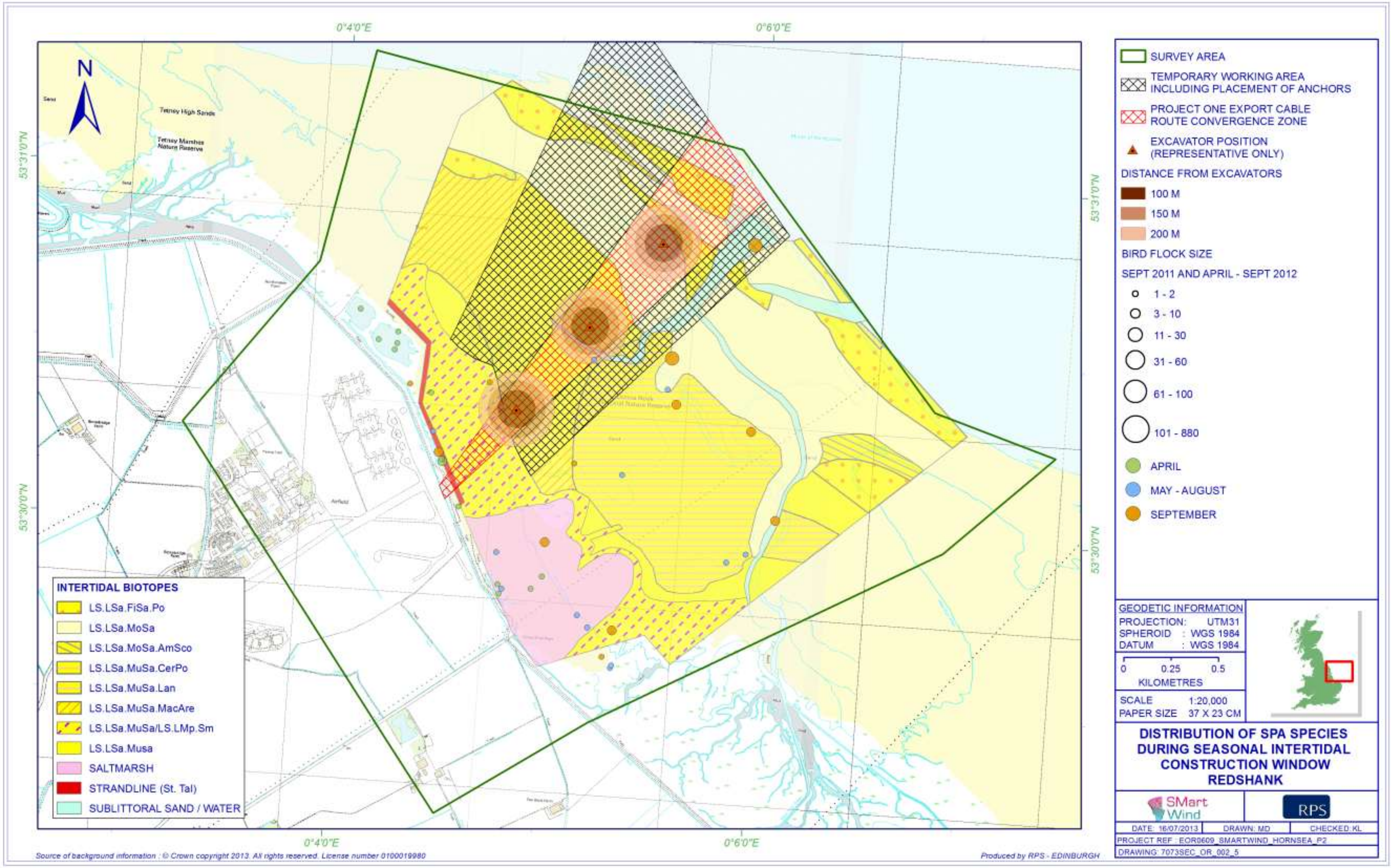


Figure F.30 Redshank raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Teal

Key Sites: Blacktoft Sands Nature Reserve, Crabley to Brough, Saltend, Winteringham Haven and Read's Island (Allen *et al.* 2003).

Seasonality

F.86 Small numbers of teal are found in the Humber Estuary during August after moult and numbers then build up, rising to a maximum in December. The majority of birds depart during March and April with numbers dropping further in May and June (Allen *et al.* 2003).

Distribution

F.87 The species displays a clustered distribution within the Humber, although small flocks are present along the majority of the WeBS sections. The main flocks on the Humber occur at Winteringham Haven, Saltend, Crabley Creek and Brough Haven, Blacktoft, Theddlethorpe-Saltfleetby and Read's Island. Peak maxima often reflect flock movements within the estuary and periods of peak usage, reflecting the productivity of preferred feeding areas or disturbance pressures (Allen *et al.* 2003).

F.88 Low Tide Counts of widespread teal peaked in January 2004, with Blacktoft, Broomfleet, Read's Island and Saltfleet all harbouring high concentrations.

Population trends and status

F.89 The number of teal on the SPA shows a high degree of inter-annual variation making interpretation of the underlying trend difficult; however, numbers recorded during recent winters have included some of the highest on record (Thaxter *et al.* 2010).

F.90 The most recent WeBS core counts recorded a five year peak mean of 3,710 individuals, representing an increase of 36% over the cited SPA population (Table F.1).

Horseshoe Point landfall site

F.91 No teal were recorded within the Horseshoe Point WeBS core count sector, although 34 birds were recorded in the adjacent sector, representing 1.5% of the cited SPA population (Table F.1) and 1.0% of the current SPA population. A larger number was recorded during low tide counts in sector MSF in December 2003, which peaked at 97 individuals. Teal was recorded on one occasion during cable landfall site surveys in 2011/12 (a flock of six birds in August), indicating that the locality is of little value to the species.

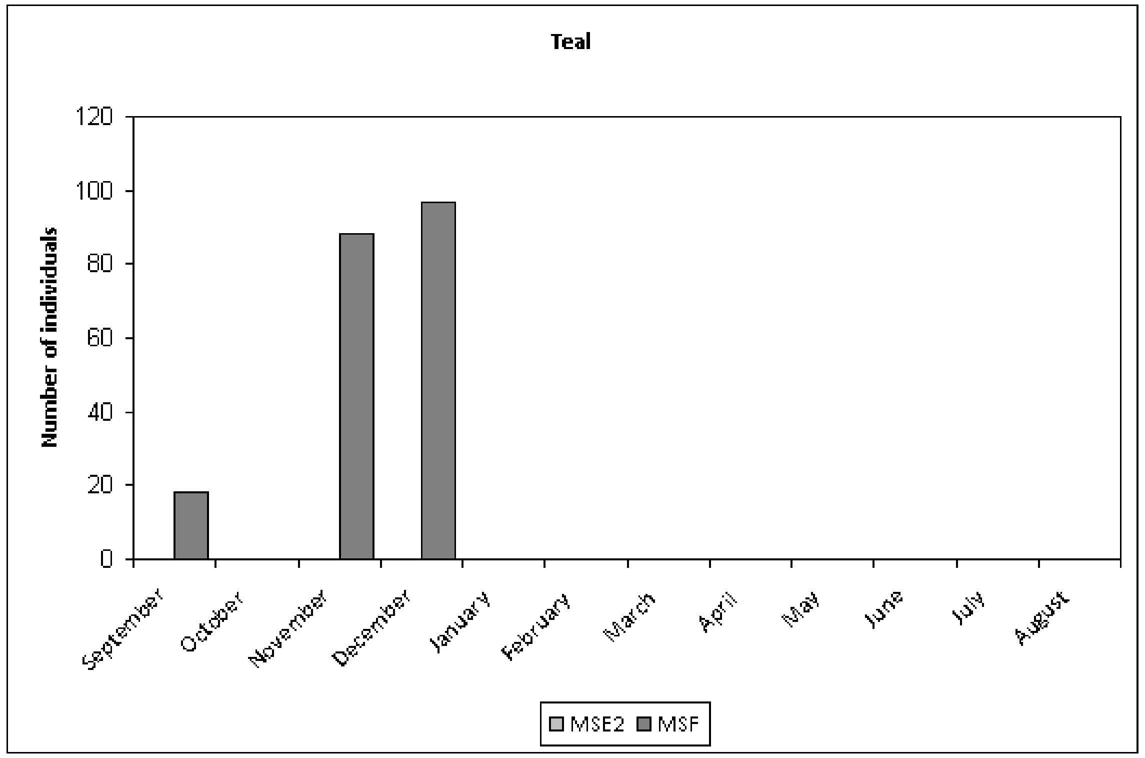


Figure F.31 Teal WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

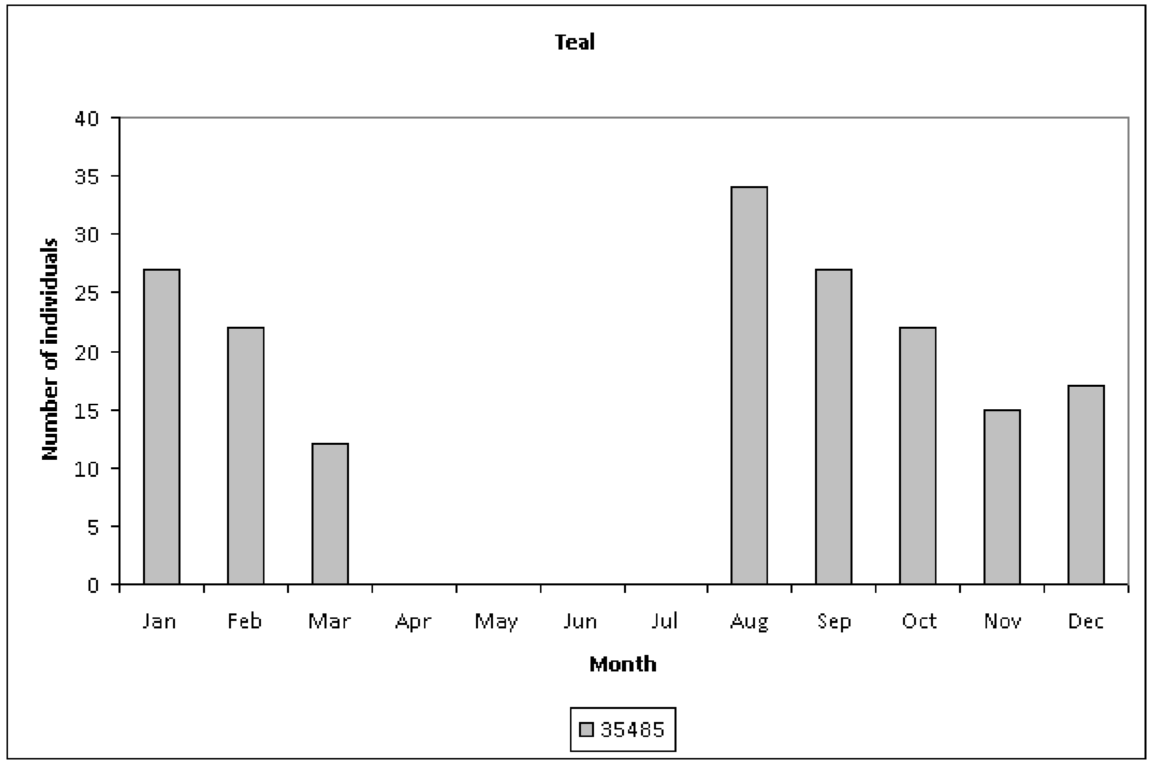


Figure F.32 Teal WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

Wigeon

Key Sites: Saltend to Spurn, Pyewipe and Read`s Island (Allen *et al.* 2003)

Seasonality

F.92 Wigeon are present in Britain from early September onwards, with a return passage from March to May. On the Humber, peak maxima are usually encountered during the November to January period, although the timing of the peak period can depend on external factors such as weather conditions in the region (Allen *et al.* 2003).

Distribution

F.93 Wigeon are generally concentrated on a small number of sites within the estuary, with the main concentrations at the Faxfleet to Brough reach, Whitton Sands and Alkborough Flats. A key feeding site is the Broomfleet Island frontage which can feature grazing flocks of over 6,000 birds during the November to January period. A further concentration of around 500 wigeon occurs in the middle/outer estuary on the Cherry Cobb and Welwick reaches, where there are areas of saltmarsh as well as extensive mudflats (Catley, 2000).

F.94 During low tide WeBS counts in 2003/04, wigeon were distributed over the whole estuary, with the greatest densities found in the Blacktoft / Broomfleet area and at Read's Island.

Population trends and status

F.95 Although wigeon numbers within the SPA have been relatively stable since the late 1980s, lower numbers have been recorded during more recent winters (Thaxter *et al.* 2010). Accordingly, a Medium WeBS alert has been triggered for the long-term. As the species' population has increased the proportion supported by the Humber Estuary SPA has declined steadily, possibly due to the SPA being close to the maximum capacity for this species.

F.96 An estimate of population in the Humber Estuary was not available in Holt *et al.* (2011) but it is evident that numbers have dropped below 1% of the national population.

Horseshoe Point landfall site

F.97 No wigeon were recorded during WeBS core counts within the Horseshoe Point sector, although the adjacent sector recorded a five year peak count of 41 birds, or 0.8% of the cited SPA population (Table F.2). During low tide counts in 2003/04, a peak of 300 birds was recorded in sector MSF in October 2003, 6% of the cited SPA population. Surveys at the cable landfall site recorded a peak of 13 birds in February 2012, or 0.3% of the cited SPA population, with the species absent during all other surveys. Despite a reduction in SPA numbers, the area is unlikely to be important for the species.

Figure F.33 Wigeon WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

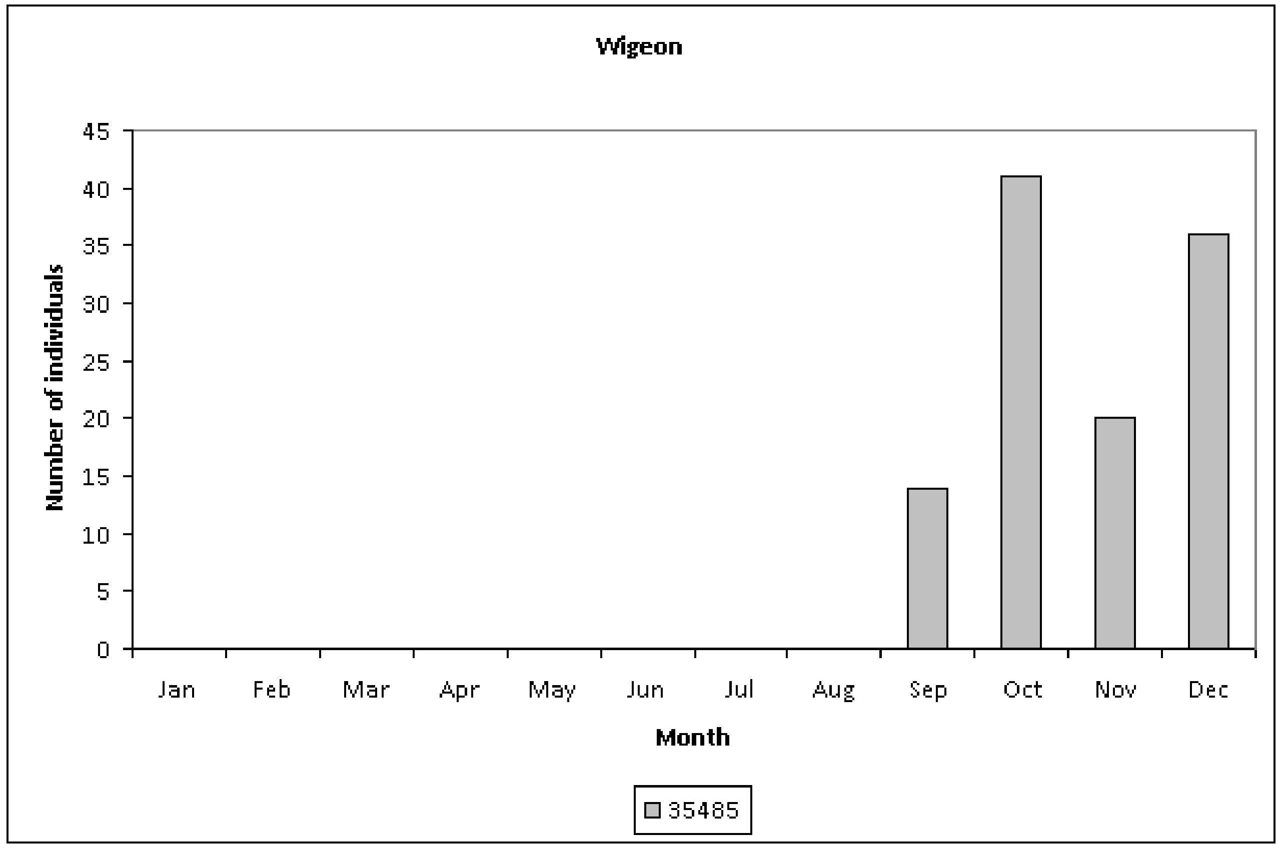


Figure F.34 Wigeon WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

Mallard

Key Sites: Saltend to Spurn, New Holland to Pyewipe, Upper Humber Wildfowl Refuge (Allen *et al.* 2003).

Seasonality

F.98 Mallard is present on the Humber all year round, but with peak maxima achieved during the mid winter period. In general, birds depart during the late winter and early spring onto inland breeding sites. A return of non-breeders and some eclipse males usually occurs during the summer, with the main influx occurring during August and into September. Thereafter numbers decline and stabilise over the early to mid winter period.

F.99 A small number of mallard territories were recorded within the cable route survey area during breeding bird surveys in 2011, but it is unlikely that any associated works would significantly affect the SPA wintering population which is much larger.

Distribution

F.100 The species breeds on or adjacent to wetland areas, including lakes, pools and drainage dykes along the estuary. In winter, WeBS data for the estuary show that the species is present along most reaches, but is most commonly recorded in the mid to outer estuary, particularly on the north bank The outer estuary and coastal margin is not particularly important for the species, supporting around 200 birds along the coast as far south as Saltfleetby (Allen *et al.* 2003).

F.101 Low tide counts in 2003/04 showed that mallards were present in all areas of the estuary. A sector peak maximum of 247 individuals (ISJ-North Killingholme Haven to South Killingholme Haven) was recorded in June 2004, with an overall peak of 952 birds in the Humber Estuary, mainly the inner sections (Mander and Cutts, 2005). It is suspected that the influx of eclipse birds and juveniles from adjacent waters to the estuary contributed to the large increase noted in June.

Population trends and status

F.102 The number of mallard over-wintering in the SPA has declined sharply since the late 1980s, and so a WeBS High-Alert has been triggered for the long-term and a Medium-Alert for the period since designation (Thaxter *et al.* 2010). The SPA decline has been more rapid than at a regional and national level, suggesting site-specific pressures cannot be ruled out.

F.103 The most recent WeBS core counts for the Humber Estuary have shown a 19% decrease since SPA citation (Table F.1).

Horseshoe Point landfall site

F.104 Numbers of mallard recorded during WeBS core counts and low tide counts were generally low, with a peak of 45 birds in December in the adjacent core count sector (1.8% of the cited SPA population). Only two individuals were recorded within the Horseshoe Point core count sector, with a peak count of three birds during the 2011/12 cable landfall surveys (0.1% of the cited SPA population). The area is likely to be of little importance to the species.

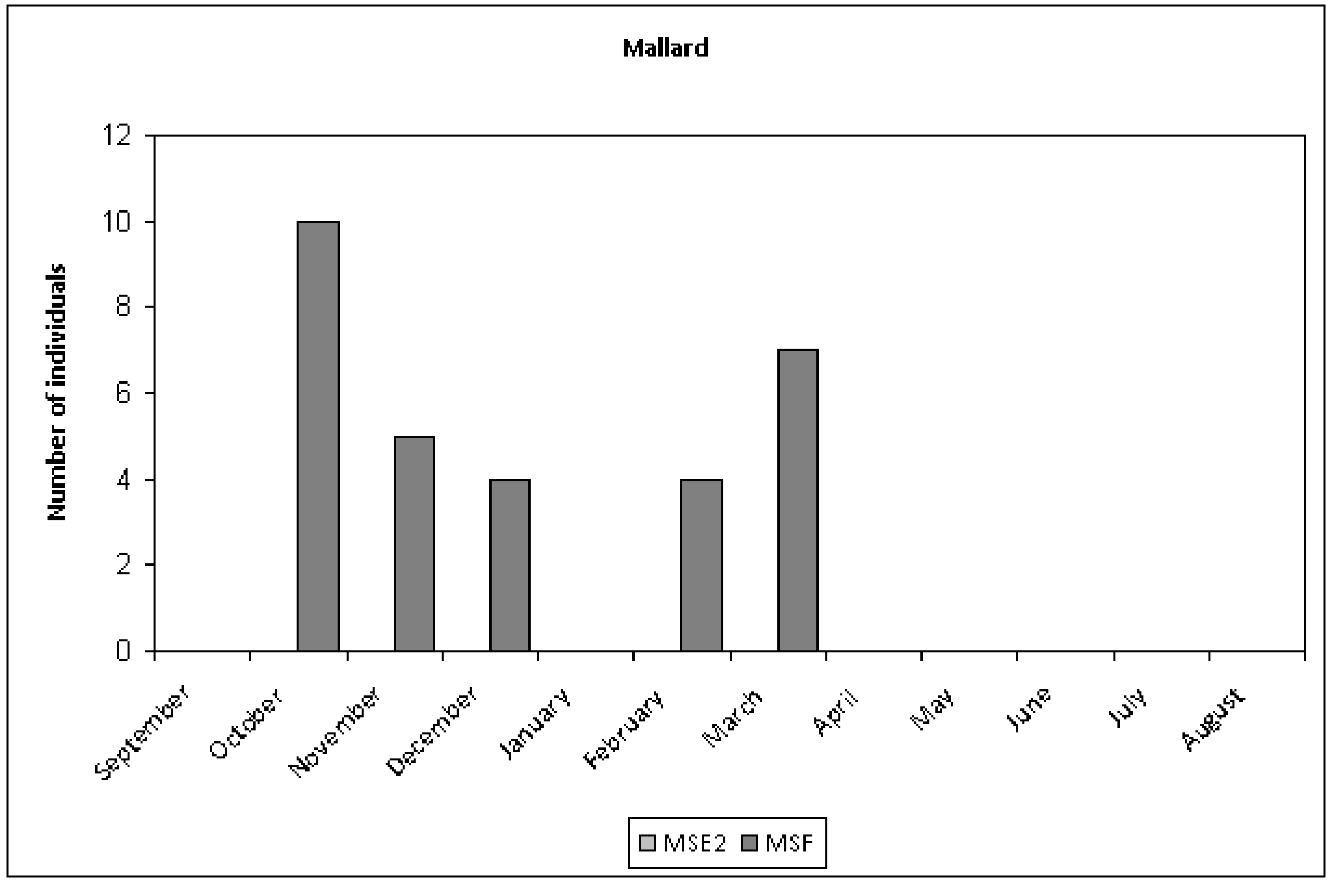


Figure F.35 Mallard WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

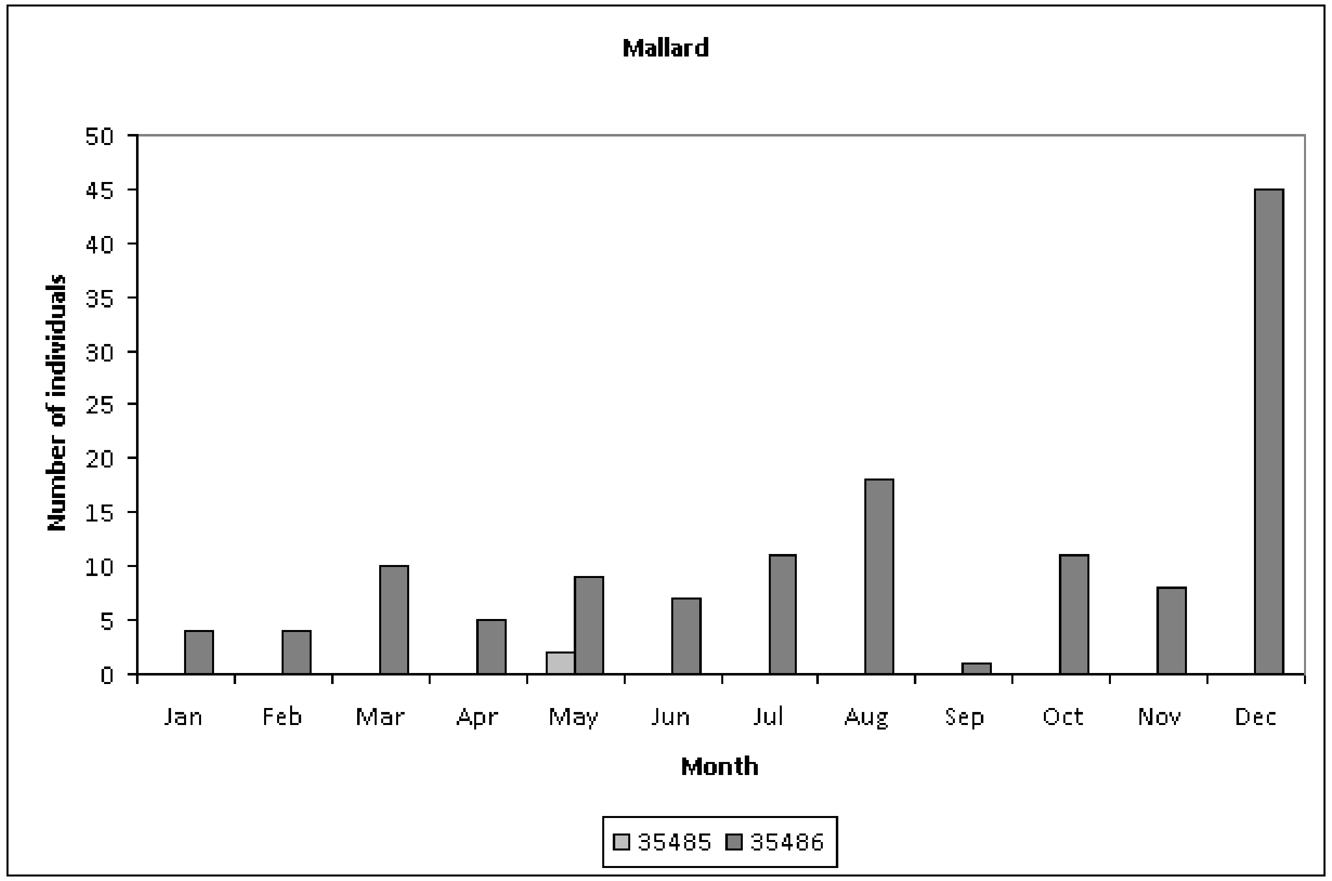


Figure F.36 Mallard WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

Turnstone

Key Sites: Barton to Goxhill, Hessle to Hull including Hull frontage and Pyewipe to Northcoates (Allen *et al.* 2003).

Seasonality

F.105 Autumn turnstone passage commences in mid July with the main arrival occurring in August. The numbers of birds in the Humber increase gradually throughout the early part of the winter, with numbers then undergoing a decline in mid winter, but building up again in March with birds returning to their breeding grounds in Greenland and Canada (Catley, 2000).

Distribution

F.106 The species is associated at low tide with stony, seaweed-covered areas and coarse sandy beaches. The majority of the Humber population is located on the upper estuary and on the outer estuary between Pyewipe and Northcoates. At high water the area from Goxhill to Barrow in the upper estuary held the greatest concentration of roosting birds although it is likely that roost activity on the estuary is under-recorded as the species often uses derelict industrial areas (Catley, 2000).

F.107 Numbers of turnstone reported during low tide counts in 2003/04 were higher than those recorded on corresponding core counts, with a peak of 723 in December. The highest densities were found between Goxhill and New Holland.

Population trends and status

F.108 This species was not included in Thaxter et al's (2010) WeBS Alert report for the Humber Estuary. However, a five year mean peak of the most recent WeBS core counts across the estuary recorded 553 birds in November. This represents a decrease of 12% from the cited SPA population, suggesting that the population has remained relatively stable, at least since the turn of the century.

Horseshoe Point landfall site

F.109 No turnstones were recorded during WeBS core counts within the Horseshoe Point sector, although the adjacent Grainthorpe Haven sector recorded a peak of 38 individuals in November (6% of the cited SPA population). Numbers were generally low throughout the year however, particularly in midwinter and midsummer. Low tide counts recorded similar numbers, with a peak of 27 birds in both August 2003 and January 2004 in sector MSE2.

F.110 Surveys at the cable landfall site in 2011/12 recorded slightly higher numbers in late October 2011, with a peak flock size of 87 birds representing 14% of the cited SPA population. This appeared to be a brief passage occurrence however, as turnstones were recorded only on one other survey (eight individuals in late November). Observations occurred around mean high water mark on rising tides.

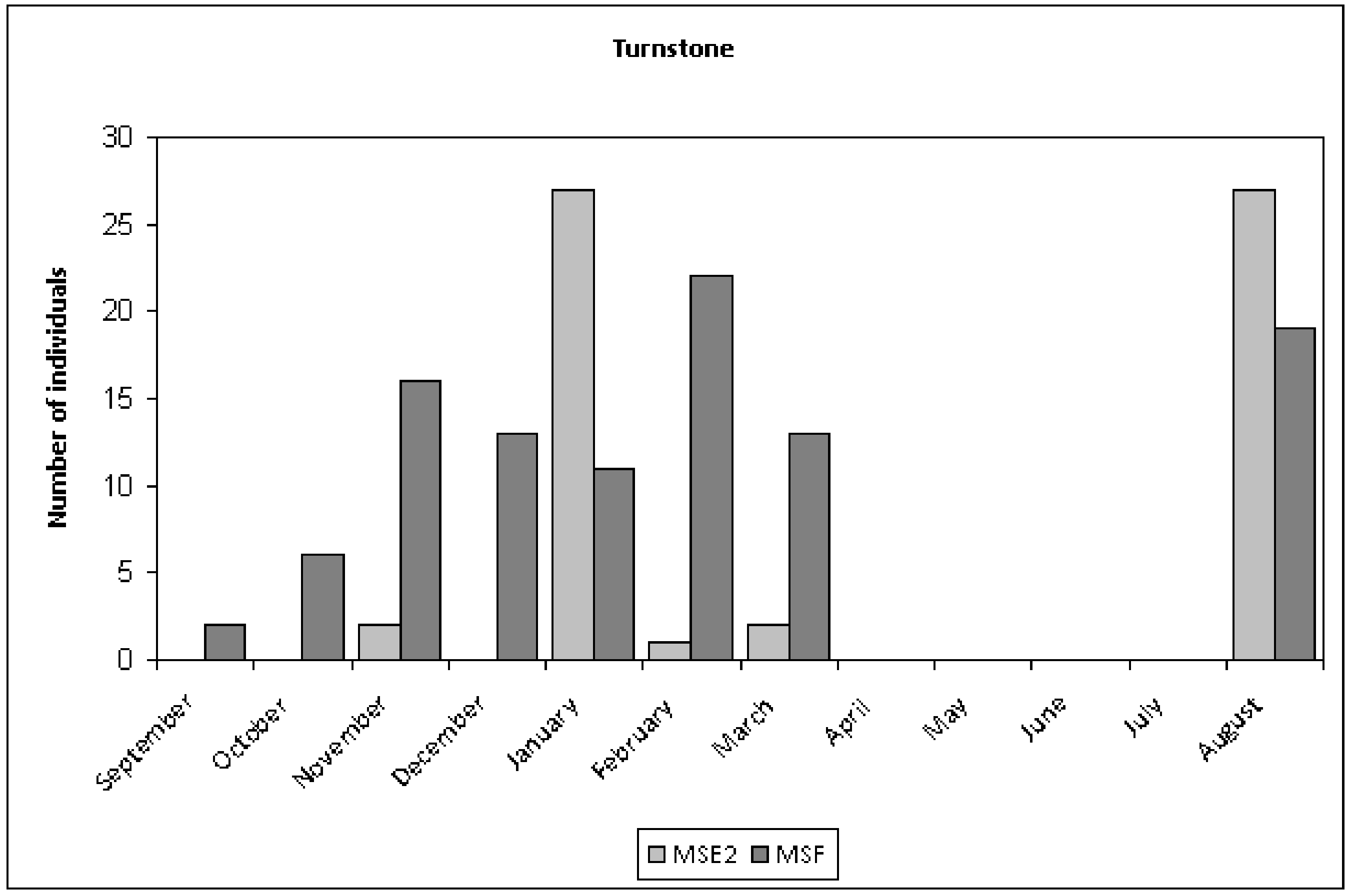


Figure F.37 Turnstone WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

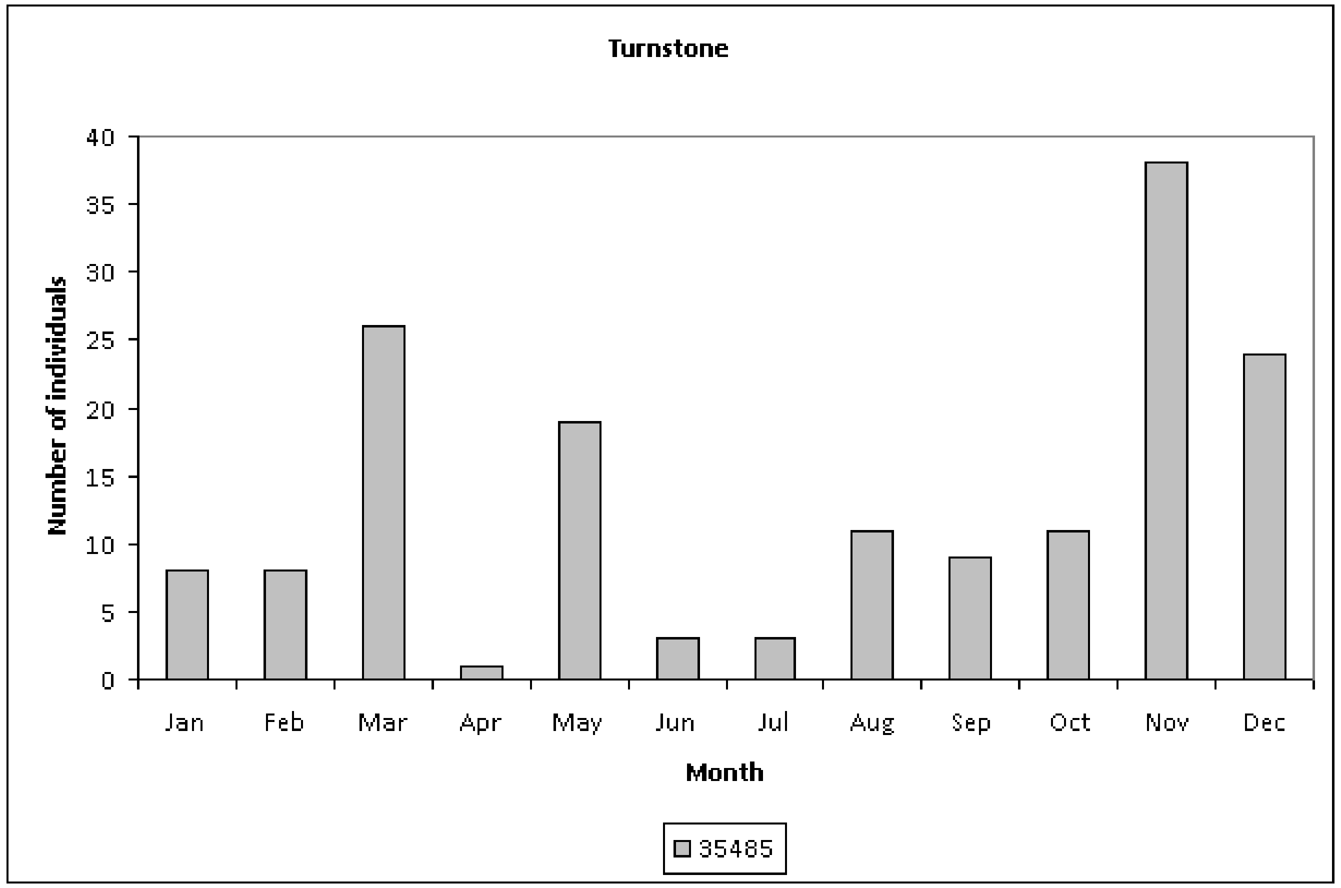


Figure F.38 Turnstone WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

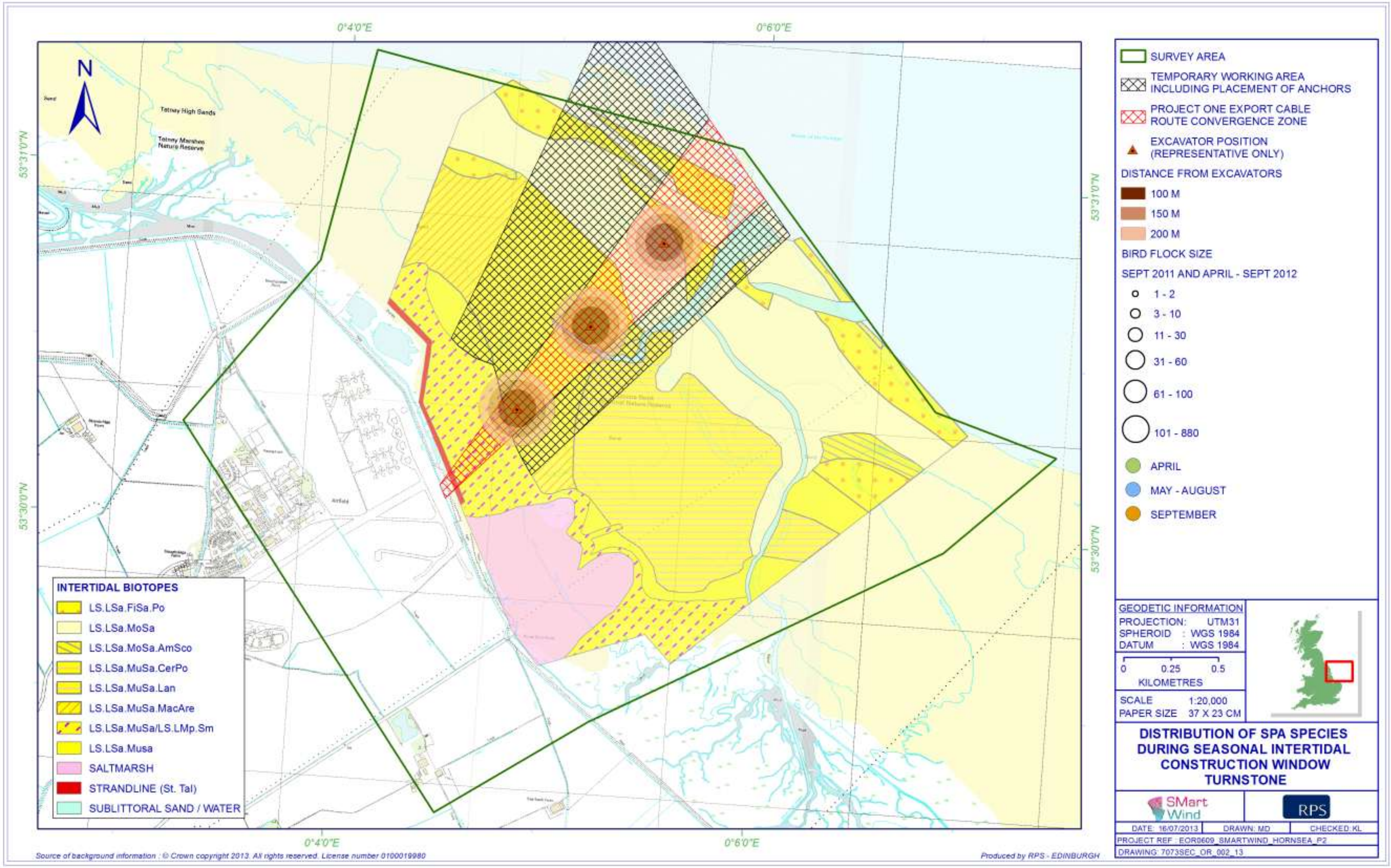


Figure F.39 Turnstone raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Pochard

Key Sites: On the Inner Humber from Chowder Ness to Goxhill Haven (Allen *et al.* 2003).

Seasonality

F.111 The first autumn arrivals of pochard appear in late September, gathering through October into December and invariably peak in January or February. The main departure is generally in March with relatively few birds remaining into April (Allen *et al.* 2003).

Distribution

F.112 On the Humber Estuary the majority of birds can be found between in the upper Humber. The major feeding site on the Humber is at WeBS sector ISG (New Holland Pier to Goxhill Skitter). Roosting and loafing takes place as far down the estuary as Immingham (Allen *et al.* 2003).

F.113 Small numbers of pochard were found at Goxhill Haven during low tide counts in January 2004, though this species is recorded in far greater numbers on Core Counts.

Population trends and status

F.114 Numbers of pochard over-wintering on the SPA increased to high levels in the mid-1990s, and they have since returned to more typical levels. Accordingly, WeBS High-Alerts have been triggered for the medium-term and for the period since designation (Thaxter *et al.* 2010). However, since there has been a decline from an atypically high period this population should not be considered for concern.

Horseshoe Point landfall site

F.115 The area around Horseshoe Point is evidently not important for the species, as no observations were recorded during any WeBS core or low tide counts, or during targeted cable landfall site surveys in 2011/12 (Table F.2 and Table F.3).

Greater Scaup

Key Sites: Spurn Bight and New Holland (Allen *et al.* 2003).

Seasonality

F.116 Flocks in the Humber Estuary start arriving in October, generally reaching a peak in the late winter. However, this is subject to weather conditions and the highest numbers usually coincide with periods of harsh wintry weather (Musgrove *et al.* 2001). Most birds have left the estuary by April.

Distribution

F.117 The principal scaup wintering grounds are around the mouth of the estuary off Spurn Bight and also at New Holland (Catley, 2000).

Population trends and status

F.118 Large fluctuations occur on the Humber from one year to another but the status of scaup within the estuary appears to have remained fairly constant this century (Allen *et al.* 2003). The estuary qualified as being nationally important for the species on the basis of two large influxes in the winter of 1995/1996 and 1996/1997 (353 and 394 birds). However subsequent yearly maxima have been lower and it is likely that the site does not reach such status in an average year (Allen *et al.* 2003).

F.119 The most recent WeBS core count five year peak mean total of fewer than 50 birds represents at least a 61% decline since the SPA citation date, although this may reflect the large fluctuations of the population between years, rather than the species' long-term status within the estuary.

Horseshoe Point landfall site

F.120 The area around Horseshoe Point is evidently not important for the species, as no observations were recorded during any WeBS core or low tide counts, or during targeted cable landfall site surveys in 2011/12 (Table F.2 and Table F.3).

Dark-Bellied Brent Goose

Key Sites: Spurn Bight, Grainthorpe and Saltfleetby (Allen *et al.* 2003)

Seasonality

F.121 The main passage arrivals of dark-bellied brent goose take place in October and November with peak numbers usually present in December-February. Numbers fall rapidly by March (Allen *et al.* 2003).

Distribution

F.122 Dark-bellied brent geese feed over mudflats rich in Zostera and Enteromorpha and occur almost exclusively on the outer estuary, principally along the southern shore from Cleethorpes to Saltfleetby (Cruickshanks *et al.* 2010). Large concentrations occur in the Grainthorpe and Saltfleetby areas during the winter (Allen *et al.* 2003). Birds will also feed and roost on inland areas on arable fields (Catley, 2000). It is suggested that a greater usage of farmland during December through to February following depletion of the intertidal food resource may occur (Allen *et al.* 2003). Eco Surveys (1991) reported interchanges between intertidal and inland fields due to human disturbance in both habitats. Along the Lincolnshire coast, flocks move off the intertidal flats to roost in the havens (Allen *et al.* 2003).

F.123 Low tide WeBS counts recorded dark-bellied brent geese in nationally important numbers during 2003/04 concentrated on the shore between Humberston and Mablethorpe. The highest density was typically at Grainthorpe Haven, with lesser numbers in Spurn Bight.

Population trends and status

F.124 In recent winters, numbers of dark-bellied brent goose on the Humber Estuary SPA have been at some of the highest values recorded (Thaxter *et al.* 2010). A WeBS core count five year peak mean of 4,586 individuals in January within the Humber represents an increase of 119% over the cited SPA population (Table F.1), indicating that the SPA population is in favourable condition.

Horseshoe Point landfall site

F.125 High numbers of birds have been recorded during WeBS core counts in January, with a five year peak mean of 1,130 individuals. This represents over 50% of the cited SPA population, although around 25% of the more recent estimate. Even higher numbers have been recorded on the adjacent WeBS sector in February (over 2,500 individuals).

F.126 During surveys in 2011/12 at the cable landfall site the species was present throughout the winter, and a peak flock size of 835 individuals was recorded at low tide in March 2012, with a similar peak in January (Table F.3), representing around 40% of the cited SPA population and 18% of the likely current population. Birds were recorded mainly close to land on the mudflats.

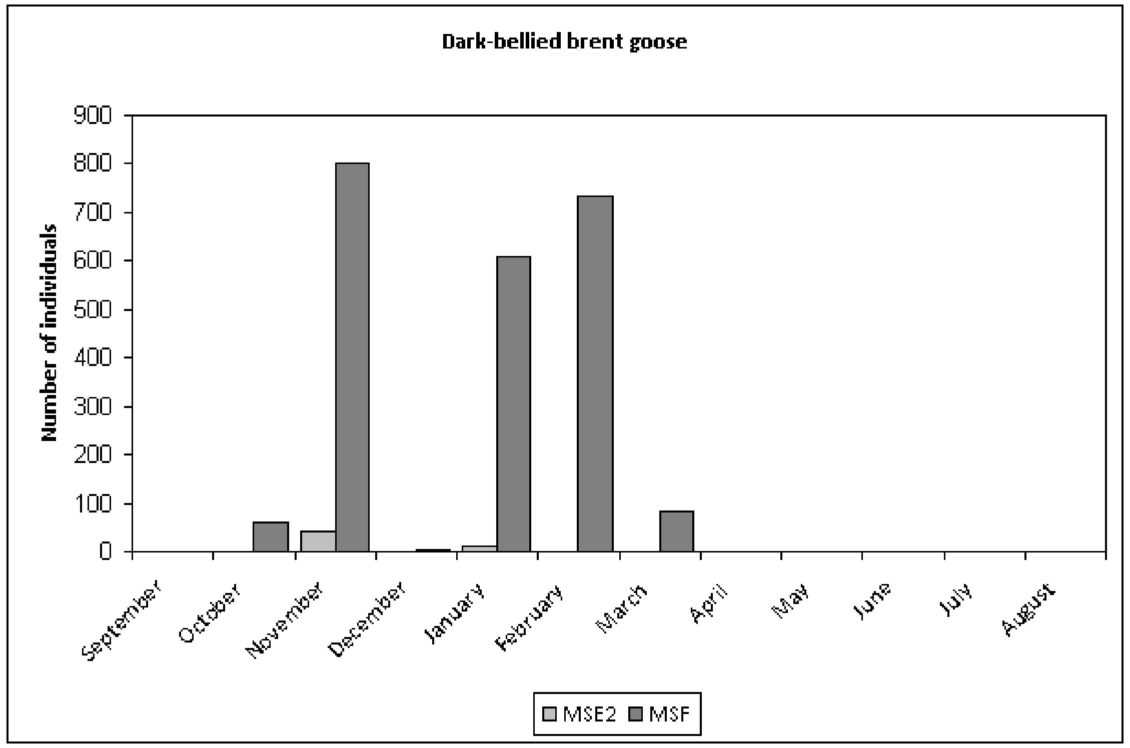


Figure F.40 Dark-bellied brent goose WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

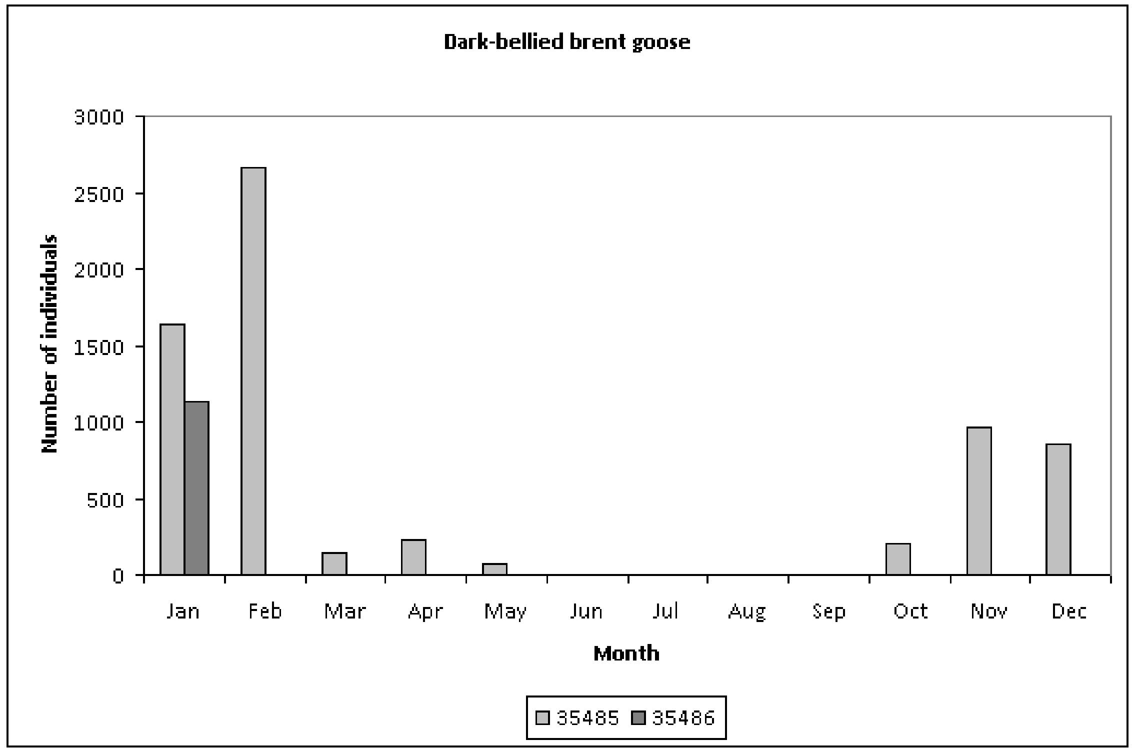


Figure F.41 Dark-bellied brent goose WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

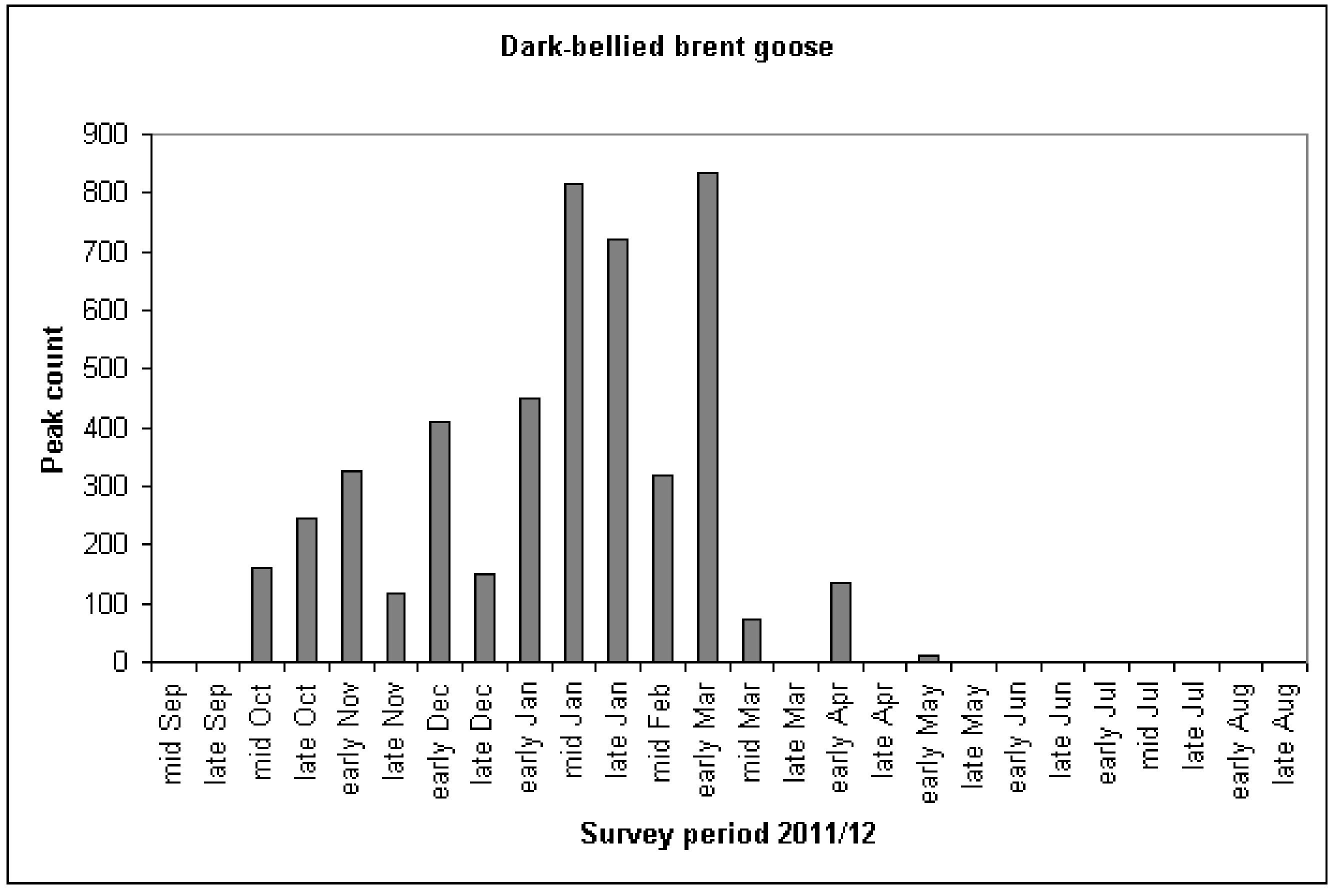


Figure F.42 Dark-bellied brent goose peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

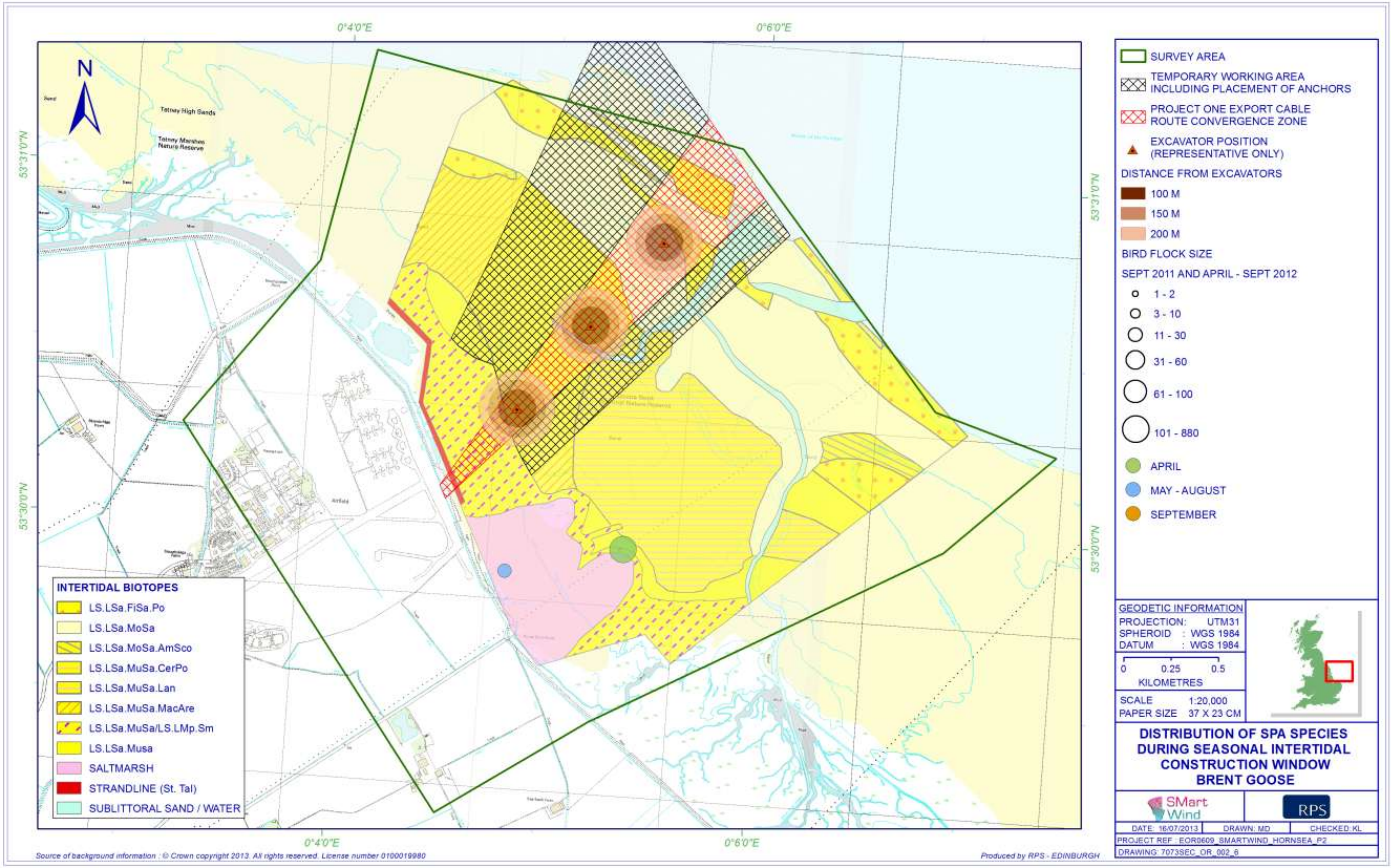


Figure F.43 Dark-bellied brent goose raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Goldeneye

Key Sites: Chowder Ness to Goxhill Haven (Allen *et al.* 2003).

Seasonality

F.127 Numbers of goldeneye tend not to build up until late November or even early December and winter peak counts are usually recorded in either December or January with a rapid decline in numbers through February (Catley, 2000).

Distribution

F.128 In the Humber Estuary the section of shoreline most favoured by goldeneye is from Chowder Ness to Goxhill Haven, but large concentrations occur from New Holland pier to Goxhill Haven in the middle estuary (Allen *et al.* 2003). The majority of feeding takes place from east of New Holland pier to Goxhill Haven but on some occasions on the falling tide groups of birds drift down the estuary as far as East Halton Skitter (Catley, 2000). Key roosting sites appear to be similar to feeding areas, and birds tend to drift down the estuary and fly back onto the feeding ground. A low tide count of 54 goldeneye was recorded in January 2004 at the New Holland jetty (Mander and Cutts, 2005).

Population trends and status

F.129 Numbers of goldeneye on the Humber Estuary SPA have remained relatively stable since the late-1990s despite a distinct decline in the WeBS regional and national totals, suggesting that this SPA population remains in a relatively favourable state. There was however a recorded decline in goldeneye numbers by 21% between most recent five year peak mean WeBS core counts within the estuary compared to the cited SPA population (Table F.1).

Horseshoe Point landfall site

F.130 The area around Horseshoe Point is evidently not important for the species, as no observations were recorded during any WeBS core or low tide counts, or during targeted cable landfall site surveys in 2011/12 (Table F.2 and Table F.3).

Sanderling

Key Sites: Spurn and intertidal flats between Grimsby Tower and Grainthorpe Haven (Allen *et al.* 2003).

Seasonality

F.131 There are two peaks per year in the number of Sanderling which coincide with spring and autumn passage. They arrive on the Humber Estuary from July onwards and numbers increase rapidly, peaking in August (Allen *et al.* 2003). There is a subsequent reduction in numbers to a relatively small wintering population. Spring passage occurs in April and May and is less pronounced, partly because of its extended duration, but also because the northward migration is predominantly along the west coast of Britain (Allen *et al.* 2003). Spring passages can however occur in large numbers in some years, particularly on the south shore of the estuary.

Distribution

F.132 Sanderling tend to occur on sandy substrates and feed at the water's edge and are largely restricted to the outer southern shore of the estuary. Large numbers are found from Humberston to Cleethorpes, at Tetney Marshes and along the northern shore of Spurn Peninsula (Cruickshanks *et al.* 2010). The area between Grimsby Tower and Grainthorpe Haven is important for feeding birds (Catley, 2000).

F.133 Regular high tide roosts are concentrated at Cleethorpes and Spurn. In August 1999 these two sectors supported almost the entire Humber population at high tide (Catley, 2000). Tasker & Milsom (1979) noted that disturbed sanderling move between the south shore and north shore on some occasions.

Population trends and status

F.134 Sanderling numbers within the SPA have been declining steadily since a peak in the late 1980s / early 1990s. Accordingly, WeBS Medium-Alerts have been triggered for short- and medium-terms and for the period since designation (Thaxter *et al.* 2010). In contrast both regional and national WeBS totals have been increasing throughout the period being reported, suggesting that declines may be site-specific.

F.135 The most recent five year peak mean WeBS core counts within the Humber Estuary recorded 970 birds in August, which represents an increase of 19% over the cited SPA passage population (Table F.1), showing that numbers may have stabilized in recent years.

Horseshoe Point landfall site

F.136 NE reported that there is normally a concentration of roosting sanderling close to the shore directly to the north of the cable landfall site in May. Accordingly, the Horseshoe Point WeBS core count sector recorded a peak of 158 birds in May 2010, which is 19% of the cited SPA passage population. Numbers were low in the adjacent Grainthorpe Haven WeBS sector, peaking at 54 birds in February.

F.137 Numbers recorded during low tide counts were lower still, peaking at 26 birds in February 2004, although this may reflect the methods and timing of the surveys in relation to species behaviour.

F.138 During surveys in 2011/12 at the cable landfall site, a peak flock size of 150 birds was recorded in early January, which represents 31% of the cited wintering SPA population, or 18% of the passage population. Smaller peaks were recorded in late October and mid February (98 and 80 individuals respectively), and the species was recorded only sporadically in small numbers for the remainder of the survey period, including May. Most individuals were recorded below mean high water at low and rising tides.

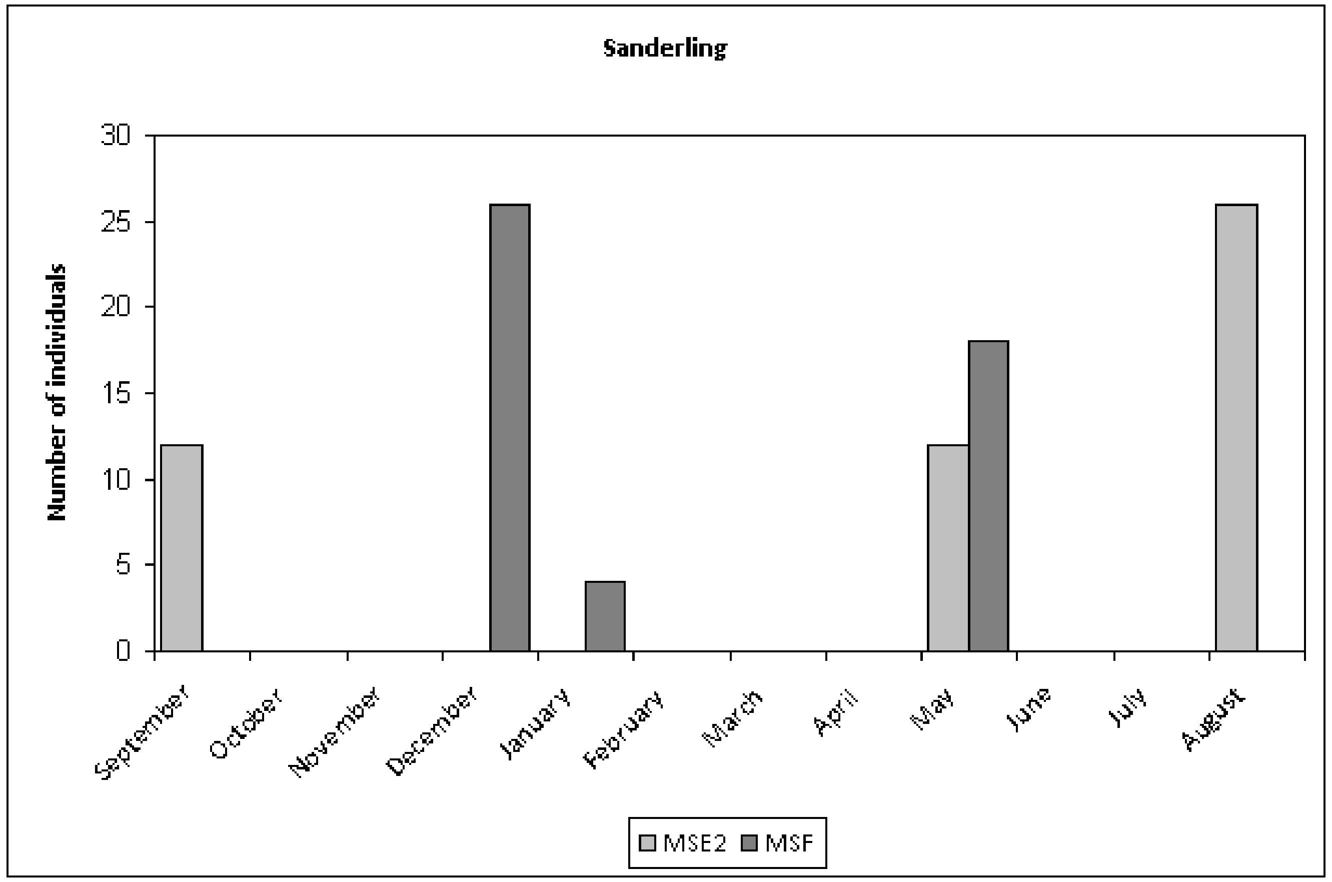


Figure F.44 Sanderling WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

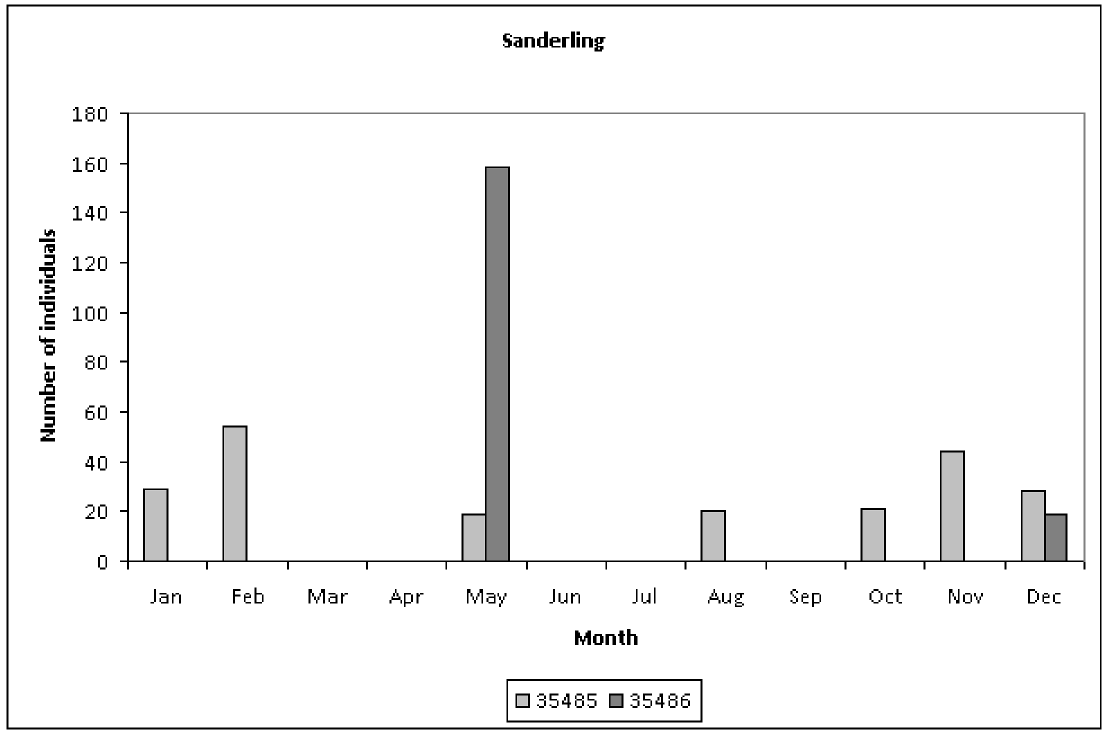


Figure F.45 Sanderling WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horsethorpe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

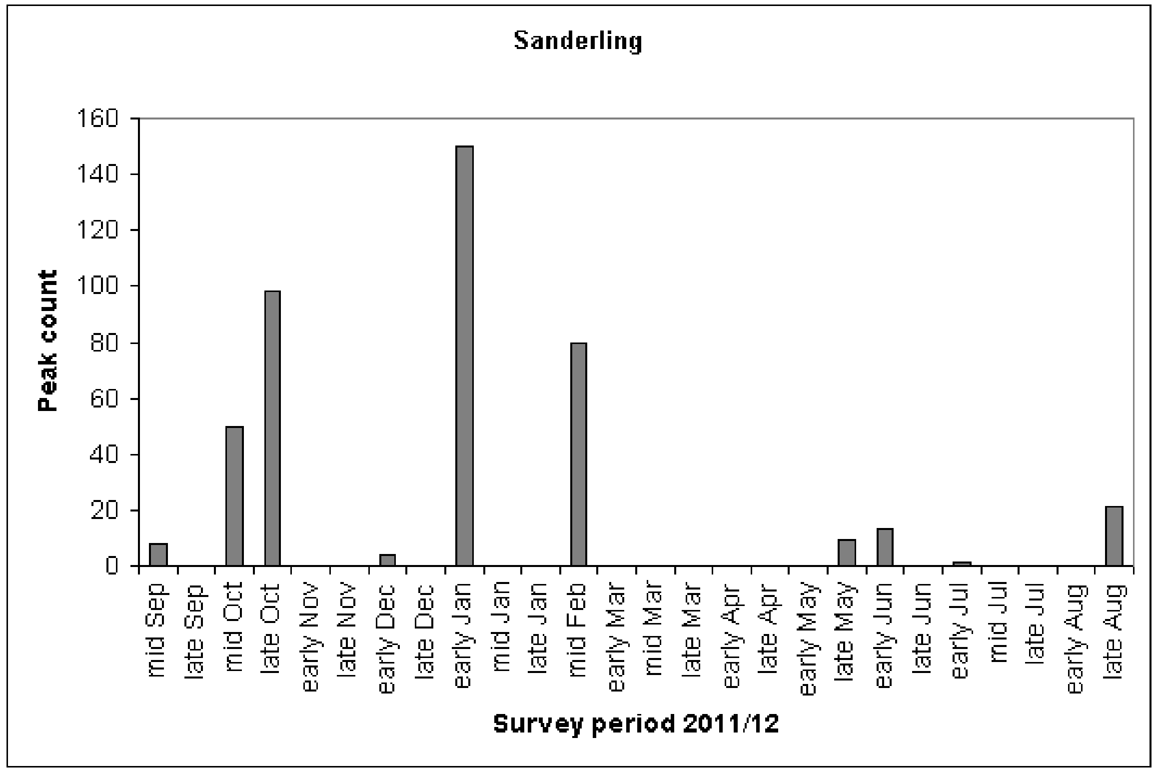


Figure F.46 Sanderling peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

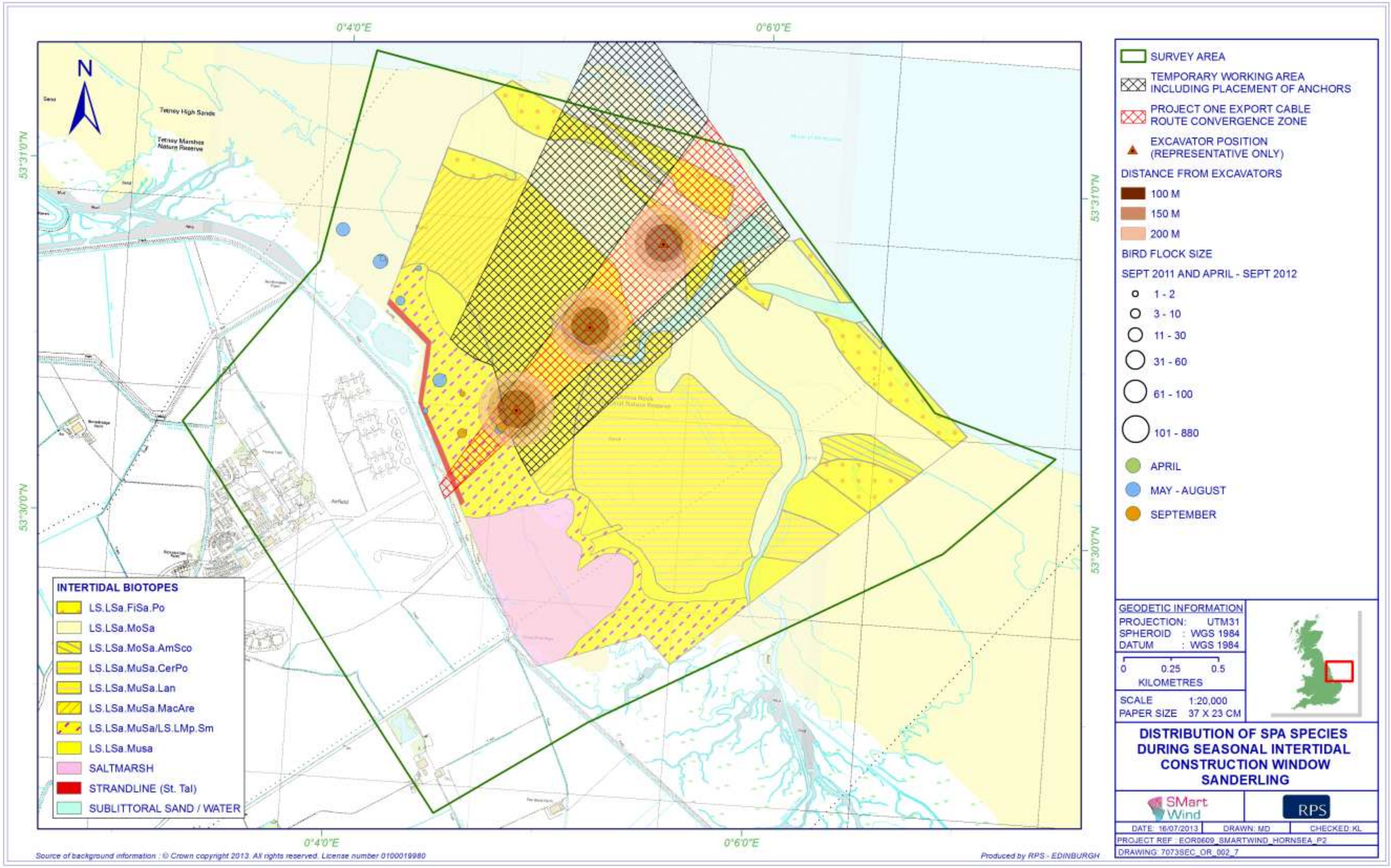


Figure F.47 Sanderling raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Ringed Plover

Key Sites: Pyewipe, Saltend and Cleethorpes to Buck Beck (Allen *et al.* 2003).

Seasonality

F.139 Ringed plover use the Humber in large numbers during migration periods, with a smaller wintering population and only a few breeding pairs (Allen *et al.* 2003). Migration through the estuary commences in mid July and continues into early October, although wintering birds begin to arrive in November. Spring migration starts in late April, peaks in mid to late May, with some movement still recorded in early to mid June (Catley, 2000).

Distribution

F.140 The principal breeding site, with more than 30 pairs in 1999, was the Spurn area (Catley, 2000). Occasional pairs breed elsewhere on the estuary where conditions are suitable, including artificial habitats such as extensive gravelled areas (e.g. Saltend Chemical Works).

F.141 Four main roosts in the Humber Estuary were identified by Catley (2000), within the following sectors: Pyewipe to Buck Beck, Cleethorpes to Humberston Fitties, Whitton to Chowderness and Spurn Bight. Small roosts can also be found on flood banks and adjacent arable fields around the estuary as well as on derelict industrial sites.

F.142 Feeding distribution within the estuary changes with the seasons. Many sectors support a feeding wintering population while some hold important numbers during passage. Wintering birds favour the intertidal area between Pyewipe and Buck Beck (north of the cable route area), with this area also being an important site in the autumn. Further out on the south shore, large numbers of ringed plover occur during spring passage (Allen *et al.* 2003).

F.143 Ringed plover favoured the traditionally preferred Pyewipe area during low tide counts in 2003/04, although they were found widely in smaller numbers. In June 2004, a sector peak maximum of 24 individuals (MSE2- Tetney Haven to Horseshoe Pt) was recorded, with an overall peak of 79 birds in the Humber Estuary (Mander and Cutts, 2005). It is suggested that a large majority of the Humber population during the June count is made up of breeding birds.

Population trends and status

F.144 Numbers of ringed plover within the SPA have undergone a steep decline since the turn of the century, and accordingly, short- and medium-term and since-designation Medium-Alerts have been triggered by WeBS (Thaxter *et al.* 2010). While site-specific pressures can not be ruled out, the decline in numbers is likely to have been driven largely by broader-scale changes.

F.145 Most recent WeBS core counts recorded a five year peak mean of 2,505 birds within the Humber Estuary in May, which is an increase of 42% over the cited SPA passage population. This shows that numbers within the SPA have stabilised and may be recovering to previous levels.

Horseshoe Point landfall site

F.146 A relatively high count of 778 birds was recorded within the Horseshoe Point WeBS core count sector in May 2010, representing 44% of the cited SPA passage population. There were no records in other months surveyed. In the adjacent Grainthorpe Haven sector the species was recorded in much lower numbers, with passage peaks of 54 birds in May and 31 birds in September. Low tide counts recorded a similar peak of 53 birds in August 2004 in sector MSE2.

F.147 Cable landfall site surveys in 2011/12 recorded ringed plovers on the majority of surveys during winter, although there was a peak count of 120 birds on autumn passage in September 2011. This represented 7% of the cited SPA passage population, and 5% of the most recent population estimate for the estuary, recorded in May. There were low levels of activity at all other times, with a peak spring passage movement count of 37 birds in early July 2012. Most records of ringed plover were above mean high water mark on the muddy substrates.

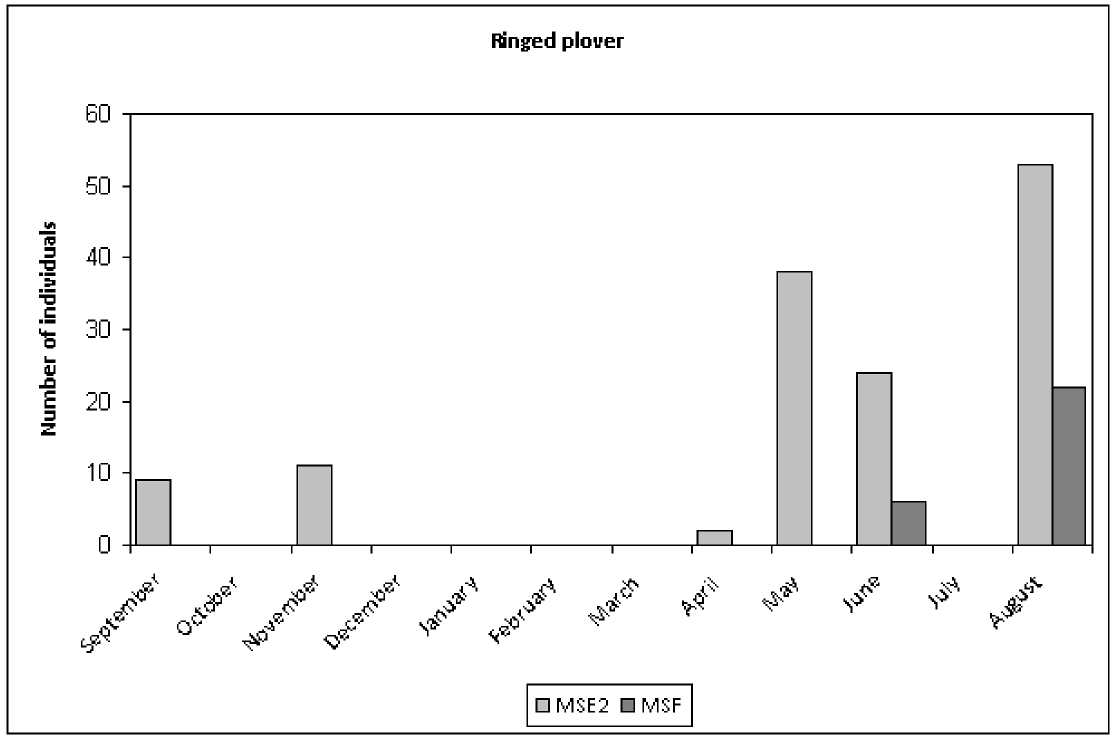


Figure F.48 Ringed plover WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

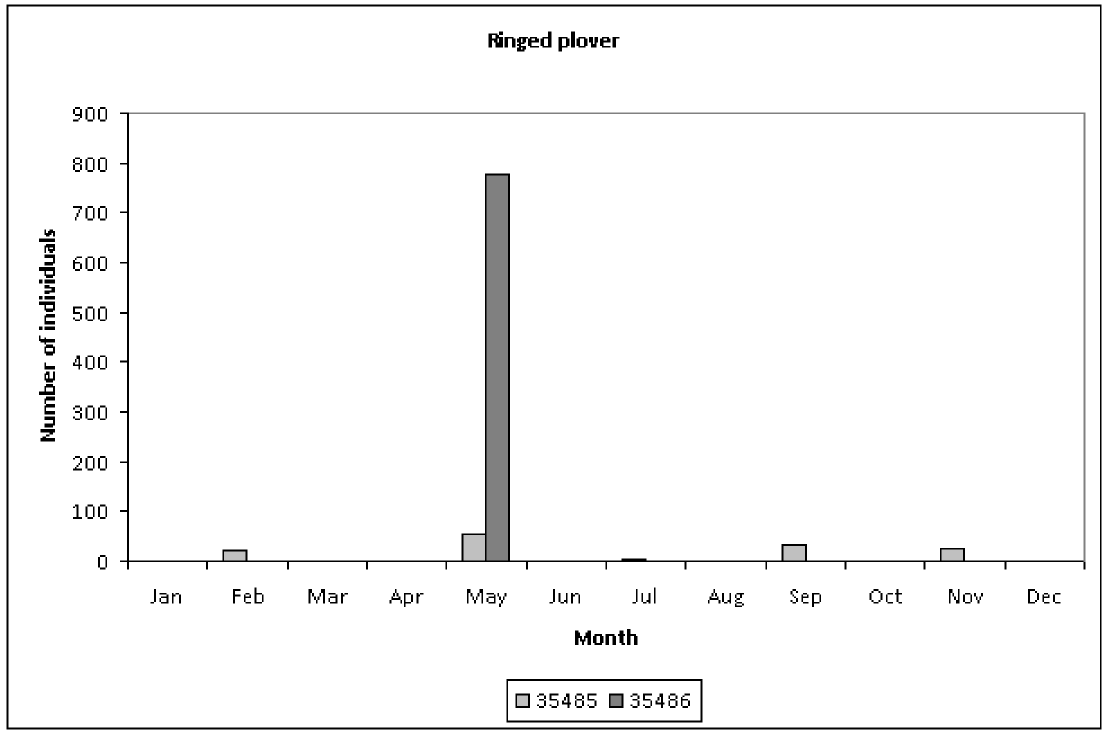


Figure F.49 Ringed plover WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

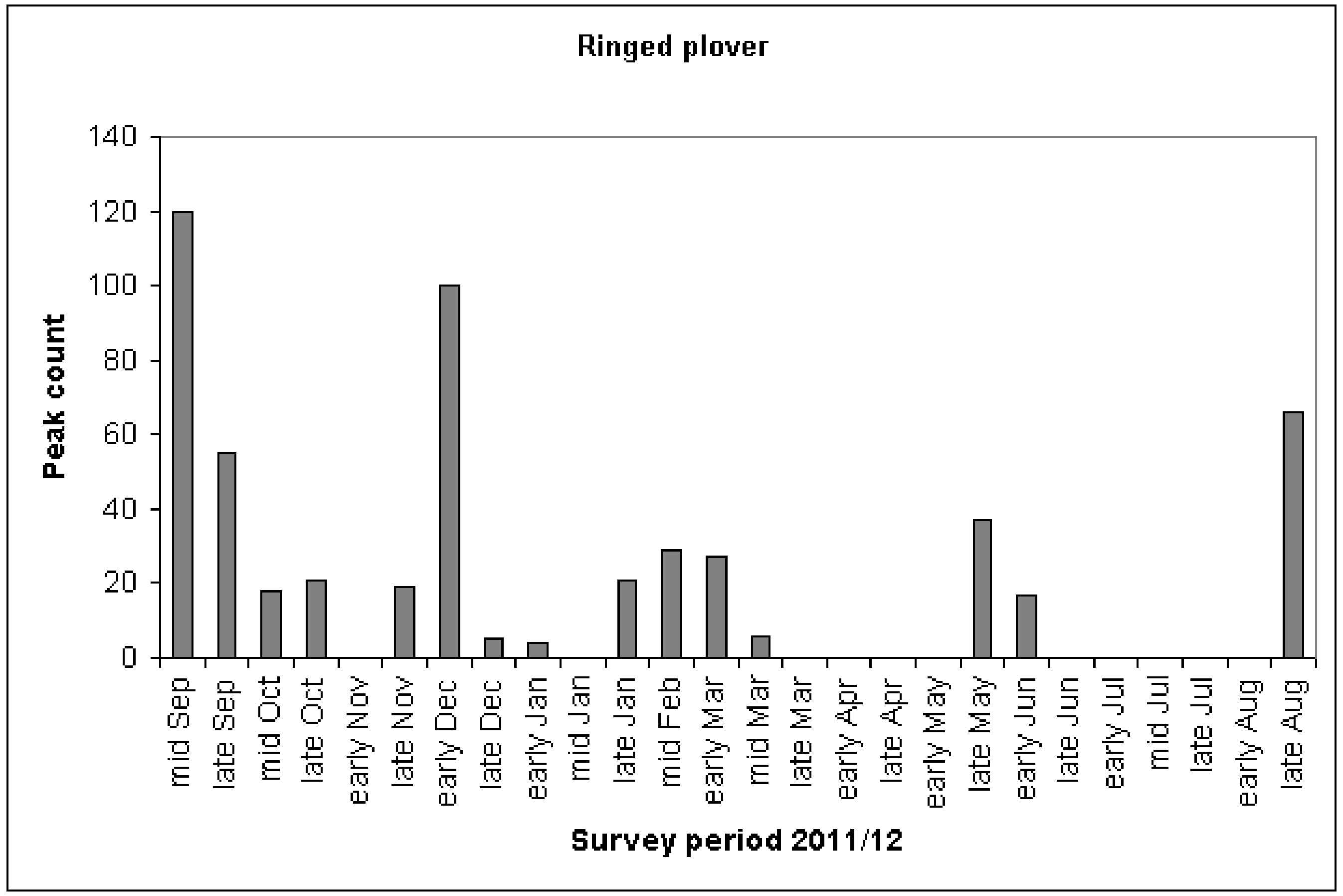


Figure F.50 Ringed plover peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

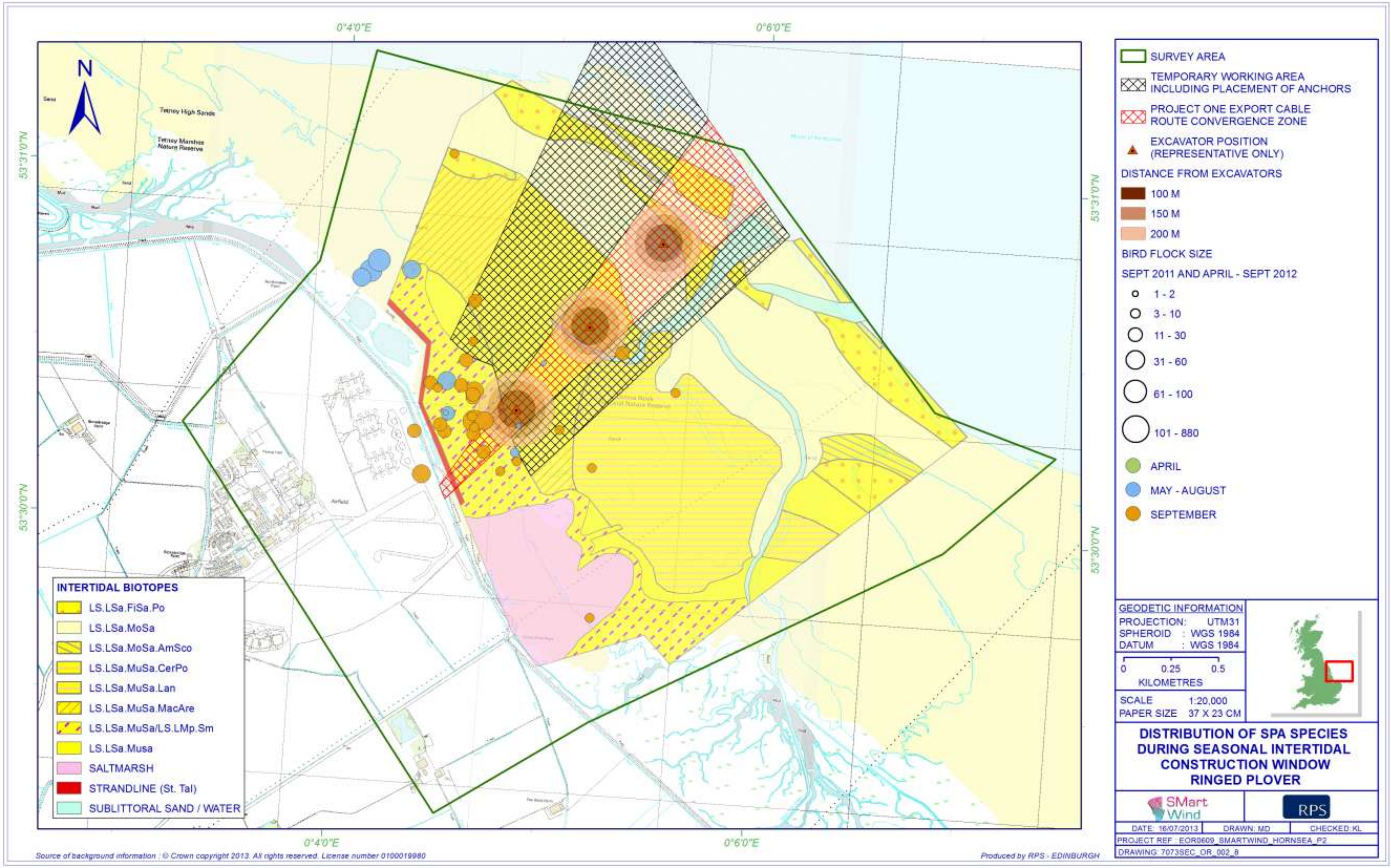


Figure F.51 Ringed plover raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Oystercatcher

Key Sites: Spurn Bight, Cleethorpes to Grainthorpe, Pyewipe, Cherry Cobb (Allen *et al.* 2003).

Seasonality

F.148 On the Humber Estuary an increase in numbers of oystercatcher occurs during September with a large influx arriving from the Wash (Allen *et al.* 2003). Overall numbers decrease slightly through the winter but small increases may occur during hard weather. A small summering and breeding population remains throughout May, June and July. A marked southerly passage of oystercatcher is regularly noted between July to September along the coast.

Distribution

F.149 Key roost sectors are located at Spurn, Northcoates and Cleethorpes throughout the year (Catley, 2000). Feeding distribution is closely linked to the distribution of key roosting sites, with birds tending to establish high tide roosts close to key feeding areas (Catley, 2000). The most important feeding areas throughout the year were located at Spurn and between Horse Shoe Point and Grainthorpe. These sites have supported up to 66% of the total population (Catley, 2000).

F.150 During low tide counts in 2003/04, oystercatchers were found mainly in the outer estuary on both shores with Spurn Bight, Grainthorpe Haven and the flats off Cleethorpes having the highest densities (Mander and Cutts, 2005).

F.151 Oystercatcher breeding territories can be found at suitable locations along the Humber Estuary on the flood defence banks, adjacent saltmarsh, grassland and on adjacent terrestrial sites (Catley, 2000).

Population trends and status

F.152 The number of oystercatcher over-wintering in the SPA shows a high degree of inter-annual variation making interpretation of the underlying trend difficult. There does however appear to be a decline since an early 1990s peak and therefore a WeBS since-designation Medium-Alert has been triggered (Thaxter *et al.* 2010). There is no indication from the comparison of regional trends that the decline has been driven by site-specific pressures.

F.153 The five year peak mean of the most recent WeBS core counts within the Humber Estuary recorded 3,624 individuals, which represents a small increase of 3.5% since the SPA citation date, suggesting that the population may be stabilising.

Horseshoe Point landfall site

F.154 Oystercatchers are present within the vicinity of the cable landfall site all year round. During consultation, NE informed RPS that near to the cable landfall site, oystercatchers roost in creeks in low, turning tides, and at low tide roost size can reach up to 2,000 individuals.

F.155 In June 2004, a sector peak maximum of 478 individuals (MSF- Horseshoe Point to Grainthorpe Haven) was recorded, with an overall population of 987 birds in the Humber Estuary (Mander and Cutts, 2005). May generally features the tail end of the Oystercatcher passage and by June, the population on the Humber is made of a significant number of sub-adult birds. The June count highlighted the importance of the intertidal areas south of Tetney Haven for feeding Oystercatcher, with these intertidal areas supporting 75% of the Humber population at that time. The peak month for oystercatcher was however in August, where 2,400 birds were recorded in sector MSF (68% of the cited SPA population).

F.156 The Horseshoe Point WeBS core count sector recorded a five year peak mean of 1,020 individuals in May, which represents 29% of the cited SPA population. The adjacent Grainthorpe Haven WeBS sector recorded an additional 695 birds in the same month (an extra 20% of the SPA population), although the peak mean count for this sector was in January with 2,400 individuals, or 68% of the cited SPA population. Numbers in the Horseshoe Point sector were much lower during this period, with 65 birds.

F.157 During the cable landfall site surveys in 2011/12, a peak flock size of 3,300 birds was recorded within the survey area in November (with a slightly lower peak in January), representing 94% of the cited SPA population. Numbers were consistent but lower during other surveys between mid September and early March, comprising flock sizes of around 500-1,000 individuals. Locally, the species was recorded in much lower numbers from mid-March through the breeding season, with peak flocks of up to 436 individuals in early July (c.12% of the cited and current SPA populations).

F.158 Birds were generally concentrated on the mudflats on low and rising tides, some 1 km or more from the shoreline.

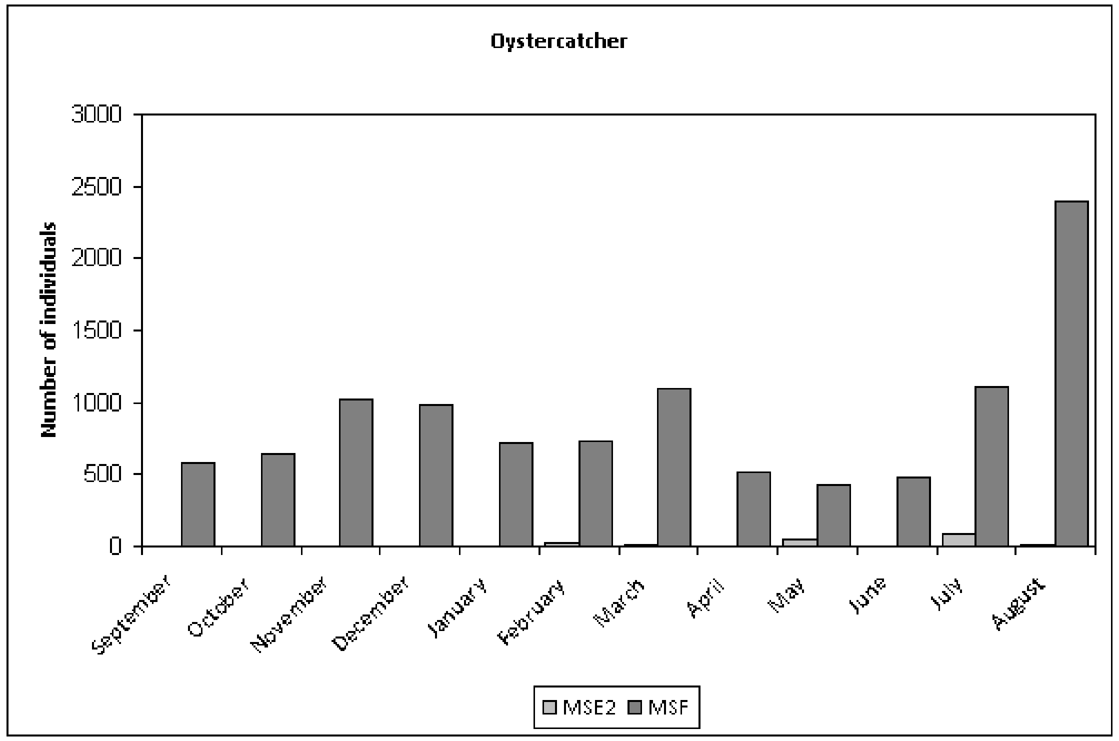


Figure F.52 Oystercatcher WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

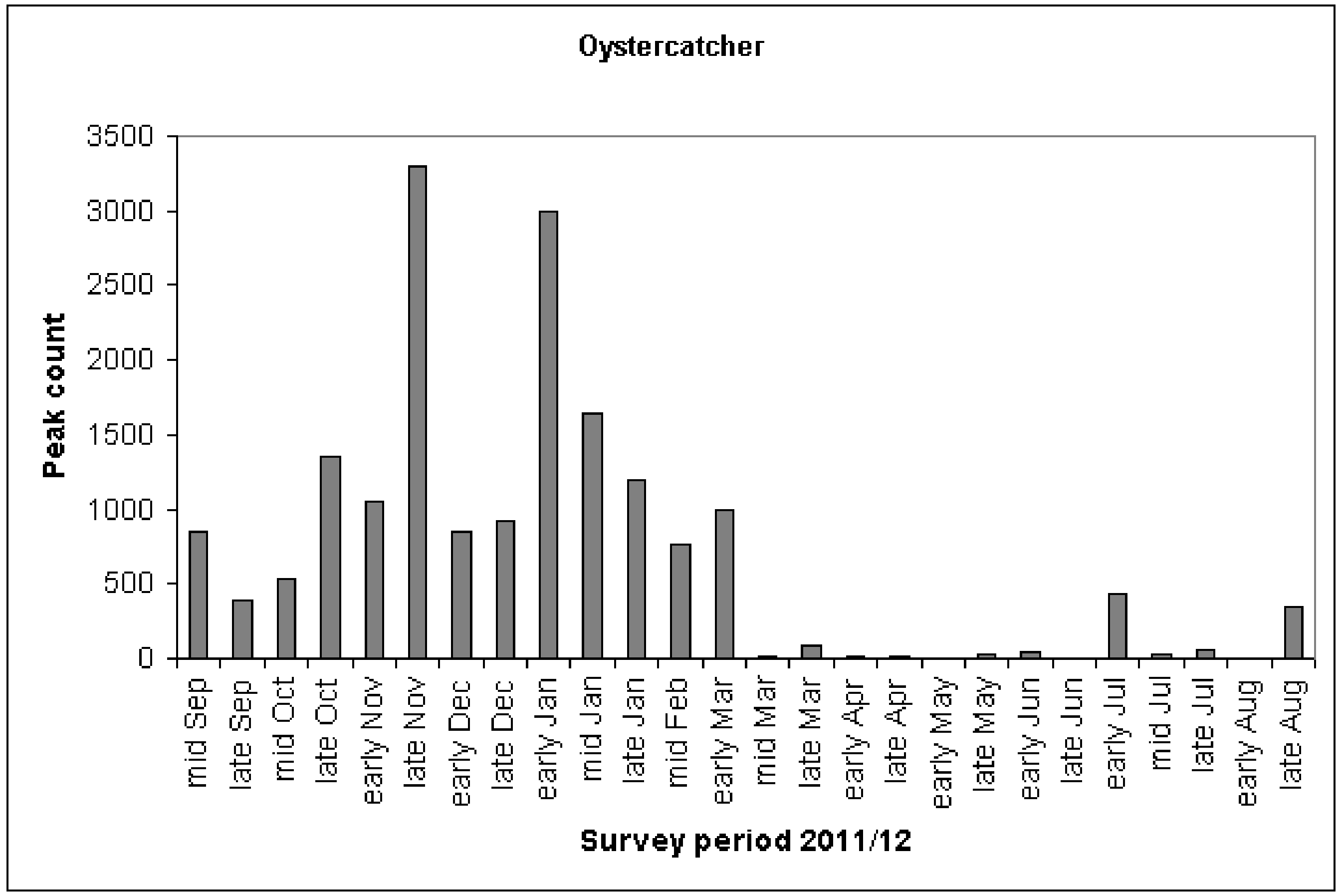


Figure F.54 Oystercatcher peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

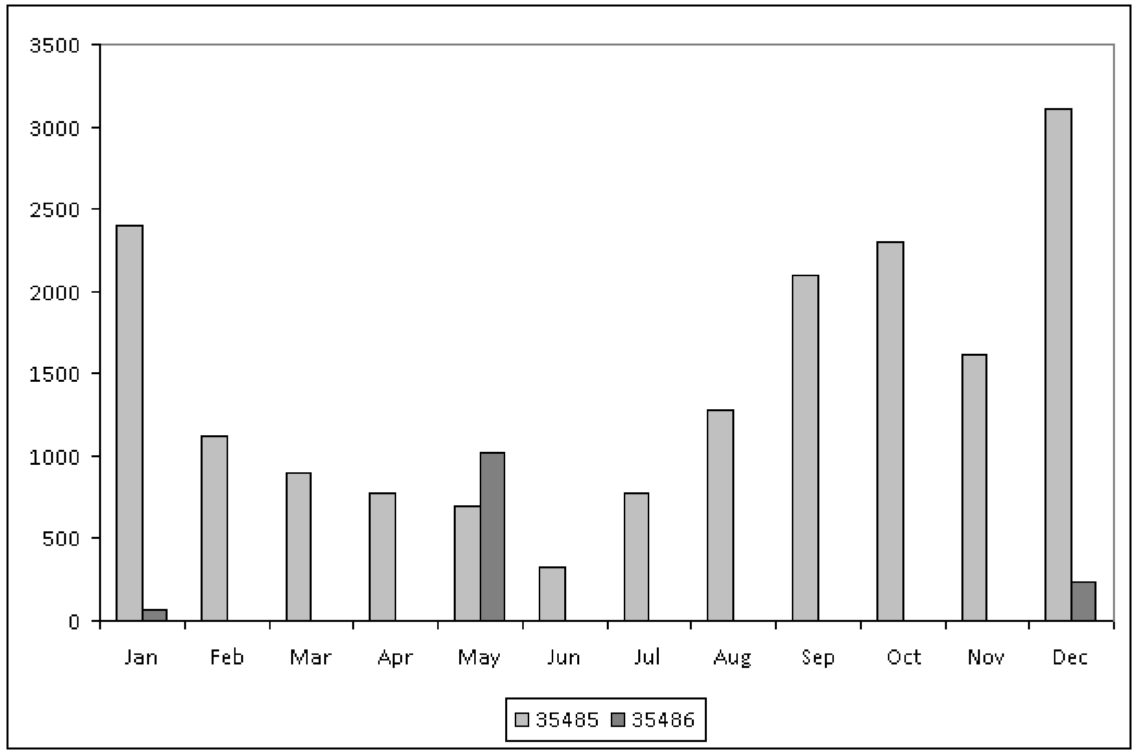


Figure F.53 Oystercatcher WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

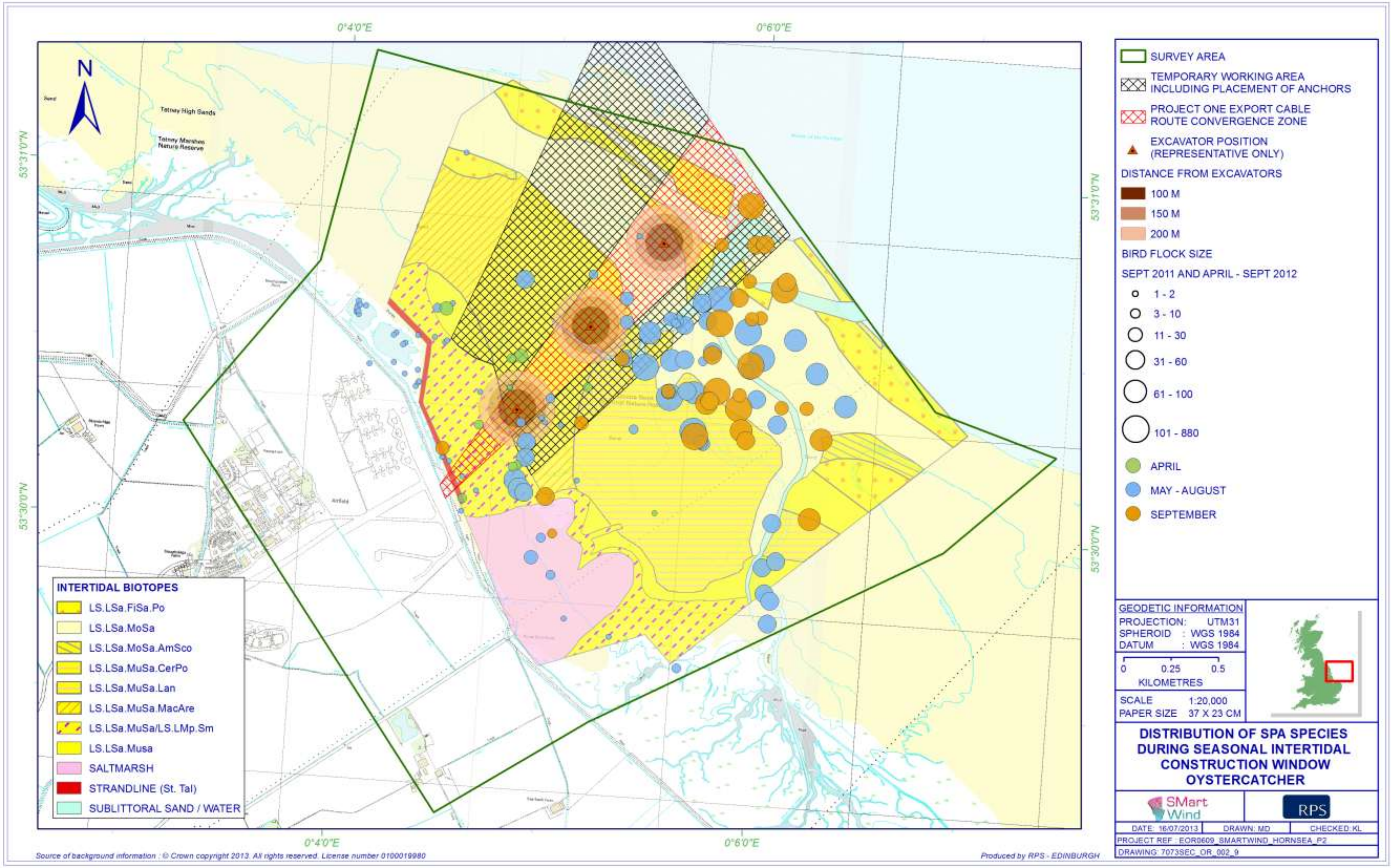


Figure F.55 Oystercatcher raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Black-Tailed Godwit

Key Sites: Killingholme-Pyewipe, North Killingholme Pits (Allen *et al.* 2003).

Seasonality

F.159 Black-tailed godwit occur on the Humber in all months of the year, although mainly occur between late June and mid February (Allen *et al.* 2003). Some of the flocks seen on the estuary during the early autumn are transient groups that subsequently move on to winter in other parts of the species range.

Distribution

F.160 The first returning birds of the autumn appear during June with flocks at this time often scattered around the estuary with regular feeding/roosting sites being at Blacktoft Sands/Whitton, Winteringham/Read's Island and North Killingholme, Saltend and Cherry Cobb (Allen *et al.* 2003).

F.161 The majority of passage birds now use the North Killingholme to Grimsby Dock Tower area to feed. They also spend long periods roosting and loafing while they undergo their complete post-breeding moult. By November the wintering flock adopts a new roost site on the Grimsby/Pyewipe frontage.

F.162 In 2003/04, the pattern for black-tailed godwit was similar to low tide WeBS counts in previous years, with most foraging at low water in the Pyewipe area. No birds were present during the June 2004 count however (Mander and Cutts, 2005).

Population trends and status

F.163 Numbers of Black-tailed godwit on the Humber estuary SPA have increased rapidly in parallel with regional and national increases of the islandica subspecies (Thaxter *et al.* 2010). A five year peak mean count in October of 4,180 individuals from the most recent set of WeBS core counts represents a large increase over the cited SPA passage and wintering populations (Table F.1) supporting the conclusions of Thaxter *et al.* (2010).

Horseshoe Point landfall site

F.164 No black-tailed godwits were recorded during WeBS core count surveys within the Horseshoe Point sector, and only a small number were recorded in the adjacent Grainthorpe Haven sector (a peak of 23 birds in November, representing 2% of the cited SPA population (Table F.3). The species was absent in most other months, with smaller peaks in May and August. A peak of two individuals were recorded during low tide counts in sector MSE2 in August (Table F.2) and no birds were recorded during any other month in MSW2 or MSF. No individuals were recorded during surveys at the cable landfall site in 2011/12, indicating that the area is of little significance to the species.

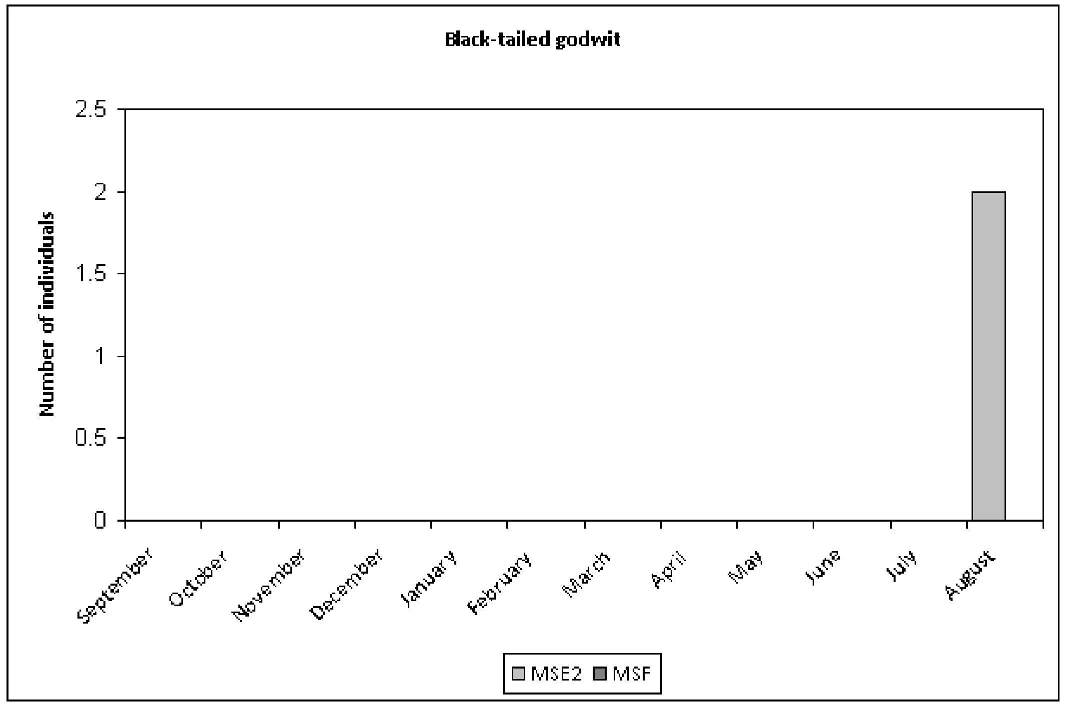


Figure F.56 Black-tailed godwit WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

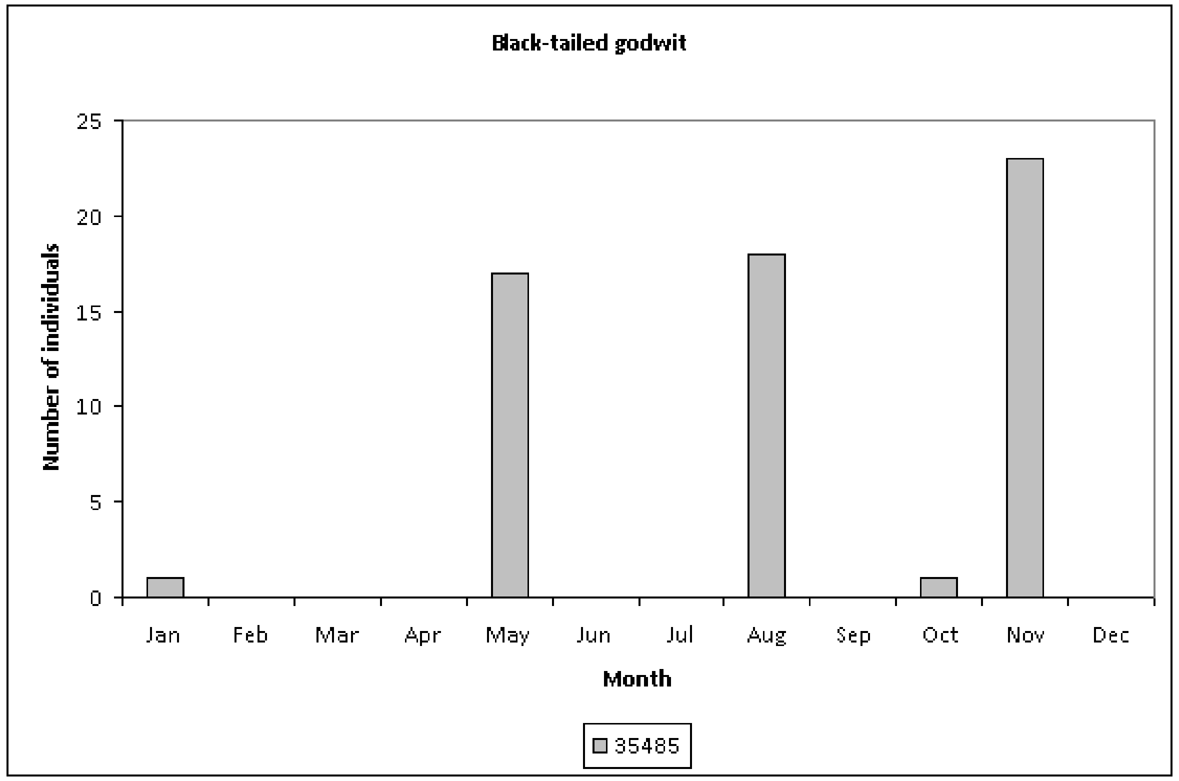


Figure F.57 Black-tailed godwit WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

Curlew

Key Sites: Pyewipe, Saltend, Foulholme Sands (Allen *et al.* 2003)

Seasonality

F.165 Autumn curlew passage commences in mid June with peak counts of visible migration later in the month and throughout July (Allen *et al.* 2003). Numbers on the Humber Estuary continue to build-up to peaks in August or September, with smaller numbers of birds remaining on the site to over-winter. Spring migration is reported from early March to late May, although numbers recorded are far smaller than in autumn. Small numbers of curlew remain on the Humber during the mid summer and it is thought that these birds may be young non-breeding adults, returning to their natal area (Catley, 2000).

Distribution

F.166 The mudflats at Pyewipe are a preferred feeding area on the south shore, while the mudflats from Saltend to Sunk Island support the largest concentration of feeding birds on the north shore. In winter, some birds move inland from the Humber to feed on stubble and sugar beet fields on both shores of the estuary.

F.167 Catley (2000) found that curlew prefer to use high tide roost sites close to their favoured low water feeding sites. The area from Saltend to Spurn is particularly important for roosting curlew as birds feeding in the outer estuary (south shore) move there to roost. On spring tides curlew are often forced to move inland to roost, where they generally favour pasture but also utilise stubble fields (Allen *et al.* 2003).

F.168 Curlews were evenly distributed throughout the estuary during low tide counts in 2003/04 (Mander and Cutts, 2005). The low tide count of 502 birds in June 2004 indicated the presence of a substantial summering population. The birds present in May are likely to be one-year-old birds, and further birds arrive in June, which could be the result of an early movement of failed breeders.

Population trends and status

F.169 The number of Curlew on the Humber Estuary SPA has been relatively high over recent winters and do not show and sign of the decline apparent at the regional and national level. Consequently the Humber Estuary SPA can be considered to be in relatively favourable condition with respect to this species (Thaxter *et al.* 2010). A five year peak mean count of 4,239 individuals in March from the most recent set of WeBS core counts represents an increase of 30% over the cited SPA population (Table F.1), backing up Thaxter et al's (2010) conclusions.

Horseshoe Point landfall site

F.170 The Horseshoe Point WeBS core count sector recorded a peak population of 96 curlews in January 2007, equating to 3% of the cited SPA population. Numbers were greater in the adjacent WeBS sector, with a peak of 481 birds in September (15% of the SPA population). Evidence from both sectors suggests that the area is used all year round by the species, although numbers are considerably lower from May to August. Low tide counts recorded a peak of 98 birds in sector MSF in December 2003, with low numbers again during summer.

F.171 Surveys at the cable landfall site in 2011/12 recorded a peak flock size of 74 birds in late September 2011 (around 2% of the cited and current SPA populations). Numbers were relatively stable throughout the winter survey period, with much lower numbers from late April onwards as birds moved to breeding grounds. A second smaller peak was recorded in July with around 30 birds recorded throughout the month. Birds were observed throughout the survey area at all points above low tide mark

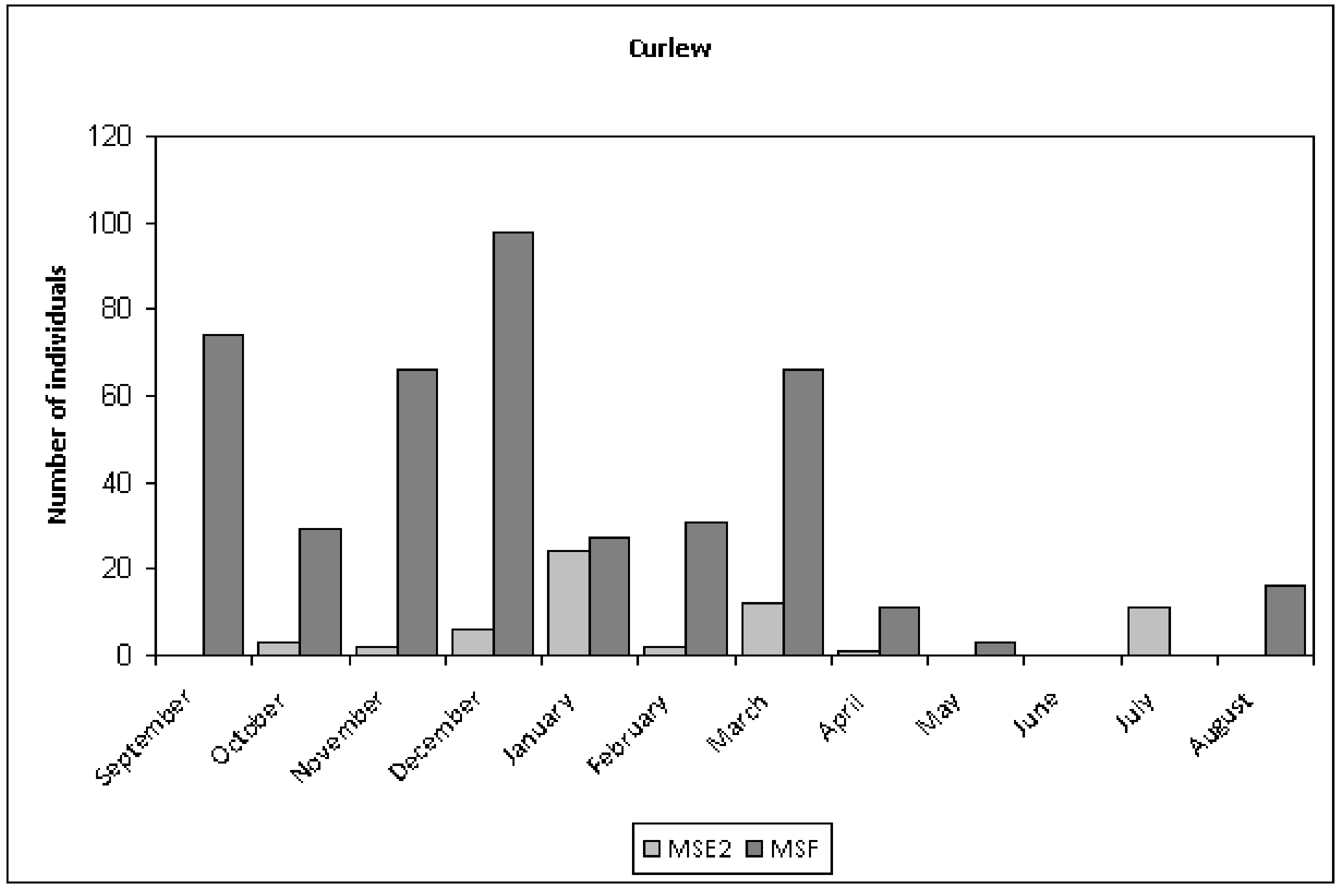


Figure F.58 Curlew WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

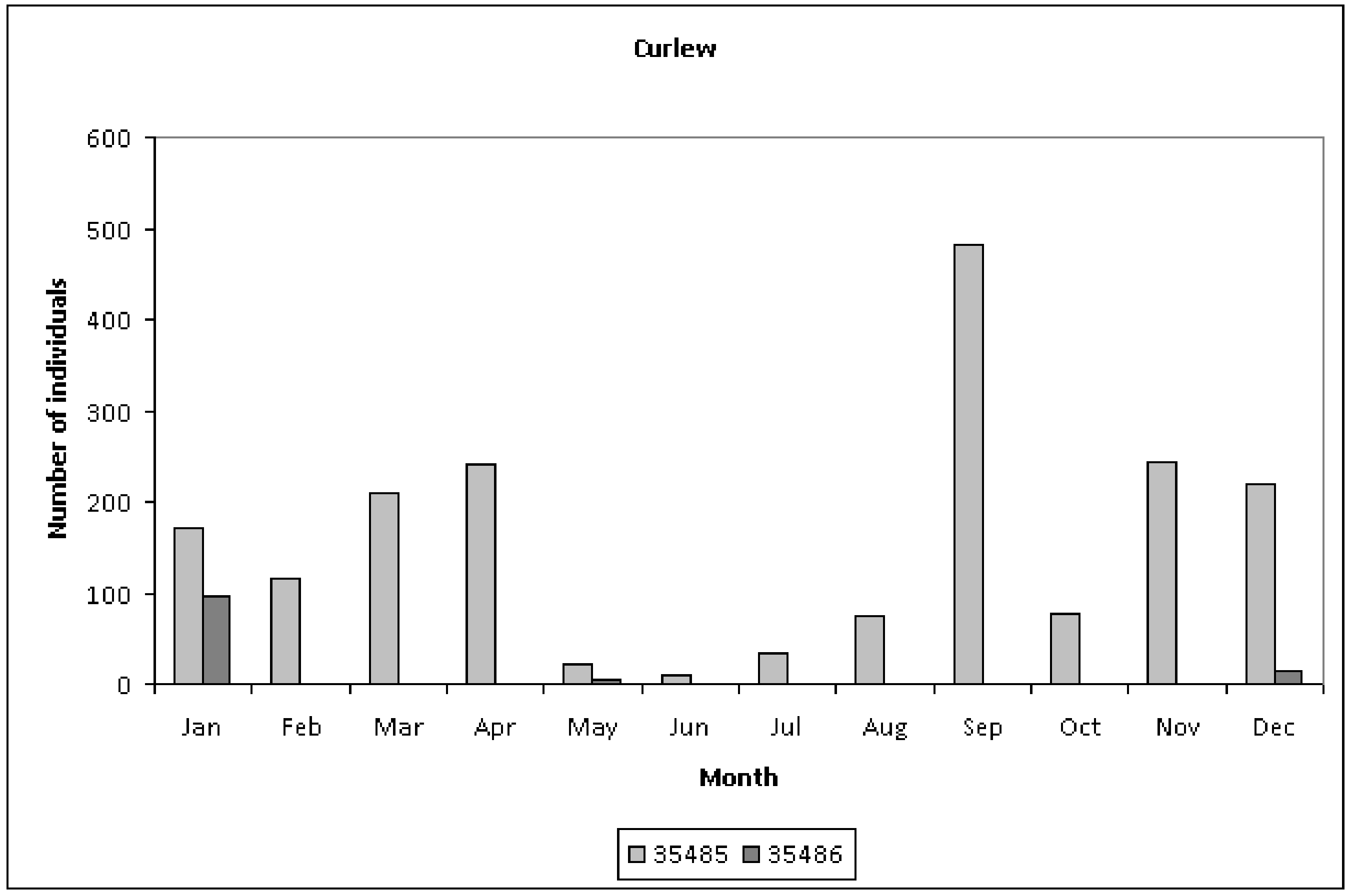


Figure F.59 Curlew WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

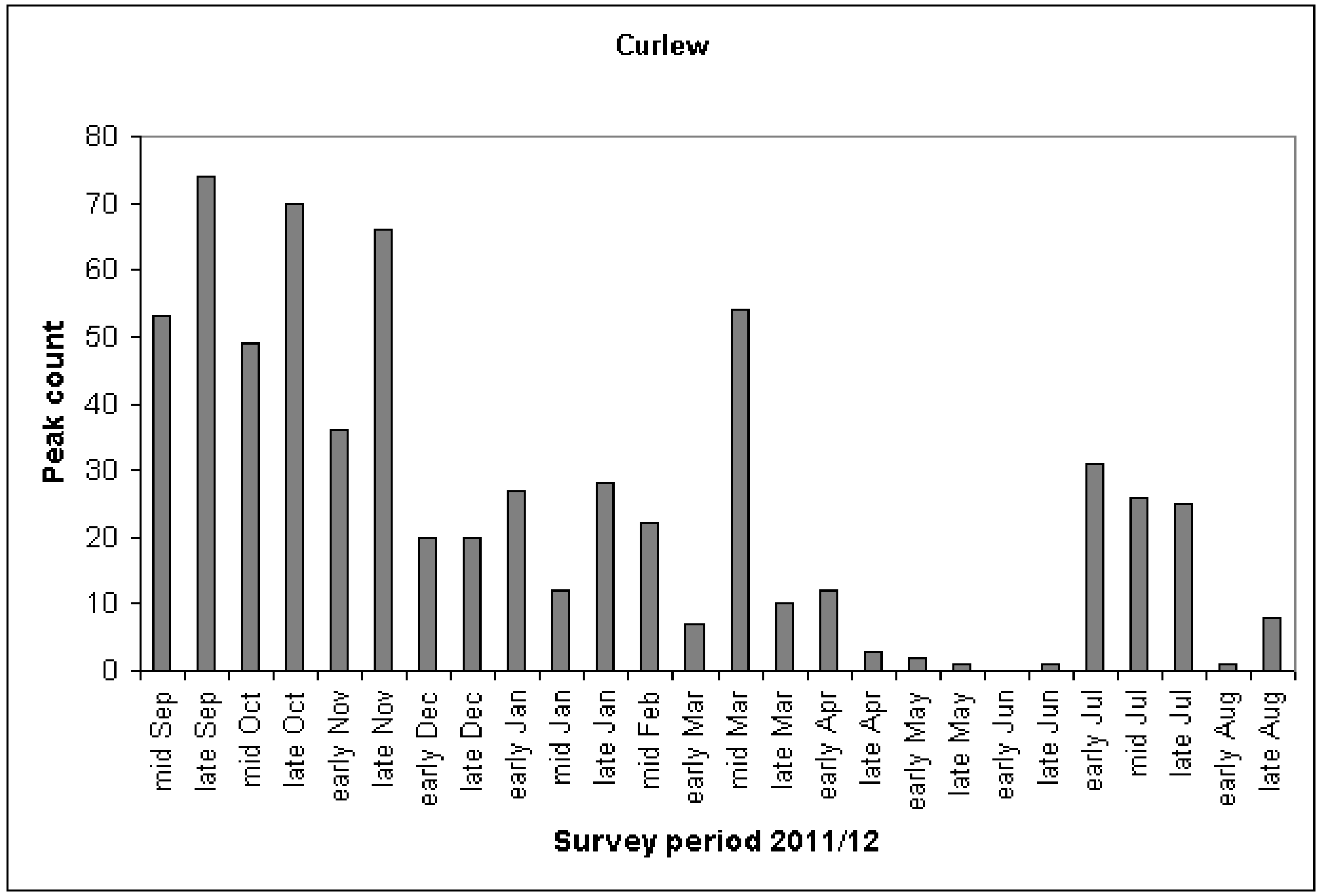


Figure F.60 Curlew peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

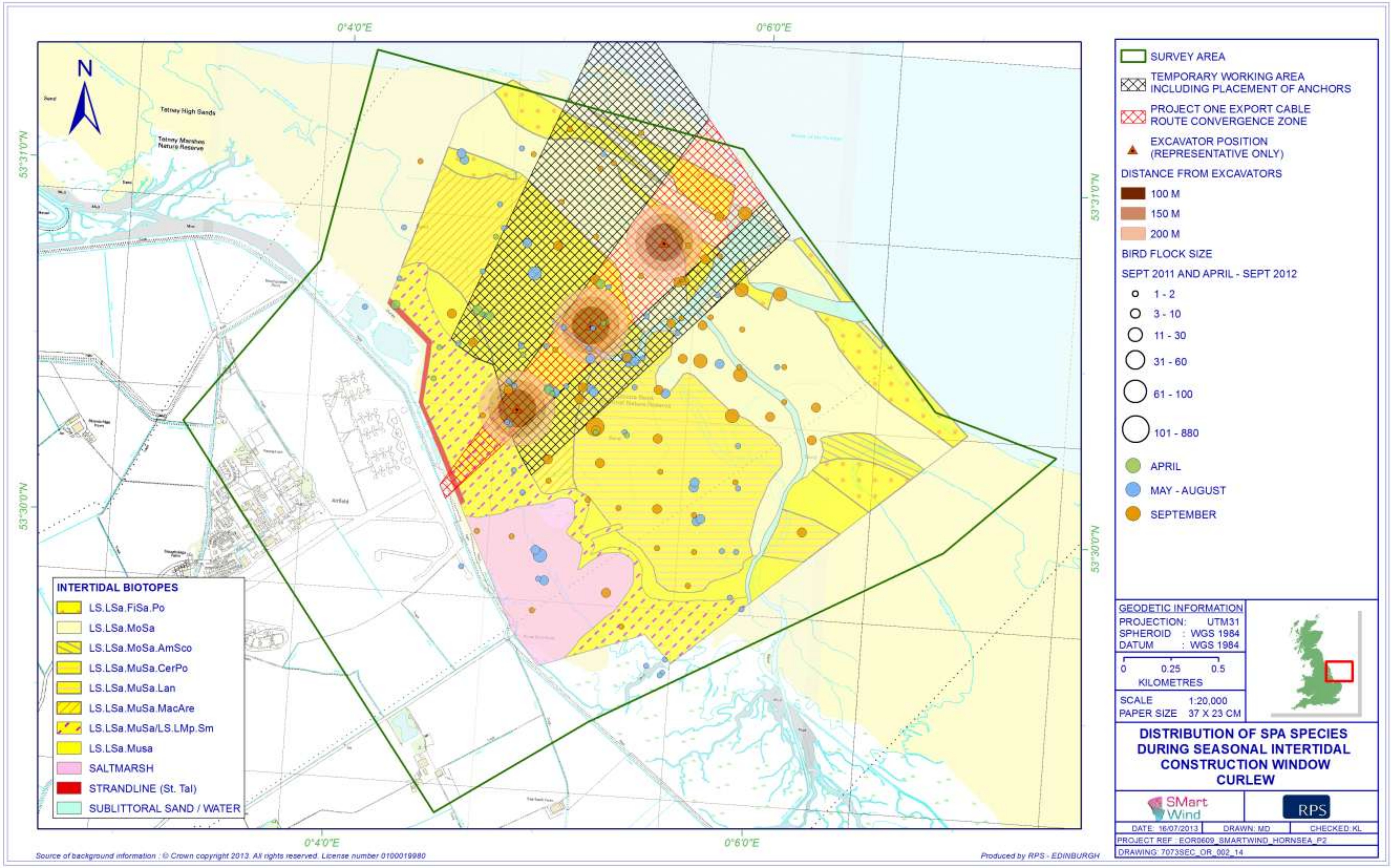


Figure F.61 Curlew raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Whimbrel

Key Sites: Spurn Bight (Allen *et al.* 2003).

Seasonality

F.172 Whimbrel only occurs in passage on the Humber Estuary. The autumn passage is prominent with the peak migration occurring in late July (Allen *et al.* 2003). The return movement in spring begins in April with peak counts recorded in May (Catley, 2000).

Distribution

F.173 At high water the main concentrations are found in the Spurn sectors, although additional numbers are present at Barton, around Saltfleet Haven and in Pyewipe (Allen *et al.* 2003). Low water counts show whimbrel to have a more widespread distribution but they are mainly concentrated in the outer estuary (Catley, 2000). Migration takes place during a limited temporal window and there appears to be rapid turnover at staging sites.

Population trends and status

F.174 This species was not included in Thaxter *et al*'s (2010) WeBS Alert report for the Humber Estuary, and accurate estimates are difficult to obtain due to the rapid turnover of individuals. However, a five year mean peak of the most recent WeBS core counts across the estuary recorded 60 birds in August, which represents a decrease of 47% from the cited SPA passage population (Table F.1).

Horseshoe Point landfall site

F.175 A peak mean count of one whimbrel was recorded during WeBS core count surveys within both the Horseshoe Point sector (May) and the adjacent Grainthorpe Haven sector (September/October), representing 0.9% of the cited SPA population (Table F.2). The species was absent in all other months. A peak of three individuals was recorded during low tide counts in sector MSF in August (Table F.3).

F.176 Few whimbrel were recorded during surveys at the cable landfall site in 2011/12, with one bird during autumn passage and up to four birds during July and August (3.5% of cited SPA population).

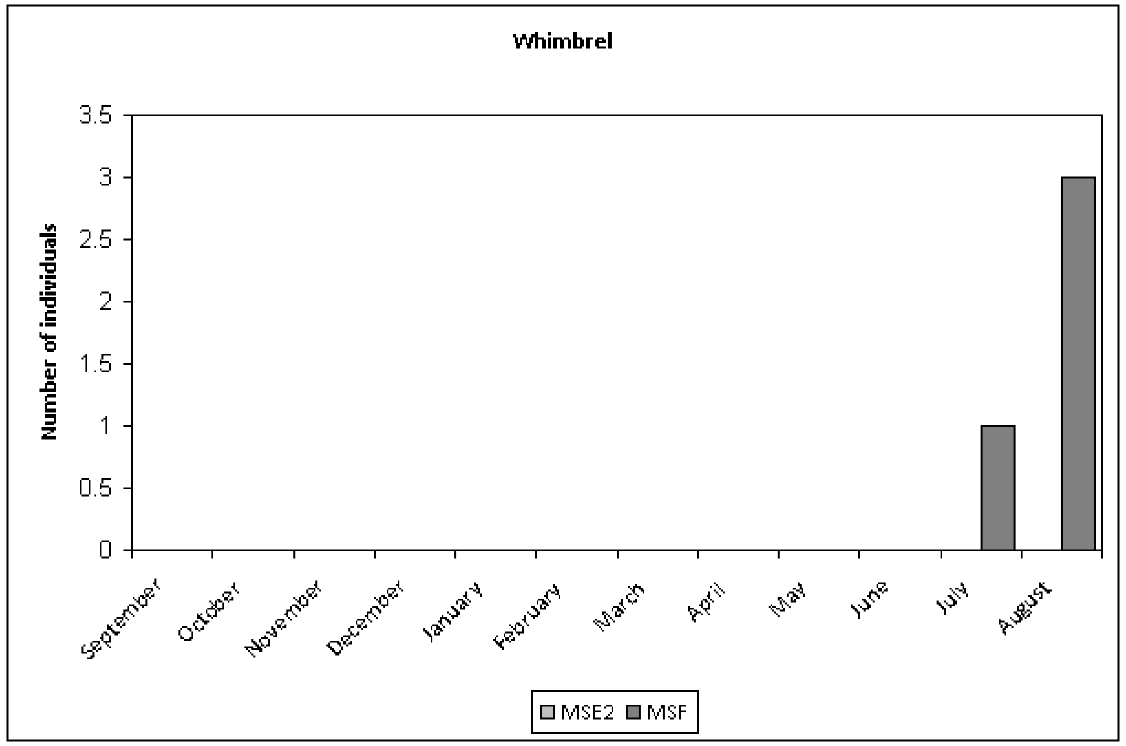


Figure F.62 Whimbrel WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

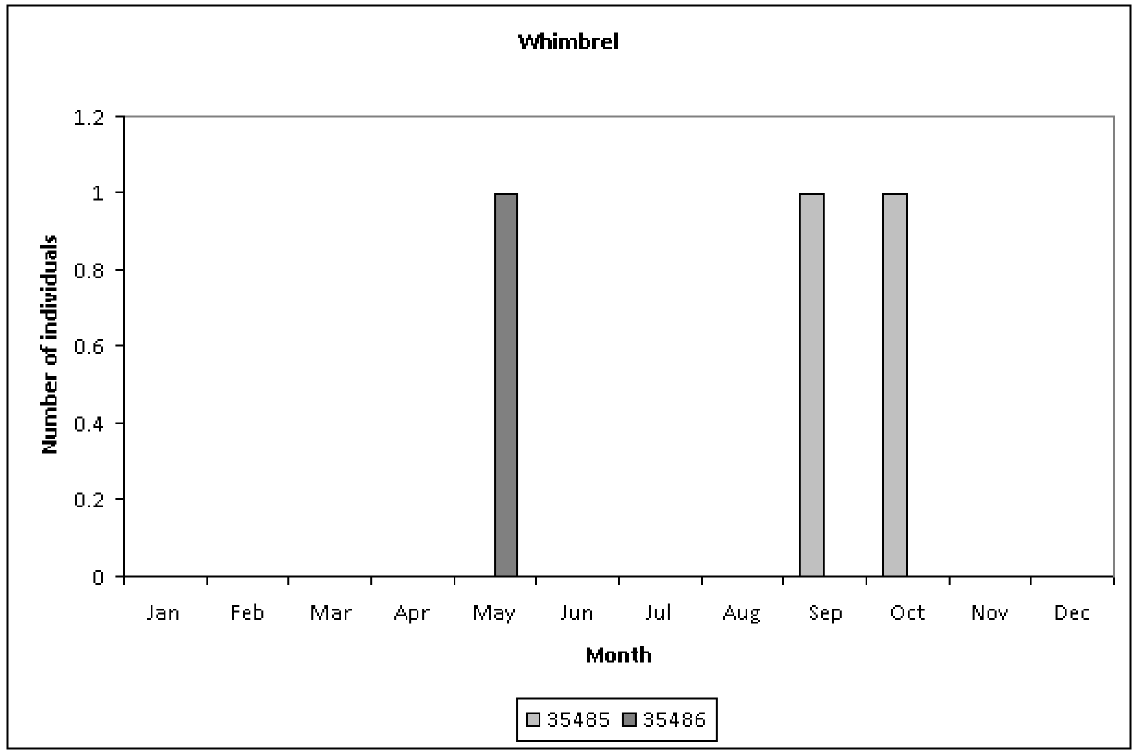


Figure F.63 Whimbrel WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

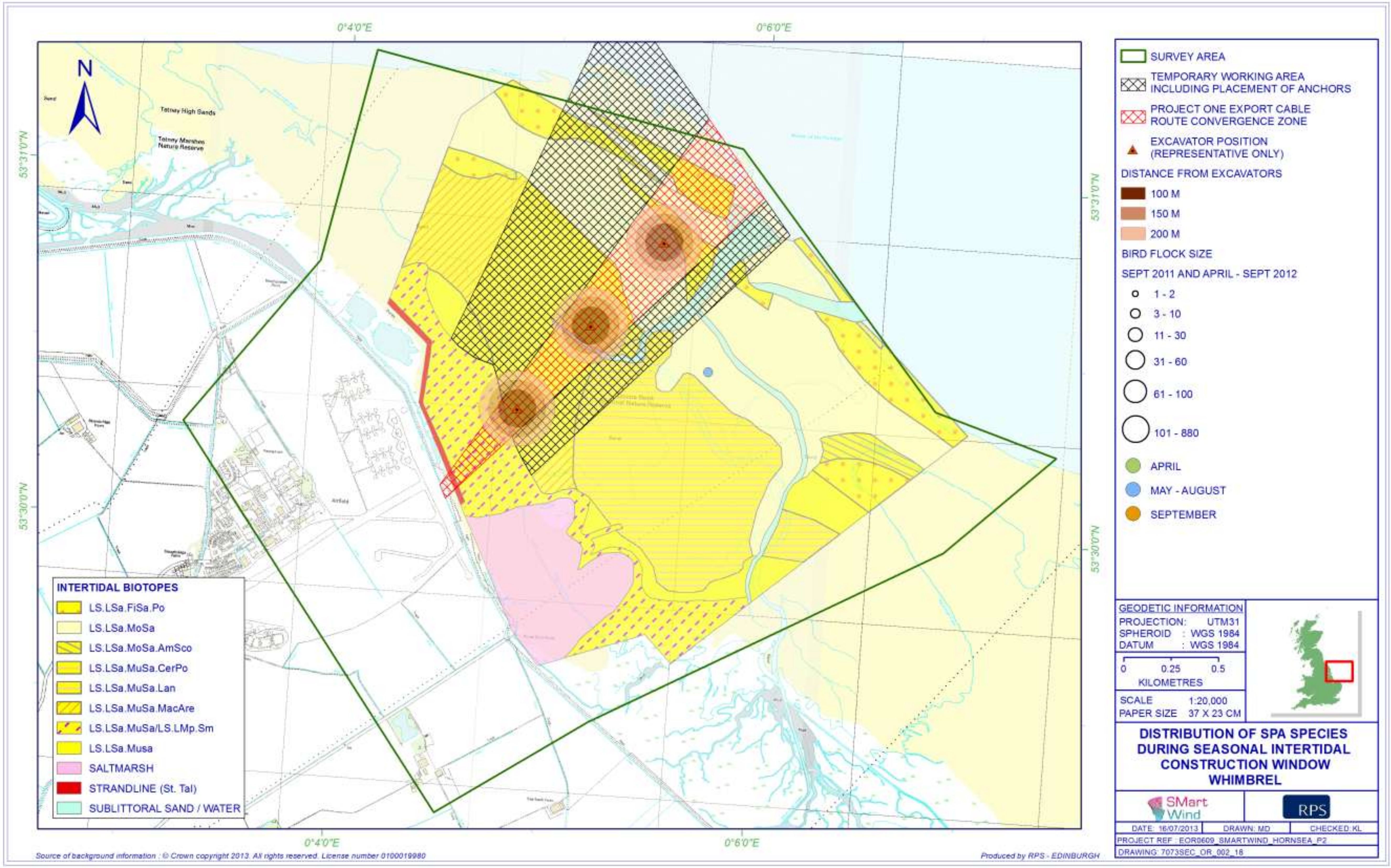


Figure F.64 Whimbrel raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Grey Plover

Key Sites: Spurn Bight, Tetney, Grainthorpe and Saltfleet basins (Allen *et al.* 2003).

Seasonality

F.177 Grey plover numbers rapidly build up through August to a September/October peak, and thereafter steadily decline due to a small southerly movement, with numbers rising again in January. Numbers build up rapidly from March to May as birds arrive on spring passage, on the same scale as the autumn migration (Catley, 2000). The June 2004 low tide count indicated no summering grey plover population on the Humber, with only one individual recorded (Mander and Cutts, 2005).

Distribution

F.178 In the Humber Estuary, grey plover are generally confined to the tidal mudflats of the outer estuary, particularly from Cleethorpes to Grainthorpe on the south shore. On the south bank, the preferred feeding areas are the Tetney, Grainthorpe and Saltfleet basins, with smaller numbers around and between these sites (Eco Surveys, 1991). Tasker and Milsom (1979) reported that the majority of roosting birds used an area located on Spurn Bight, although large roosting sites are also located in the Cleethorpes sectors and around North Cotes on the south shore (Catley, 2000).

Population trends and status

F.179 Numbers of grey plover on the SPA have remained relatively stable since the early 1990s, contrasting with a decline at both the regional and national levels, suggesting that this SPA population is in a relatively favourable condition (Thaxter *et al.* 2010). The most recent five year peak mean WeBS core count of 2,879 individuals in April represents a 69% increase over the cited SPA population (Table F.1) showing that the population continues to be in favourable condition.

Horseshoe Point landfall site

F.180 During WeBS core counts within the Horseshoe Point sector, a peak of 122 birds was recorded in December, equating to 7% of the cited SPA population. Only slightly smaller numbers were recorded in January and May (80 and 83 birds respectively). In the adjacent Grainthorpe Haven sector, a peak of 610 birds was recorded on September passage, representing 36% of the cited SPA population.

F.181 Low tide counts recorded a peak of 168 birds in sector MSF in March 2004. Numbers were much lower throughout the subsequent summer period until August, with a count of over 100 individuals.

F.182 Cable landfall surveys in 2011/12 recorded a much higher peak flock size of 885 birds in early April during mid-high tide, which is 52% of the cited SPA population, and 31% of the likely current population. This was the peak count in what appears to be a period of spring passage, stretching from mid-March to late May. The species was largely absent in all other months, with a smaller autumn passage recorded in October (231 birds).

F.183 Birds were located on the muddy substrate mainly below mean high water.

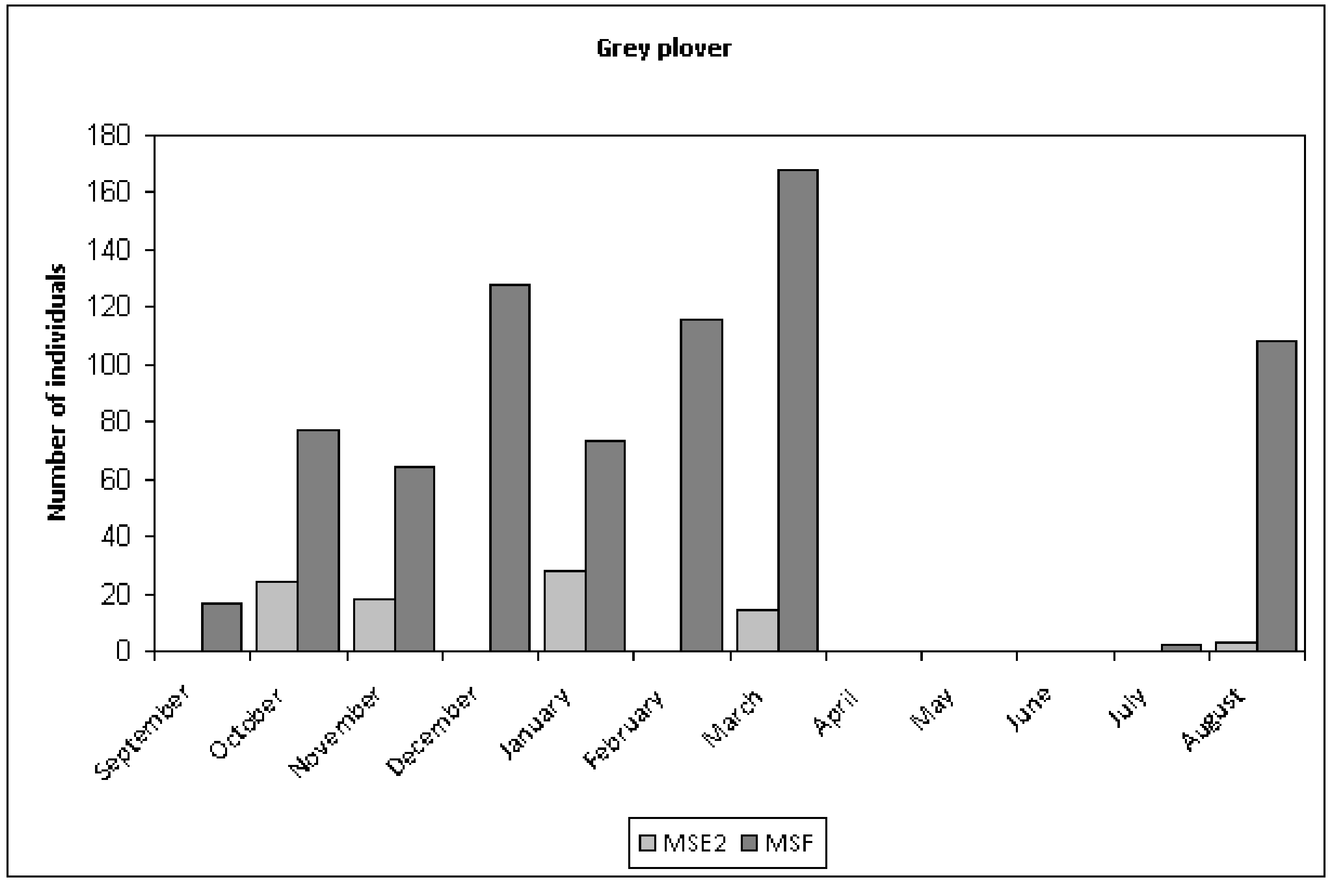


Figure F.65 Grey plover WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

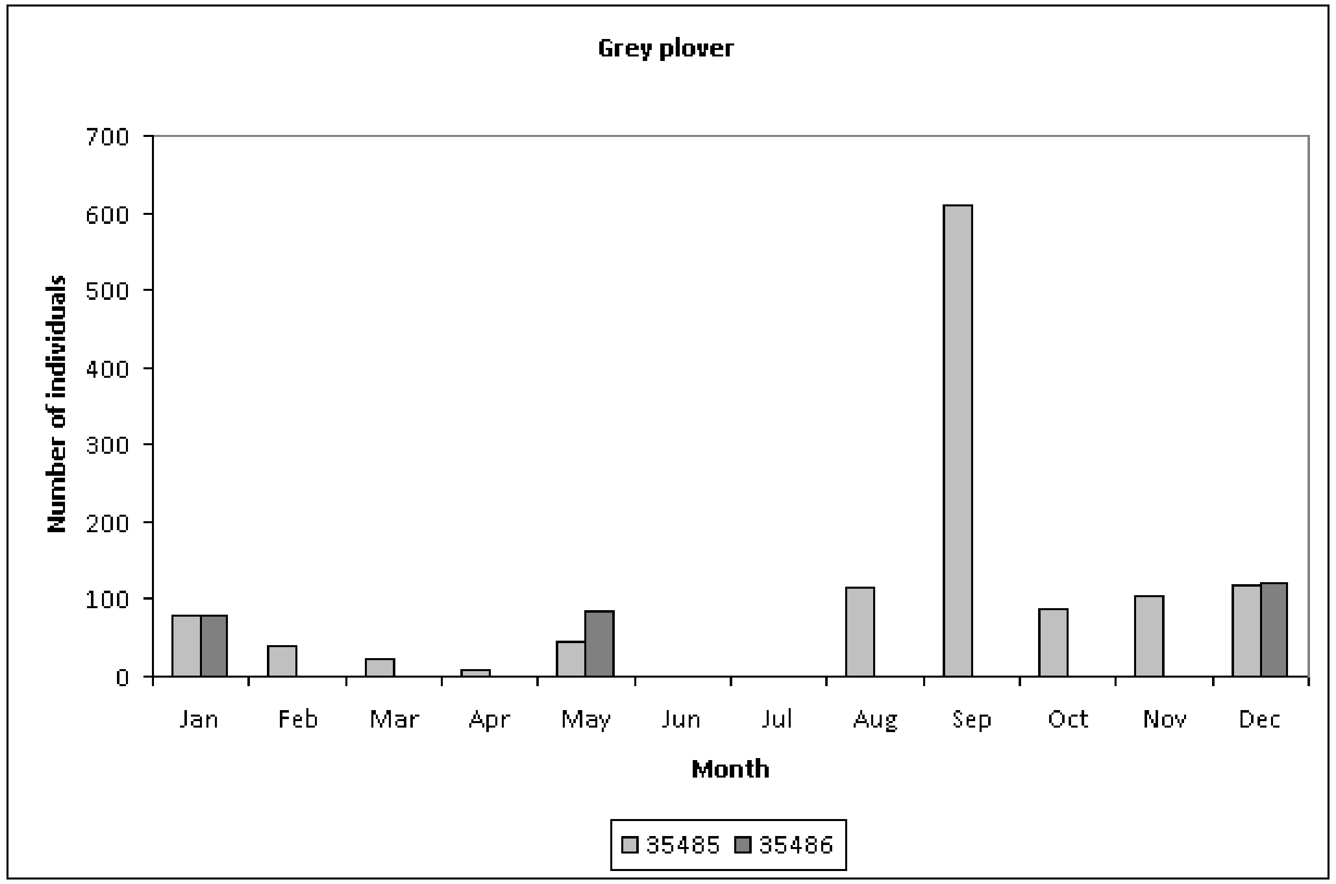


Figure F.66 Grey plover WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

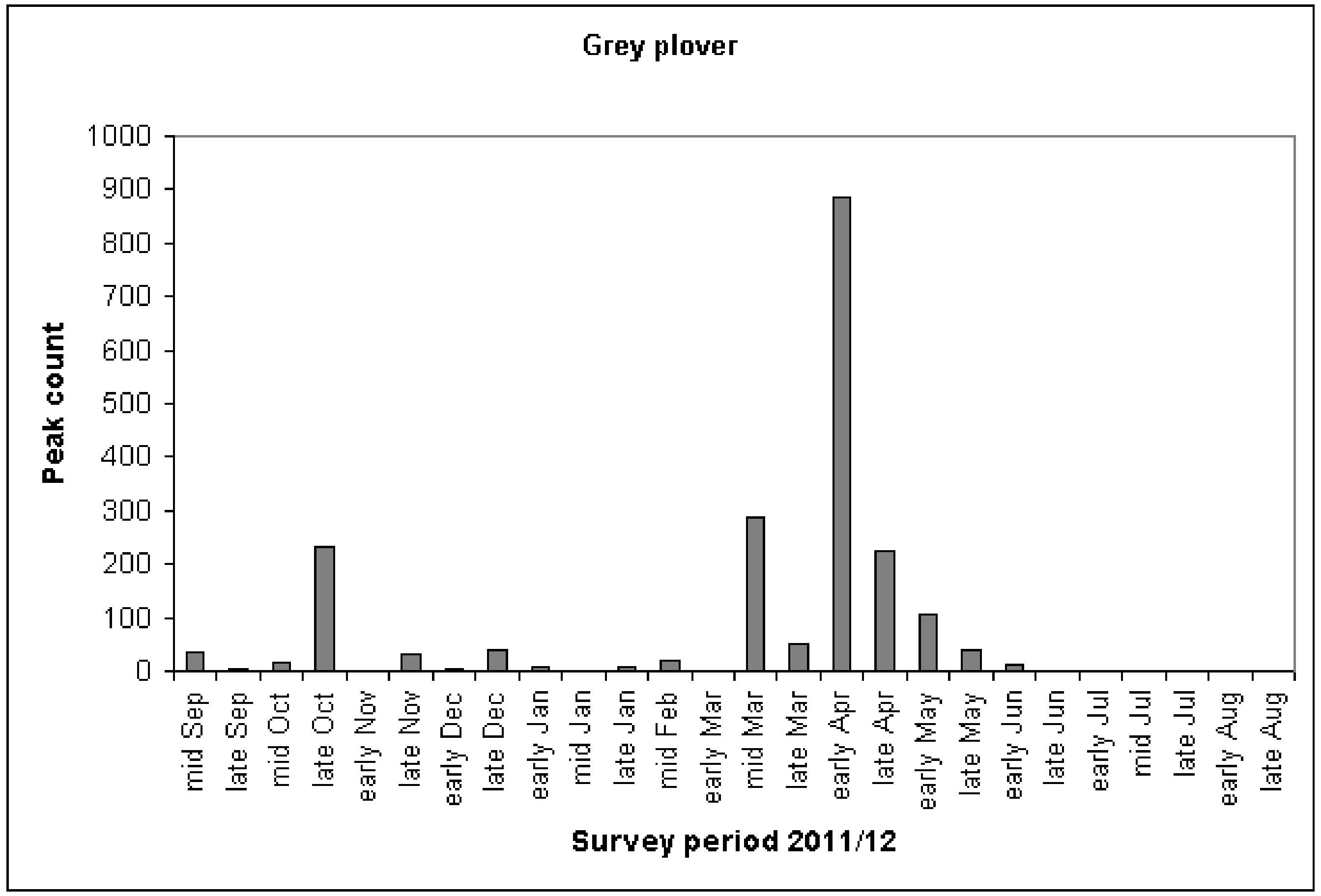


Figure F.67 Grey plover peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

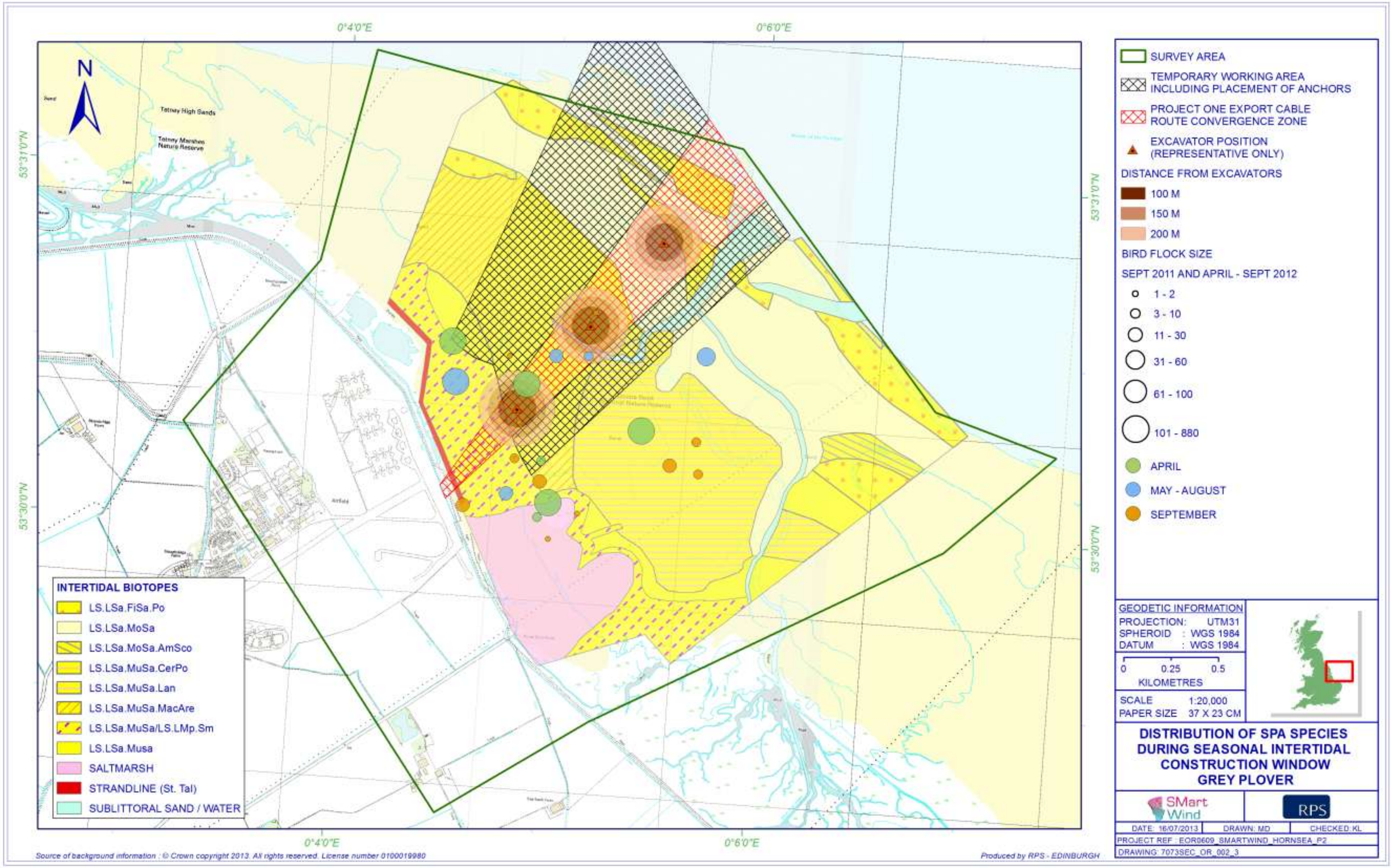


Figure F.68 Grey plover raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Greenshank

Key Sites: Saltfeet Haven to Theddlethorpe St Helen (Mander and Cutts, 2005).

Seasonality

F.184 No information on temporal occurrence of greenshank within the Humber Estuary was presented in Allen *et al.* (2003) or Cruickshanks *et al.* (2010). However, based on the results obtained from WeBS Core counts the species appears to be present all year round, although mainly during autumn passage in August and September. Mander and Cutts (2005) reported that autumn passage is more prominent than the spring passage.

Distribution

F.185 This species showed an outer estuary distribution. Over the autumn period, the largest count during low tide counts was made on the Saltfeet Haven to Theddlethorpe St Helen sector (OSE) where 11 birds were reported in September 2003 (Mander and Cutts, 2005).

Population trends and status

F.186 This species was not included for assessment in Thaxter *et al.* (2010). However, a five year peak mean WeBS core count within the Humber Estuary indicated a decline of 47% since the SPA citation figure (Table F.1), although this may be partly due to the difficulties in accurately recording passage migrants.

Horseshoe Point landfall site

F.187 The Horseshoe Point WeBS core count sector did not record any greenshank, although the adjacent Grainthorpe Haven sector recorded a peak of three birds in August (4% of the cited SPA population), with two in September. The species was largely absent for the remainder of the year. A similar peak total was recorded during low tide counts in the MSF sector in September.

F.188 During the cable landfall site surveys in 2011/12, the species was present in low numbers during autumn passage only, with six birds in September 2011 and seven birds in August 2012. Greenshank was recorded on only one other survey in July (two birds).

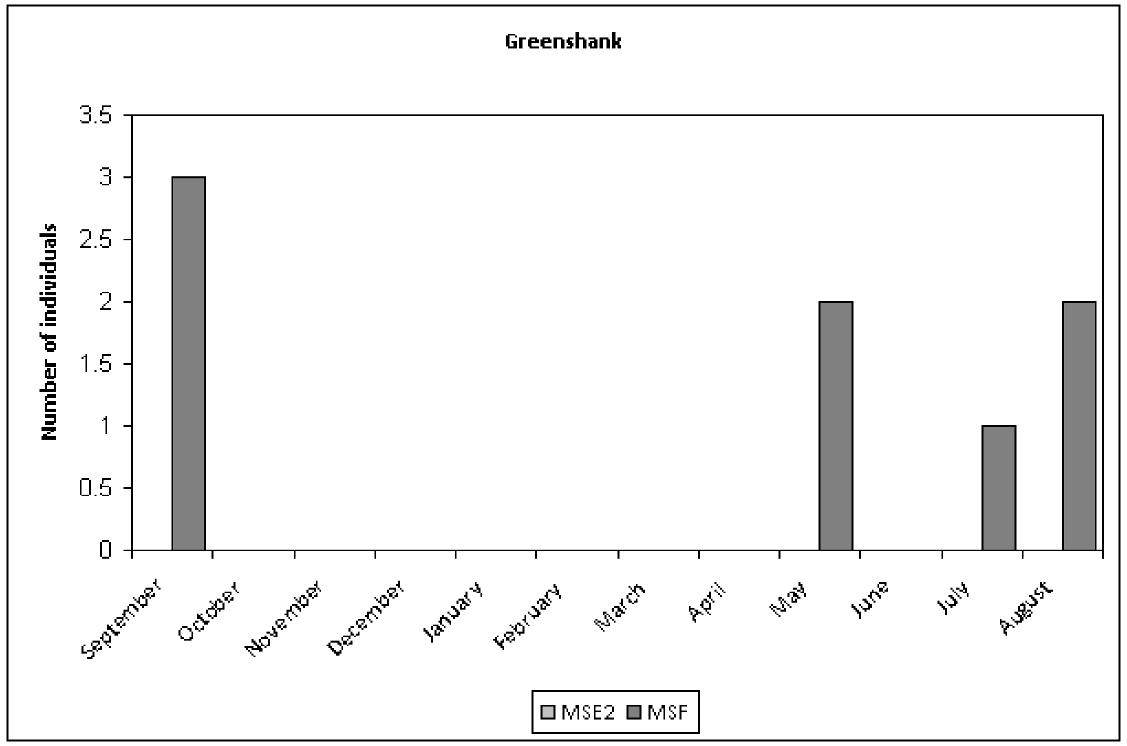


Figure F.69 Greenshank WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

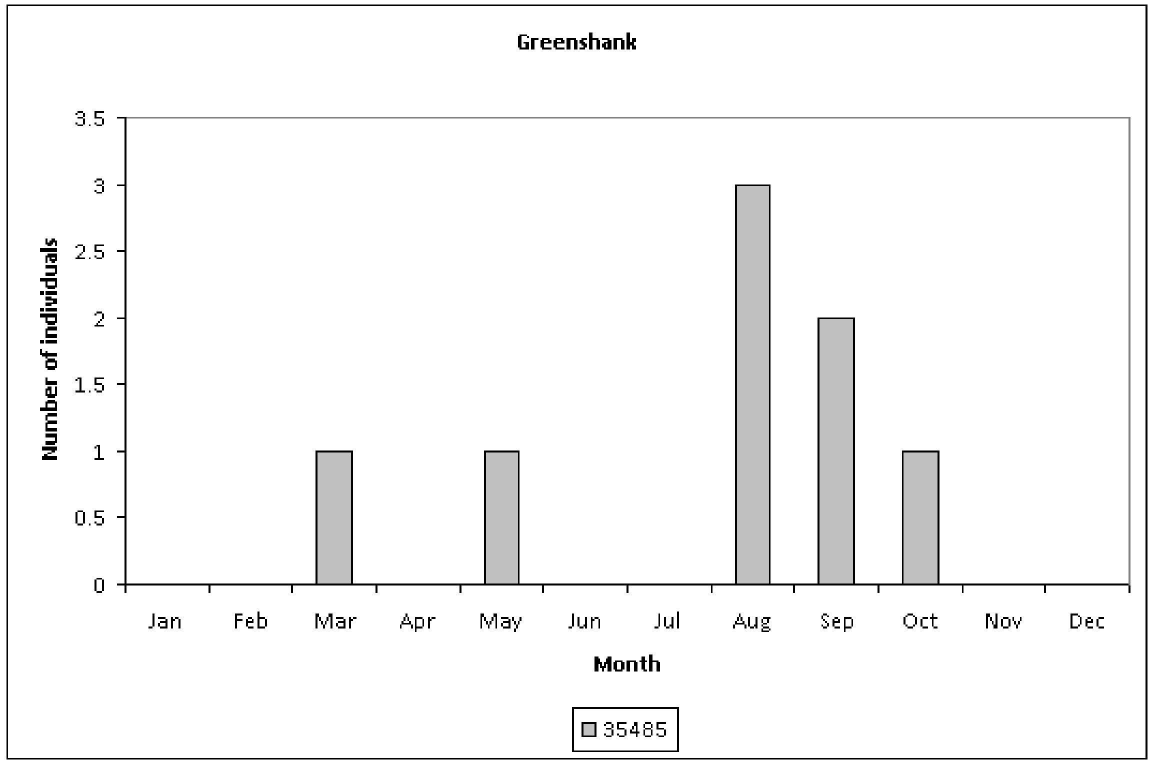


Figure F.70 Greenshank WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

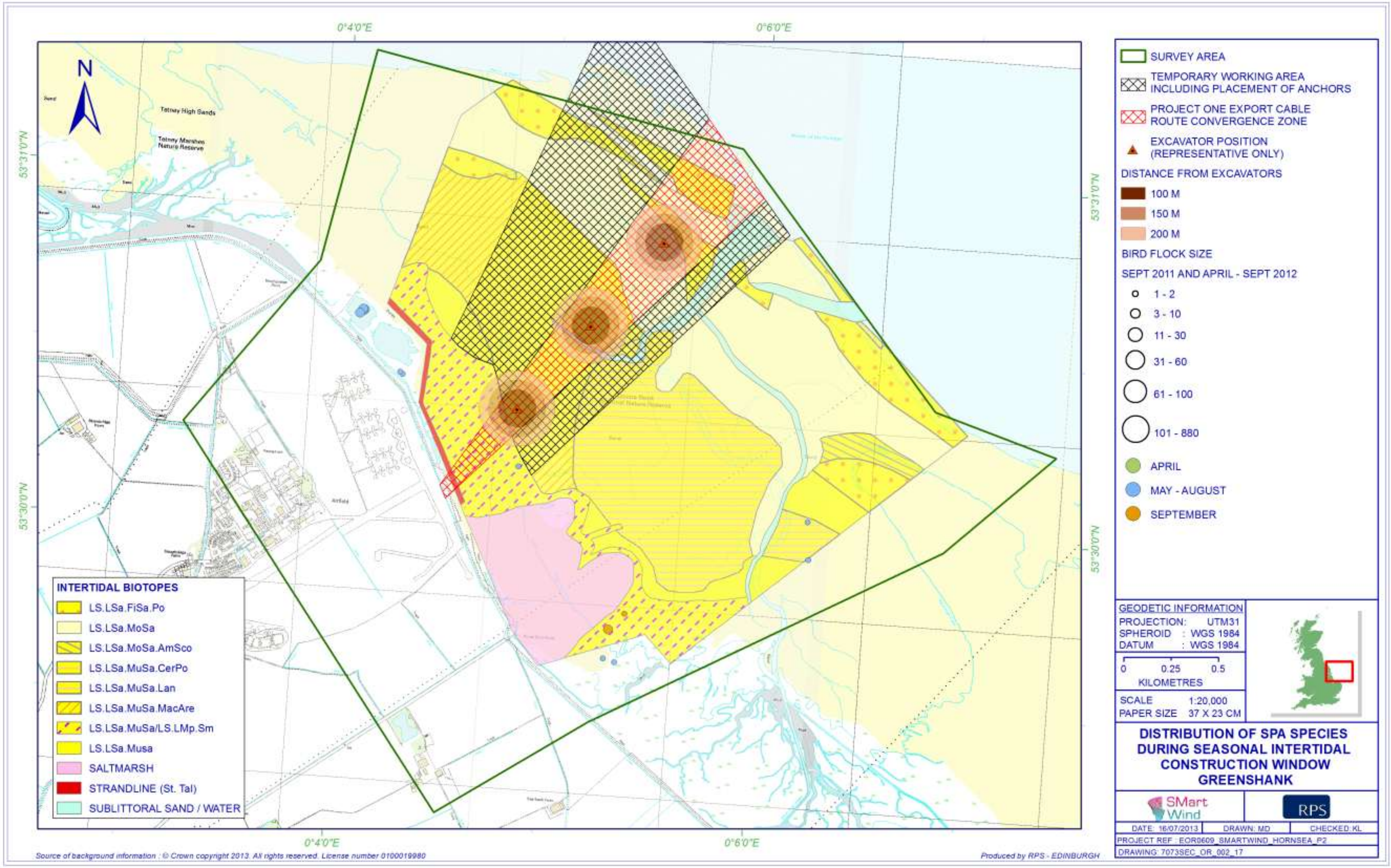


Figure F.71 Greenshank raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Lapwing

Key Sites: Inner estuary (Allen *et al.* 2003).

Seasonality

F.189 The greatest numbers of lapwing are found on the Humber during the mid winter period, mainly November to December or January (Allen *et al.* 2003). Lapwing may leave the Humber to head south during periods of severe weather, but conversely, cold weather in northern England causes influxes of birds to the Humber (Catley, 2000).

Distribution

F.190 Lapwing utilise mudflats less extensively than other wader species and the species only feeds on intertidal areas from July to September, preferring pasture, stubble and ploughed fields during the winter. On the outer estuary birds appear only to occur in important numbers during the spring and late autumn migration periods (Catley, 2000). Lapwings do however continue to use the mudflats for roosting and loafing during the daylight hours. The saltmarshes throughout the estuary provide an important communal roosting site for lapwing (Cruickshanks *et al.* 2010).

F.191 Two lapwing territories were recorded during breeding bird surveys along the cable route in 2011, but any effects due to construction activities are unlikely to be significant to the much larger SPA population.

Population trends and status

F.192 Lapwing numbers on the Humber Estuary SPA have been relatively stable although more recent winters have been particularly low (Thaxter *et al.* 2010). Accordingly, a WeBS High-Alert has been triggered for the period since designation. The decline on the SPA has been more rapid than at a regional level and the decline may have been driven, at least in part, by site-specific pressures since the early 1990s. A five year peak mean count in November of 18,756 individuals from the most recent set of WeBS core counts represents a decrease of 18% from the cited SPA population (Table F.1), backing up Thaxter *et al*'s (2010) conclusions. Lapwing numbers during low tide counts in 2003/04 were high throughout the whole estuary and peaked at 36,609 in December, though only 2,800 were noted in February.

Horseshoe Point landfall site

F.193 No lapwings were recorded during WeBS core count surveys within the Horseshoe Point sector, although a relatively large number were recorded in the adjacent Grainthorpe Haven sector (a peak of 1,060 birds in October, representing 4.7% of the cited SPA population, Table F.2). The species was mainly present between September and March in this sector, with much smaller counts between April and August (peak of 43 birds). A peak of 5,800 individuals were recorded during low tide counts in sector MSF in January (Table F.2), which represents 25% of the cited SPA population. Similar numbers were recorded in the previous two months, although lapwings were only present in one of these months in MSE2 (peak of 456 birds). There were no records between March and July inclusive.

F.194 Surveys at the cable landfall site in 2011/12 recorded a peak flock size of 362 birds in November, representing around 2% of the cited and current SPA populations. Birds were present throughout the winter period in lower numbers, generally between 40-100 peak flock size. The species was absent from March onwards throughout the breeding season.

F.195 The large majority of records were close to the shore above mean high water mark, including within the area of pools.

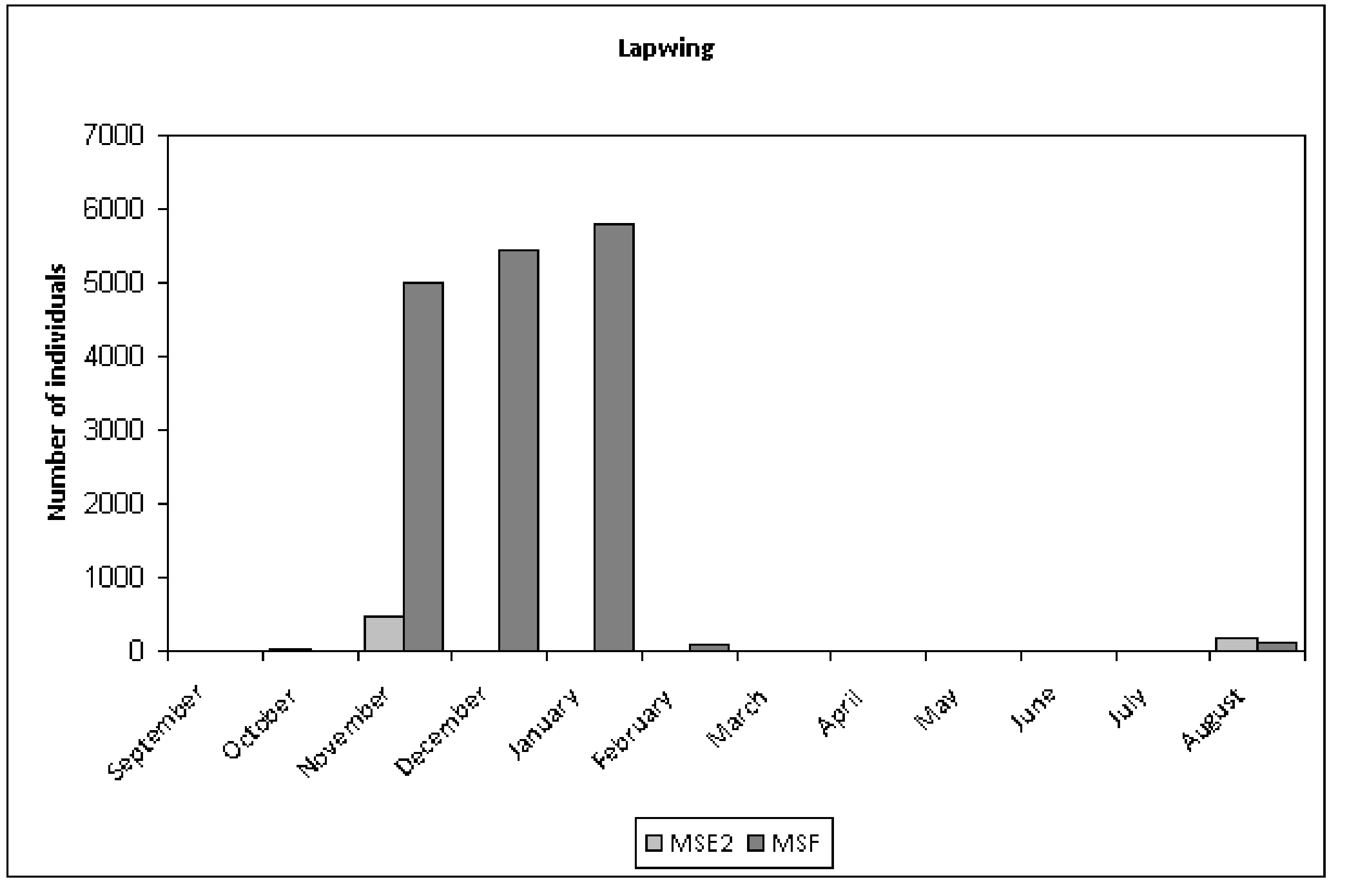


Figure F.72 Lapwing WeBS Low tide counts in 2003/04 showing monthly totals within sectors overlapping with the cable landfall site.

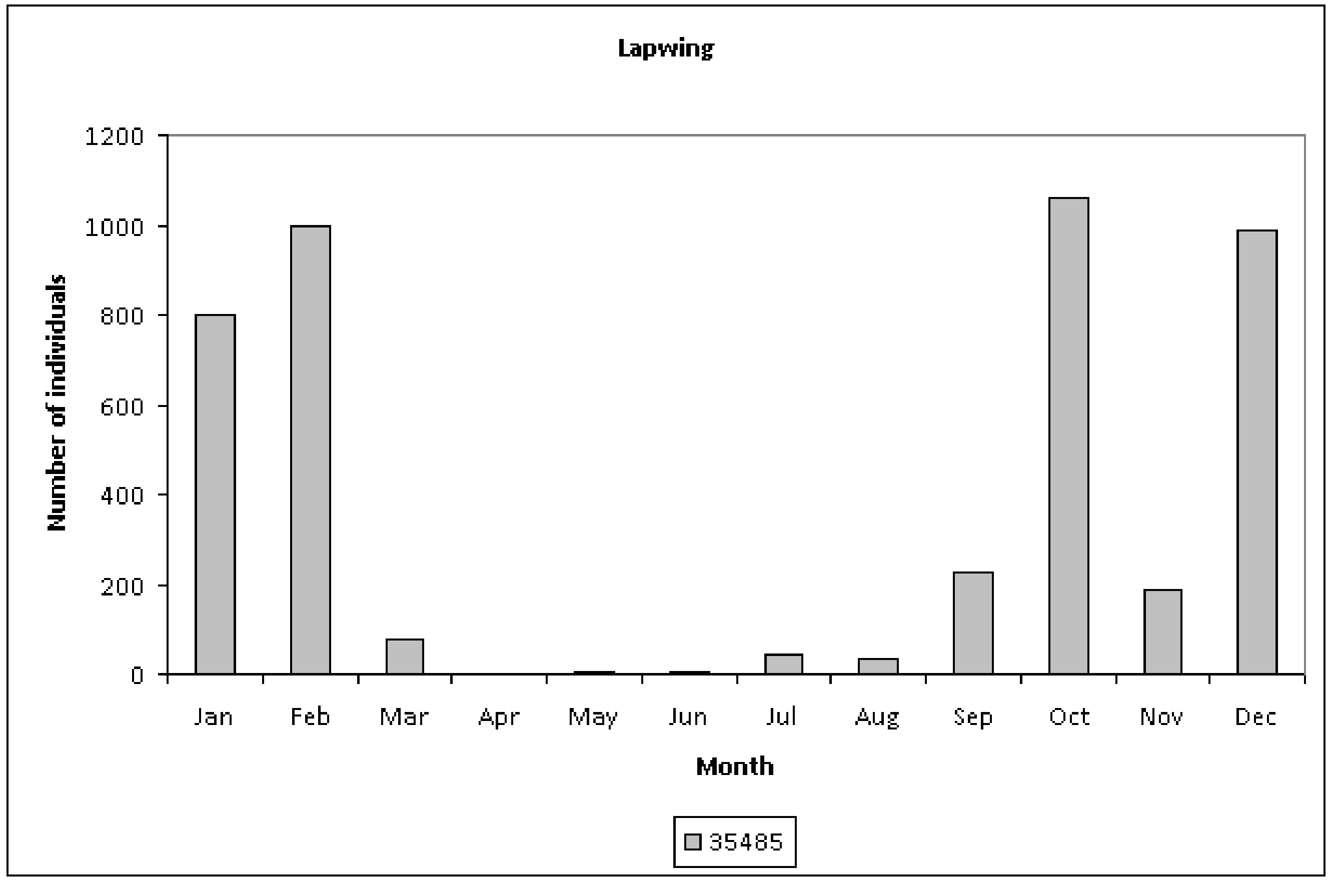


Figure F.73 Lapwing WeBS Core counts for Grainthorpe Haven sector (five year mean count for 2005/06 to 2009/10) and Horseshoe Point sector (surveyed in December and January 2006/07 and May 2009 only and therefore shows actual counts).

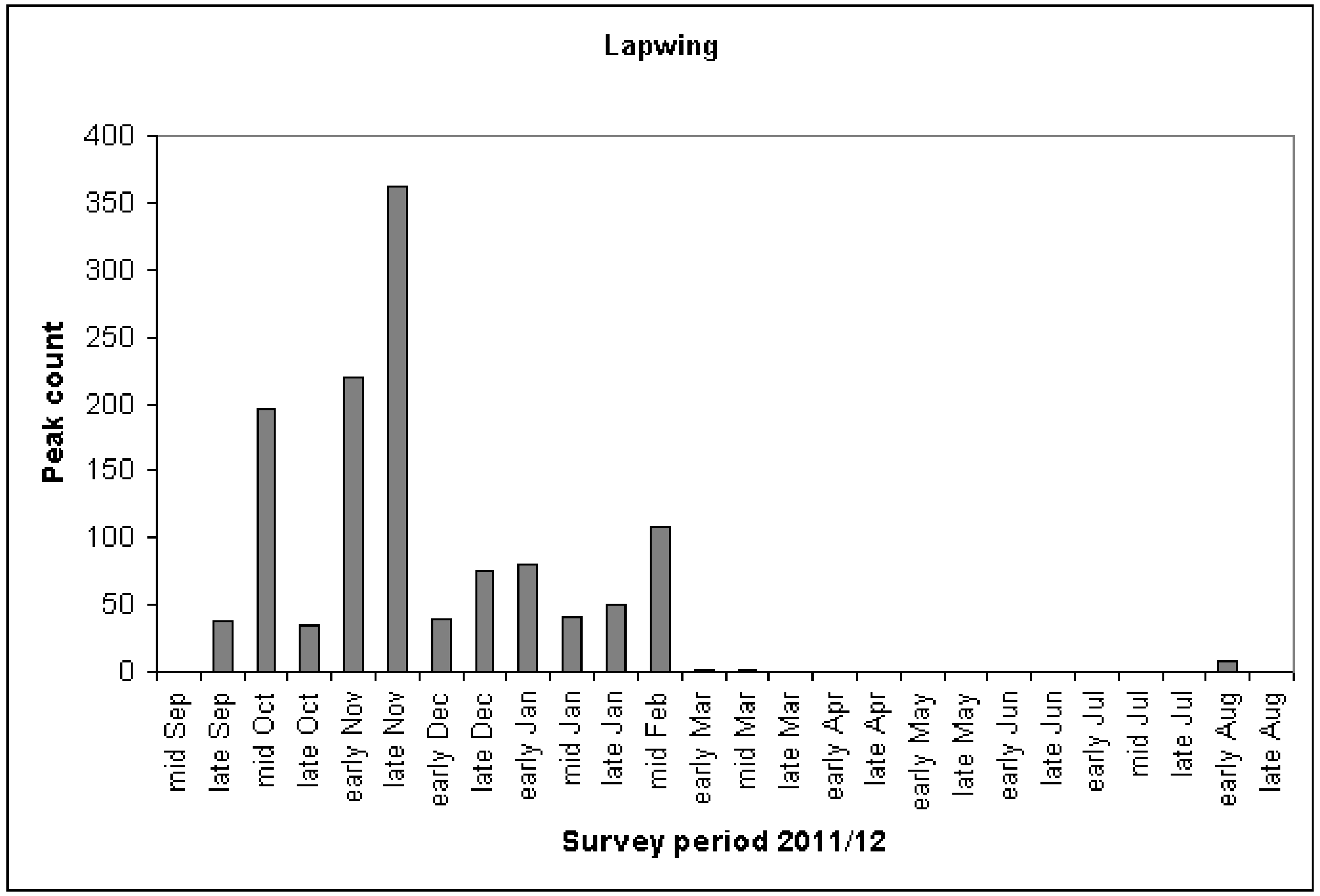


Figure F.74 Lapwing peak counts during cable route surveys at Horseshoe Point landfall site, 2011/12.

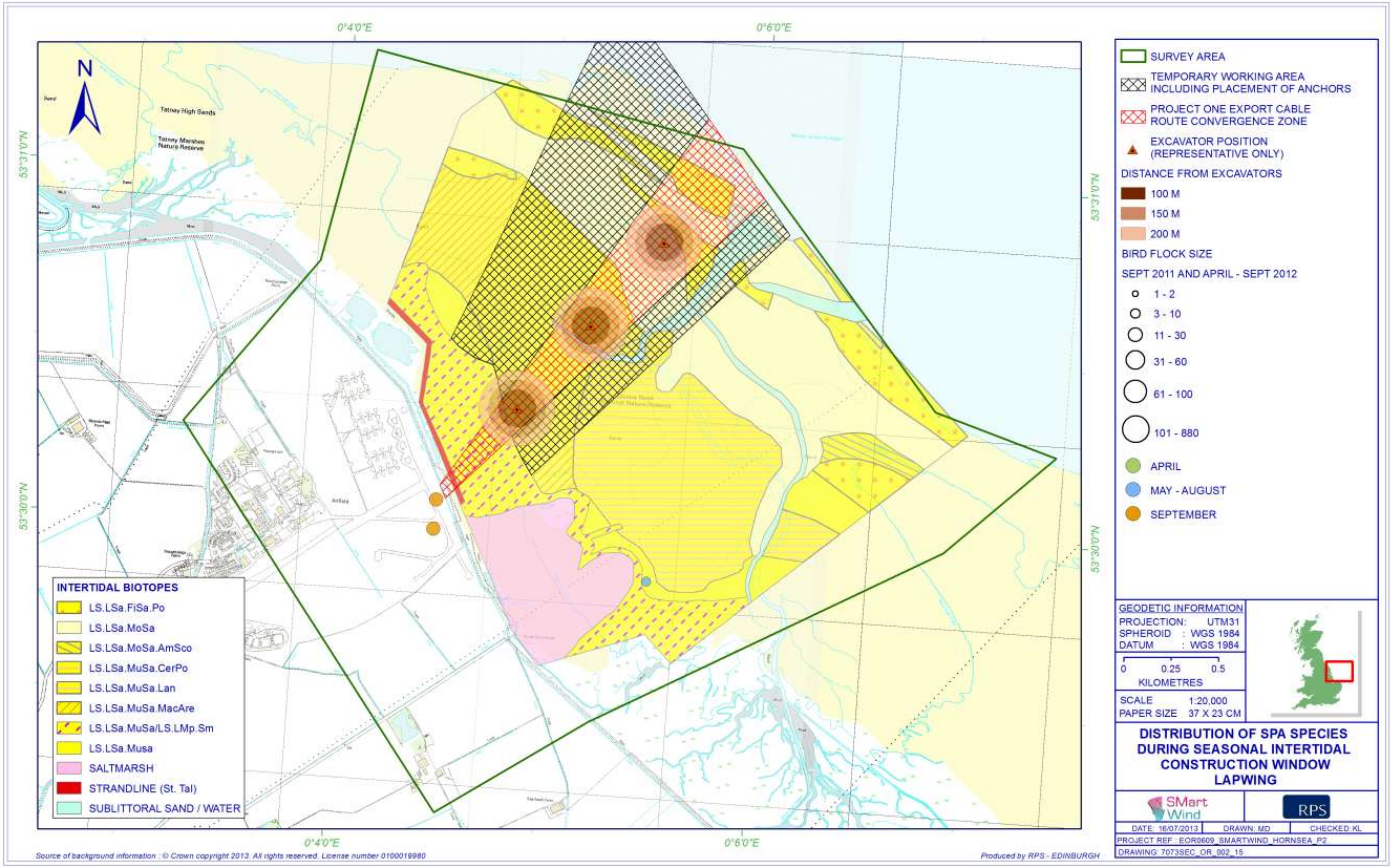


Figure F.75 Lapwing raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

Common Tern

Key Sites: Cleethorpes to Humberston (Mander and Cutts, 2005).

Seasonality

F.196 Common terns are generally only found within the Humber Estuary on autumn passage from July to September and in smaller numbers on spring passage in May and June. Mander and Cutts (2005) recorded a maximum count of 429 birds on passage in August 2004, and this was also the peak month for WeBS core count records (Holt *et al.* 2011).

Distribution

F.197 Mander and Cutts (2005) recorded peak autumn passage movements along the outer shore of the south bank, including 260 individuals on the Cleethorpes to Humberston Fitties WeBS Sector (MSC).

Population trends and status

F.198 This species was not included for assessment in Thaxter *et al.* (2010), and neither Coquet Island nor the Farne Islands are covered by WeBS Alerts. JNCC (2011) has however indicated that the national trend for common tern is stable, with a 3% increase in population between 2000 and 2010. The colony on Coquet Island has also been stable over this period, rising from around 1,000 to 1,200 pairs (JNCC Seabird Monitoring Programme Database), and increasing since the mid-1990s citation figure of 740 pairs. Between 2000 and 2010 the Farne Islands colony has reduced from 147 to 98 pairs, which is also a decline since the mid-1990s citation of 230 pairs. Trends of staging individuals within the Humber Estuary are unknown, at least partly due to the difficulties in accurately recording passage migrants, but from WeBS core count reports, numbers have increased greatly from a peak of 2,165 individuals in 2000 (Collier *et al.*, 2005), 330 in 2007 (Holt *et al.* 2009), up to 7,000 birds in the last complete estuary count in August 2008 (Holt *et al.* 2011).

Horseshoe Point landfall site

F.199 The intertidal area near Horseshoe Point has been identified by NE as a common tern roost in late summer. No common terns were however recorded during WeBS core count surveys within the Horseshoe Point sector, although a relatively large number were recorded in the adjacent Grainthorpe Haven sector (a peak of 220 birds in August, representing 11.3% of the combined cited Coquet Island and Farne Islands SPA populations, Table F.2). The species was mainly present between June and August in this sector with much smaller counts in May and June (peak of 20 birds). A peak of ten individuals was recorded in August 2004 in the MSF sector, with a lower peak of two birds on spring passage in May 2004 during low tide counts (Mander and Cutts, 2005). No individuals were recorded during breeding bird surveys of the cable route survey area in 2011, but two individuals were recorded in July 2012 during the 2011/12 surveys at the Horseshoe Point cable landfall site.

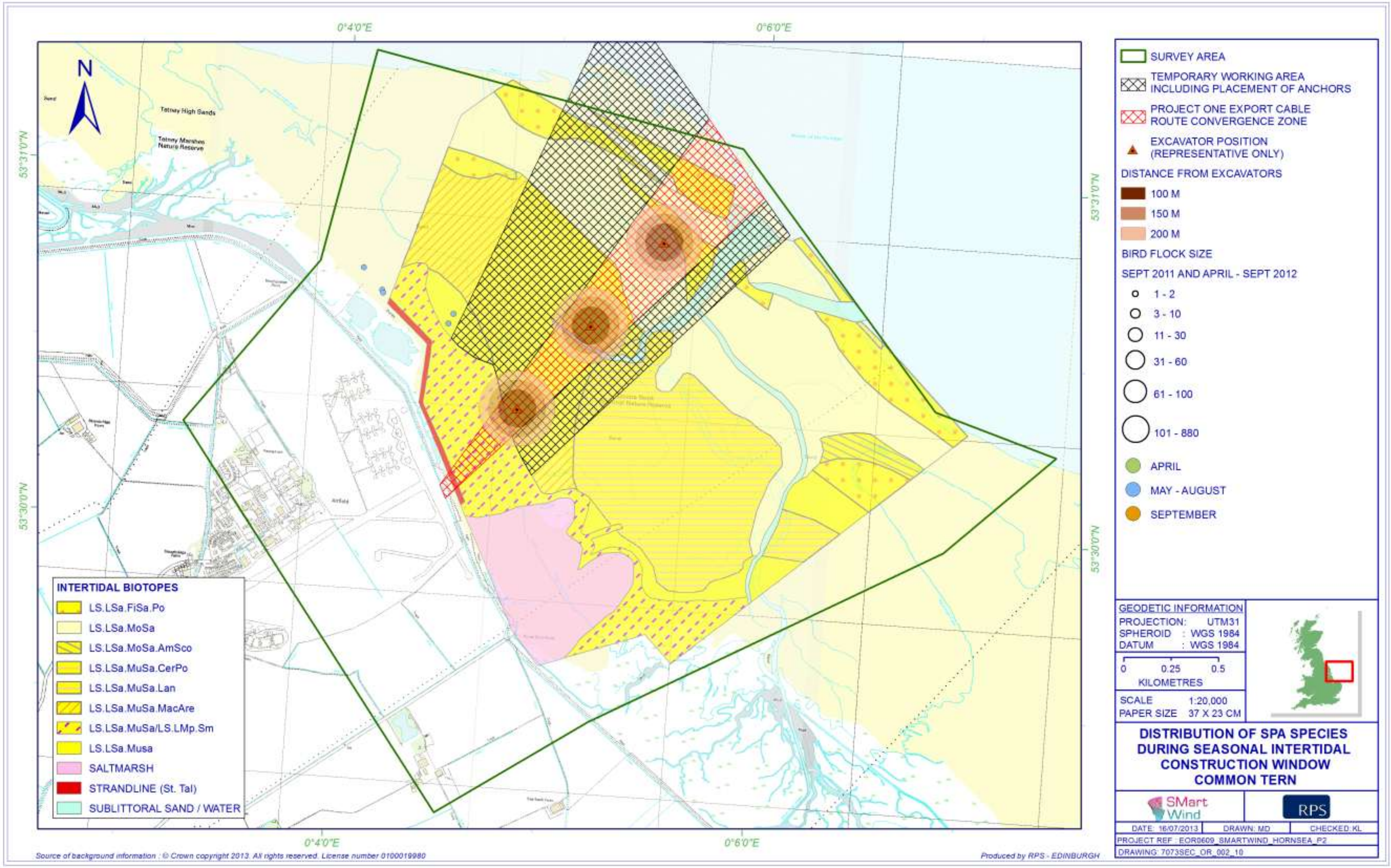


Figure F.76 Common tern raw counts during cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

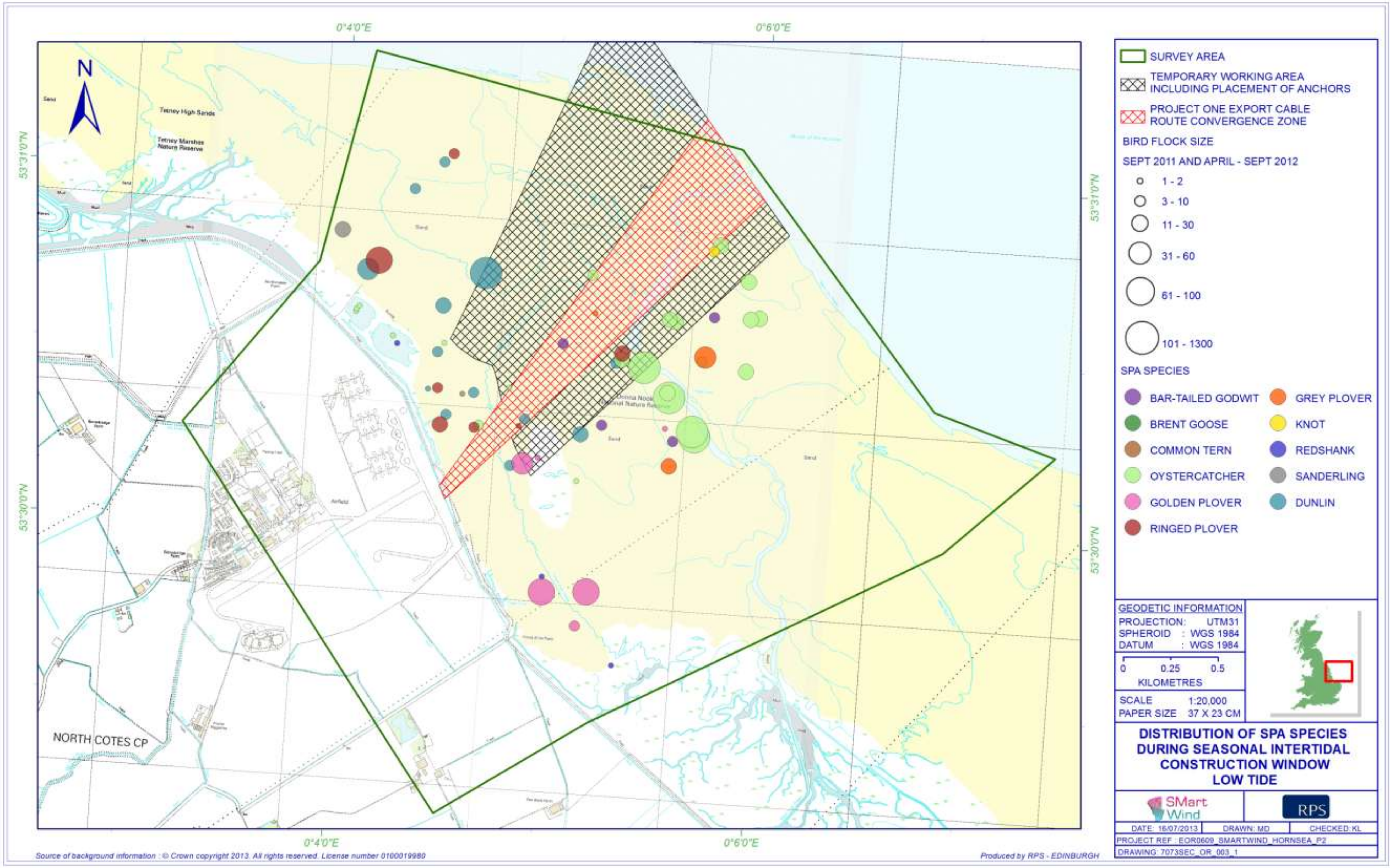


Figure F.77 Key species raw counts during low tide on cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

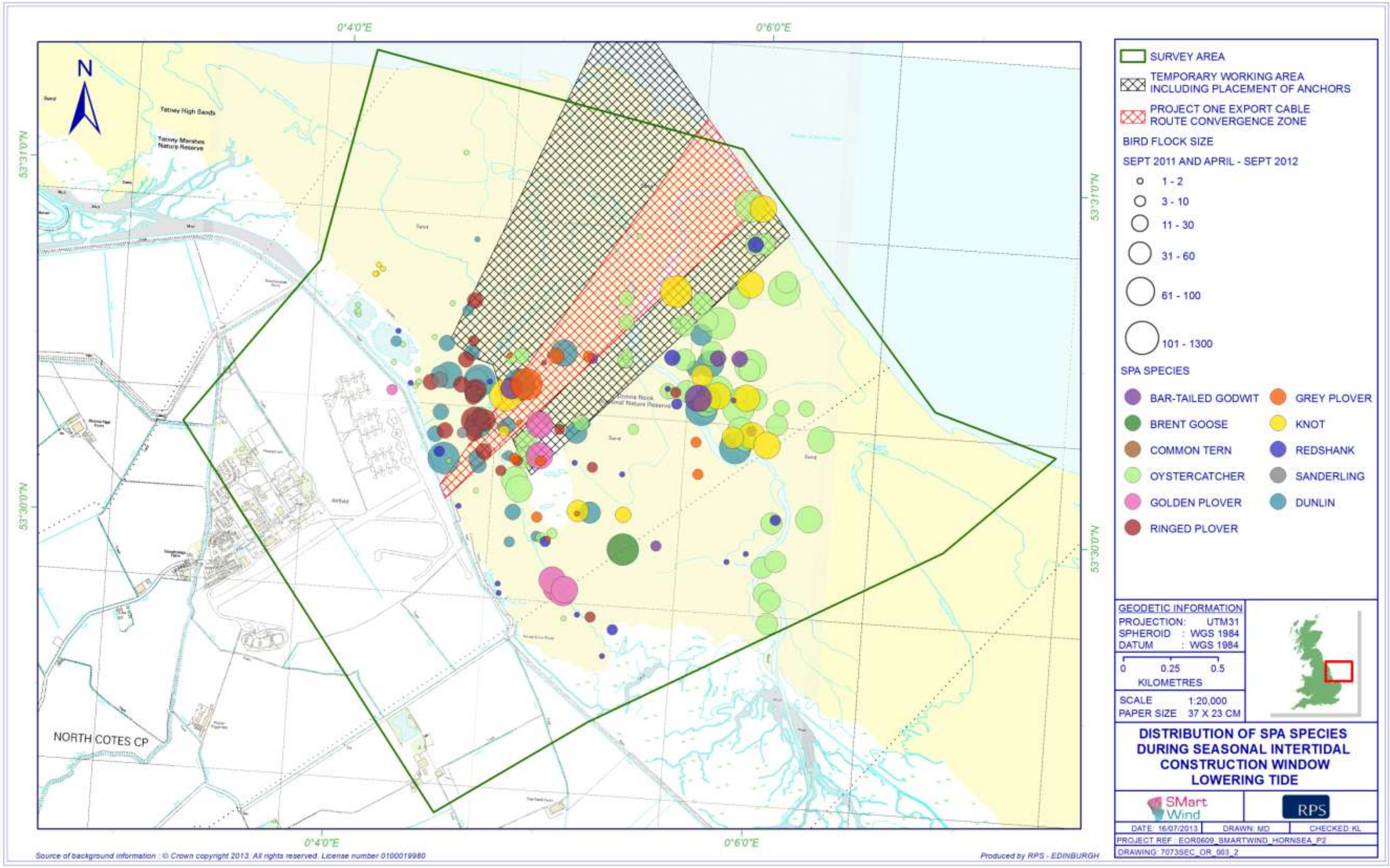


Figure F.78 Key species raw counts during lowering tide on cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

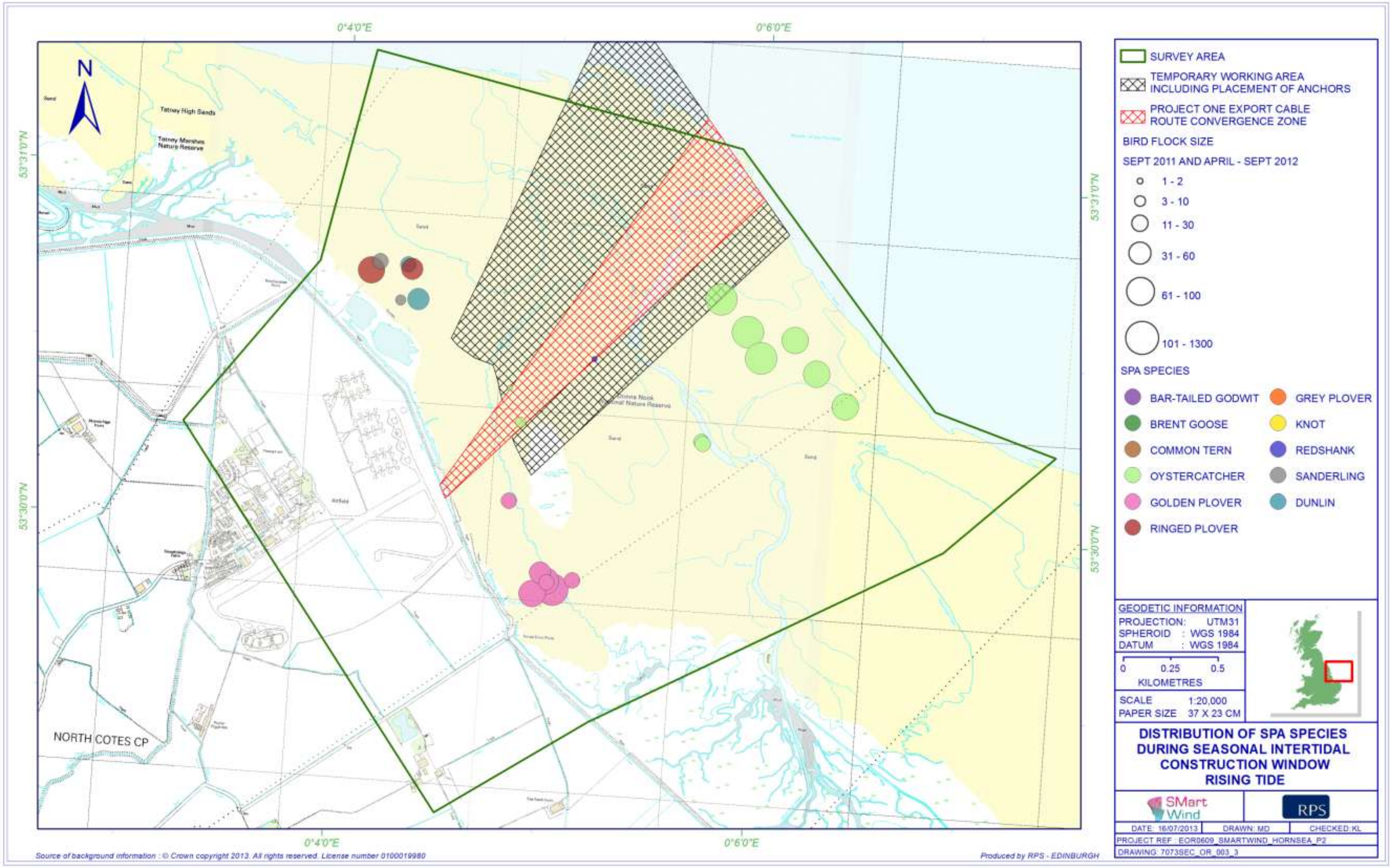


Figure F.79 Key species raw counts during rising tide on cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

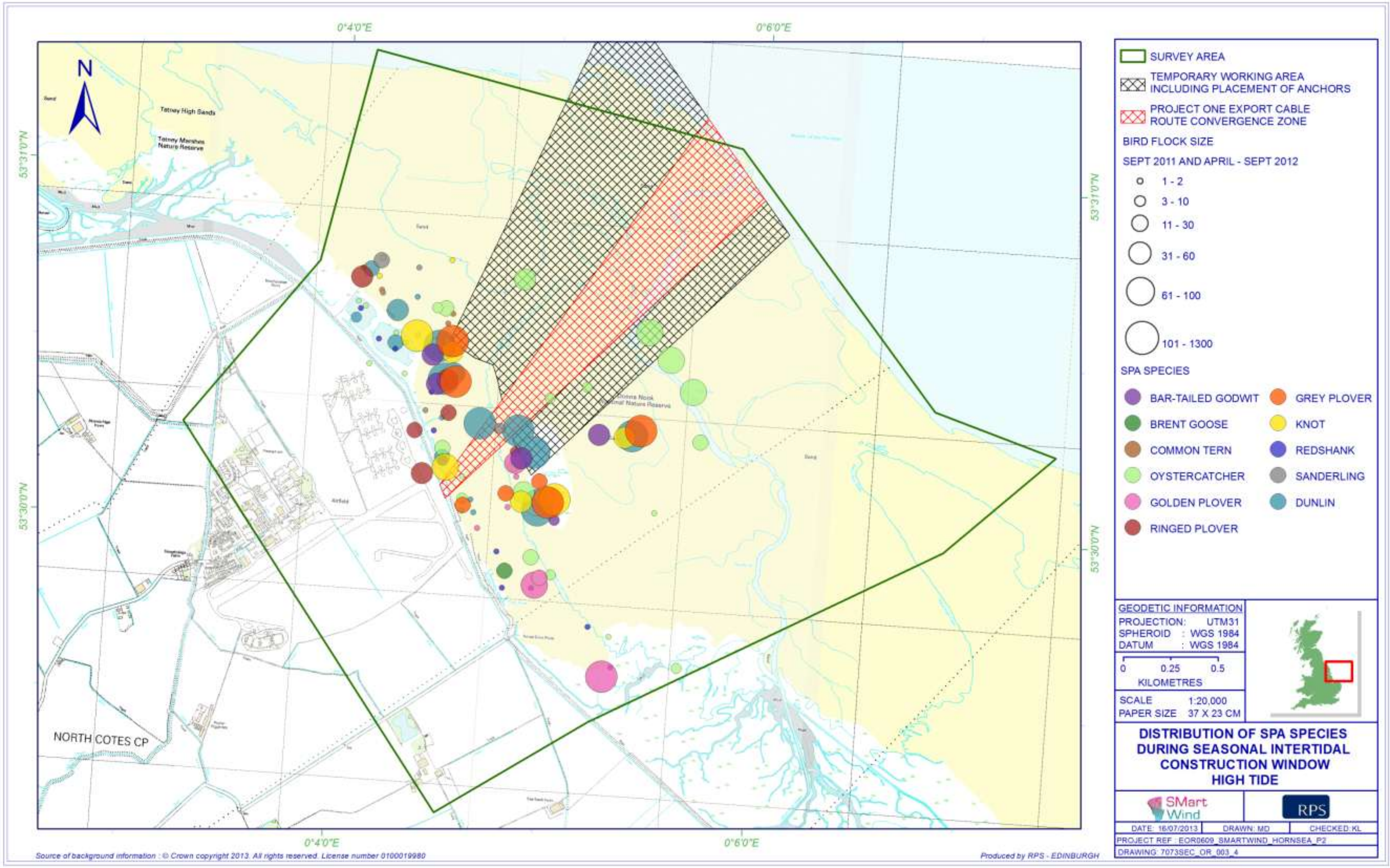


Figure F.80 Key species raw counts during high tide on cable route surveys at Horseshoe Point landfall site, 2011/12 (April to September only).

ANNEX G - SALTMARSH HABITATS EXTENTS AT HORSESHOE POINT 1992 TO 2010

G.1 This Annex presents the extents of saltmarsh habitats at the Horseshoe Point export cable landfall site between 1992 and 2010 from aerial photography at Horseshoe Point. These are presented in the figures below relative to the Project One export cable convergence corridor.

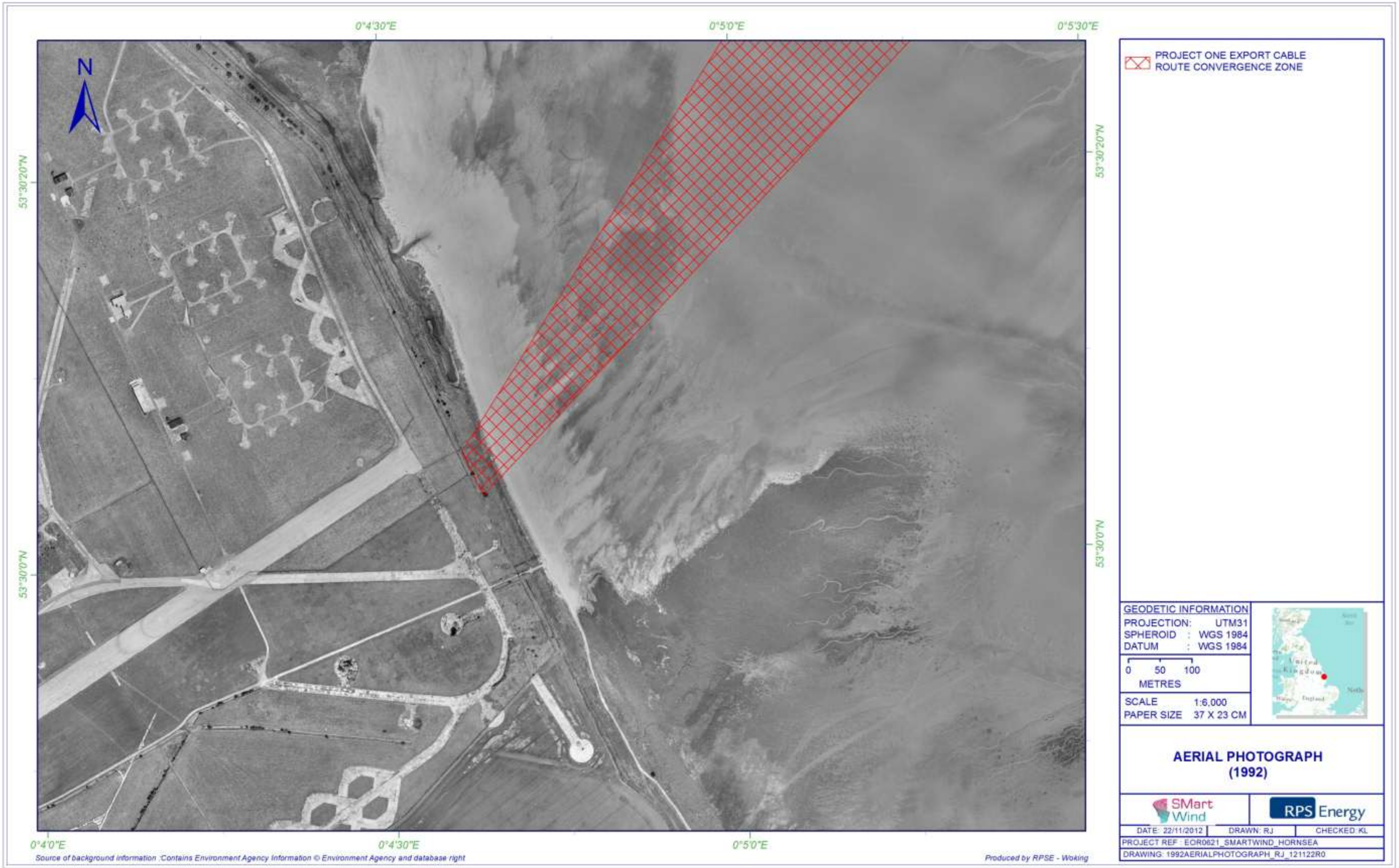


Figure G.1 Saltmarsh extents at Horseshoe Point (1992)

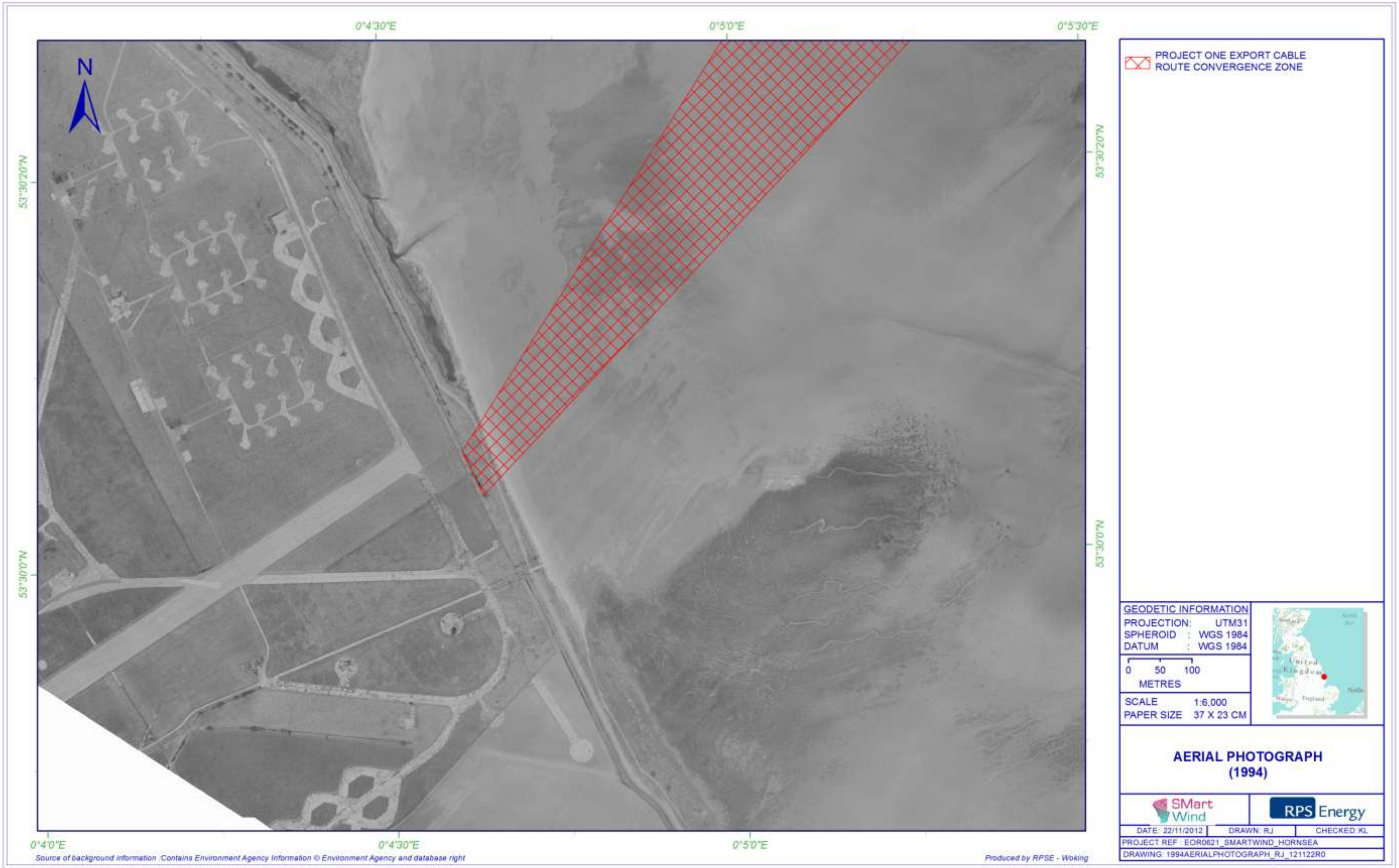


Figure G.2 Saltmarsh extents at Horseshoe Point (1994)

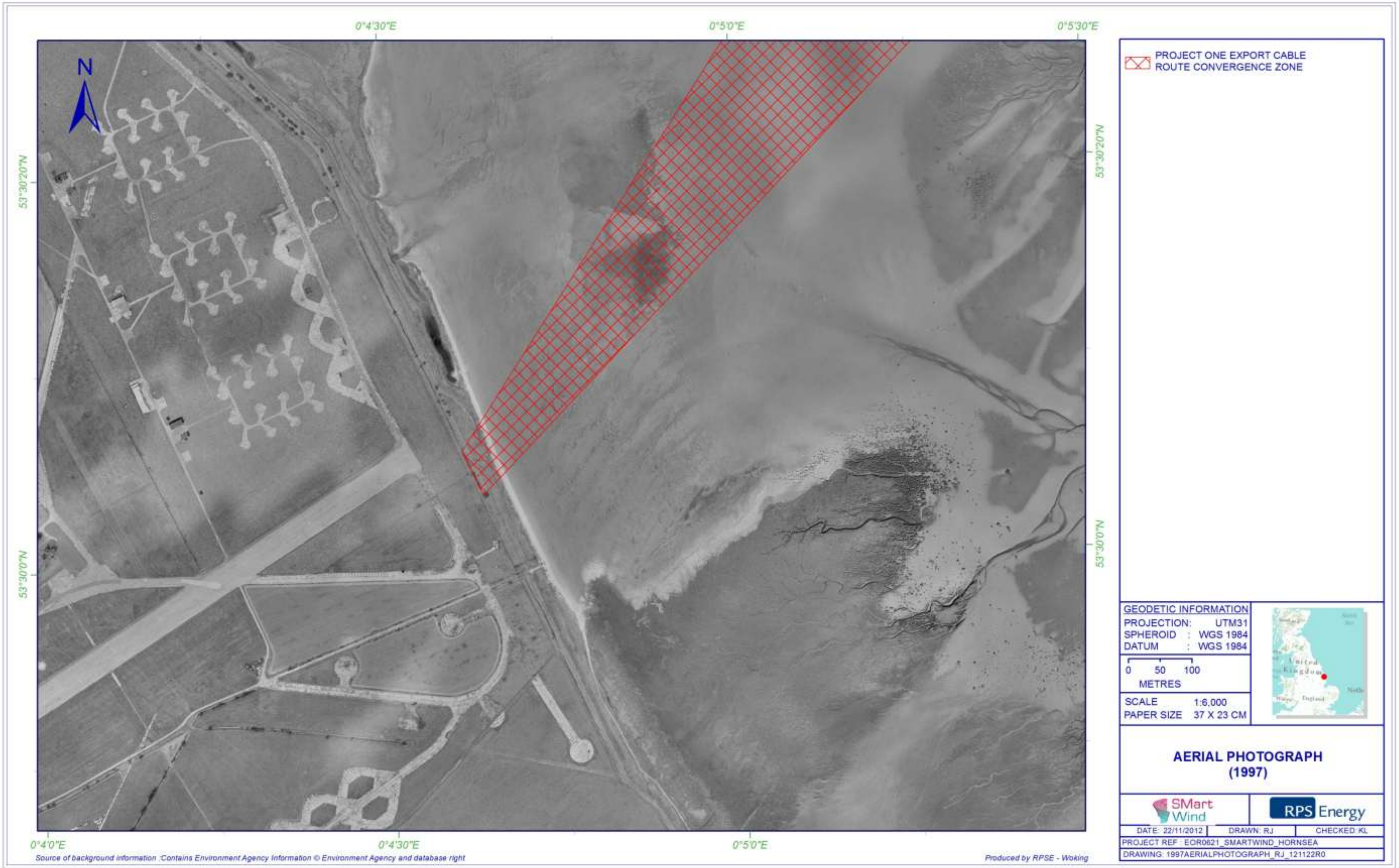


Figure G.3 Saltmarsh extents at Horseshoe Point (1997)

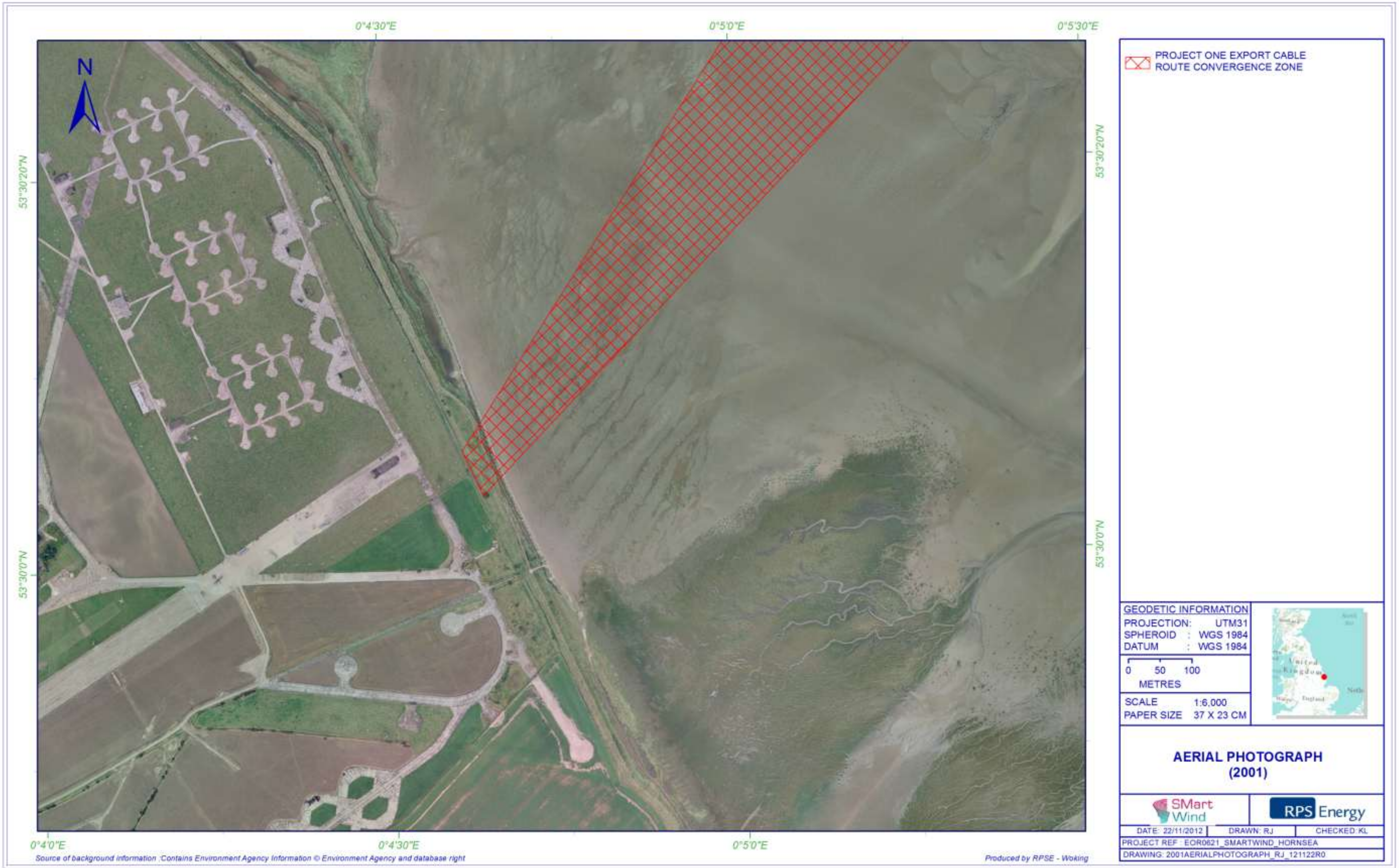


Figure G.4 Saltmarsh extents at Horseshoe Point (2001)

Figure G.5 Saltmarsh extents at Horseshoe Point (2005)

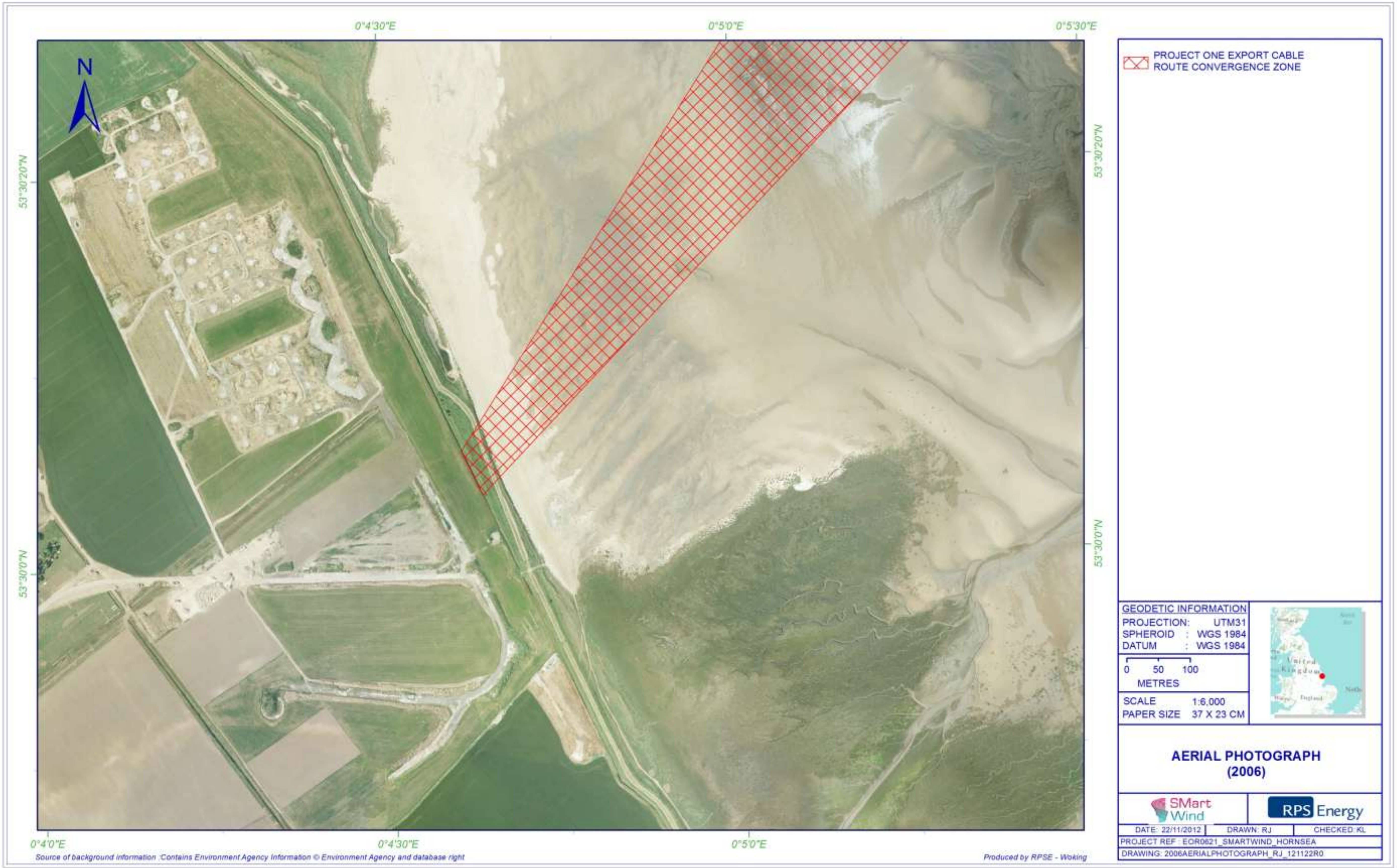


Figure G.6 Saltmarsh extents at Horseshoe Point (2006)

Figure G.7 Saltmarsh extents at Horseshoe Point (2007)

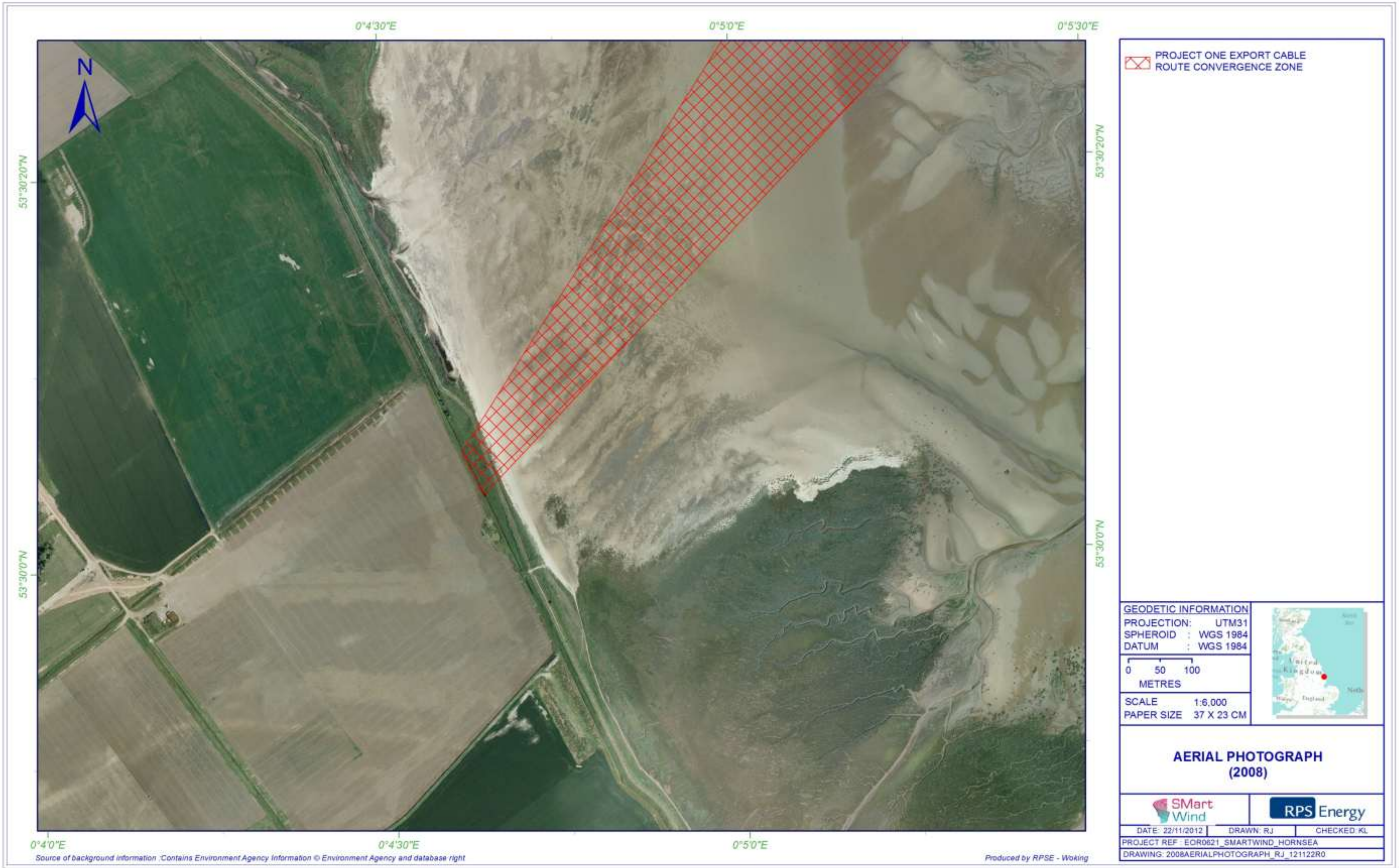


Figure G.8 Saltmarsh extents at Horseshoe Point (2008)

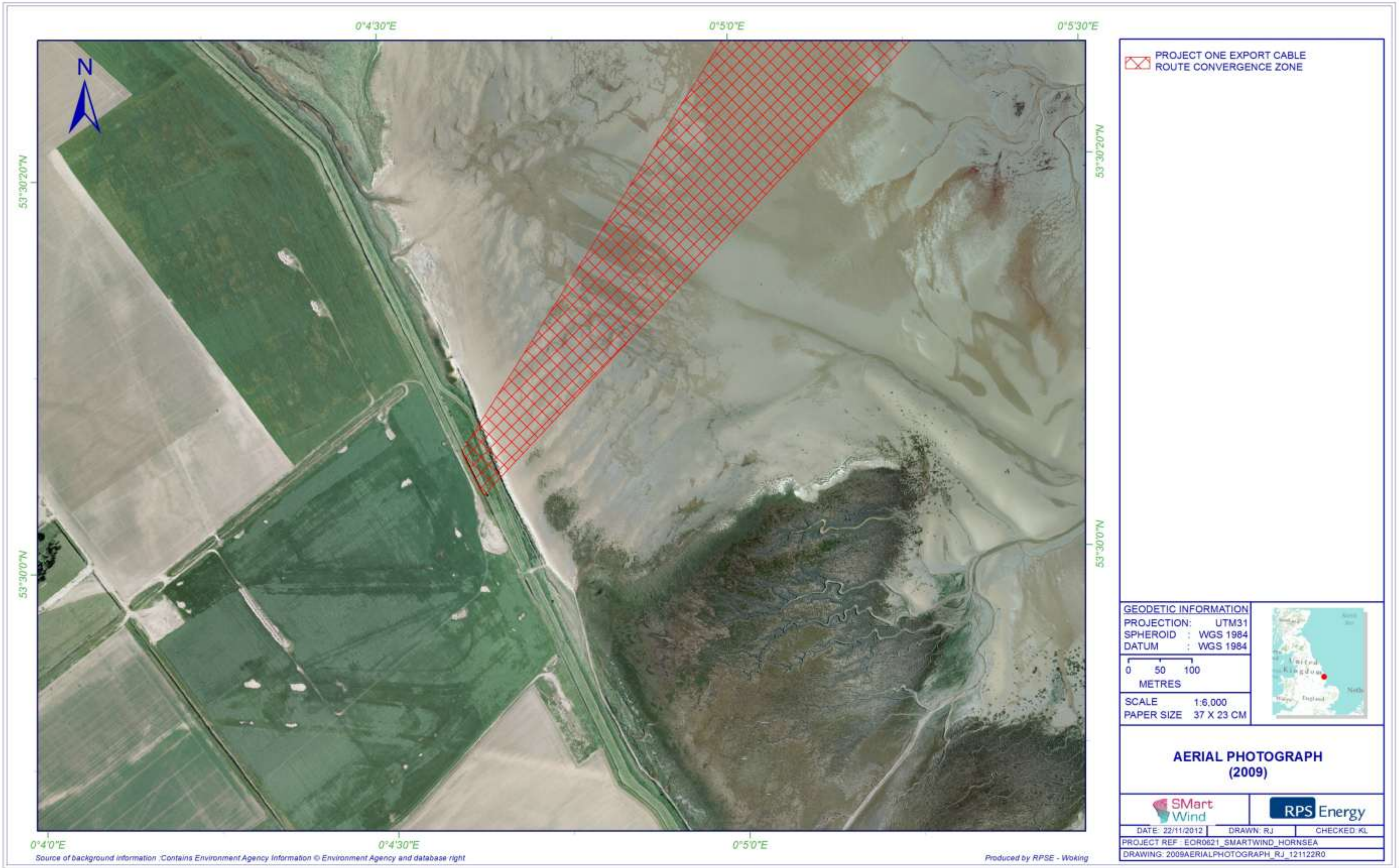


Figure G.9 Saltmarsh extents at Horseshoe Point (2009)

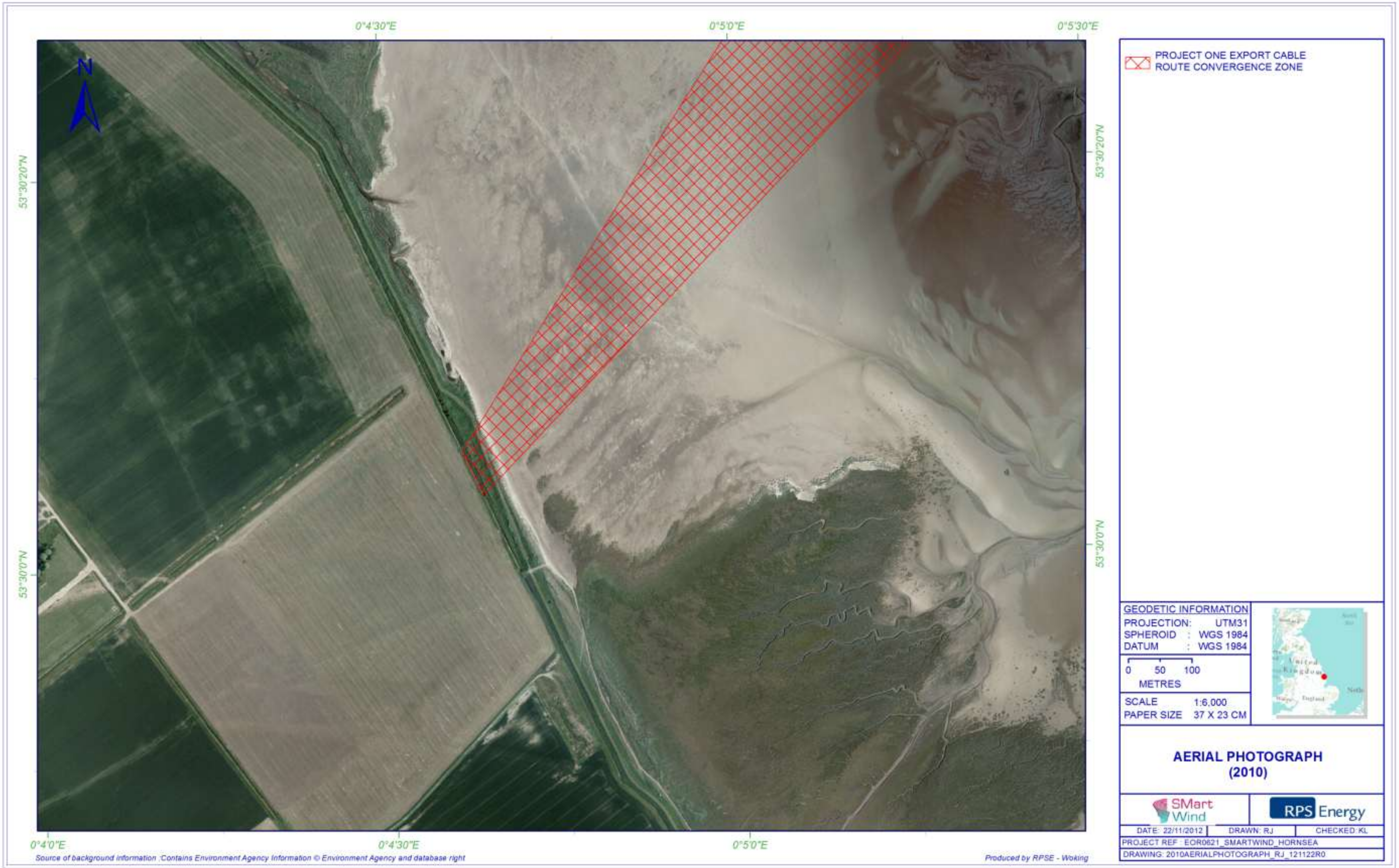


Figure G.10 Saltmarsh extents at Horseshoe Point (2010)

ANNEX H – STANDARD DATA FORMS FOR NATURA 2000 SITES

Table of Contents

H.1 UK Sites

Coquet Island

UK SPA data form

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type A

1.2 Site code UK9006031

1.3 Compilation date 198507

1.4 Update 199902

1.5 Relationship with other Natura 2000 sites

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name Coquet Island

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	198507
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	latitude
01 32 14 W	55 20 06 N

2.2 Site area (ha) 22.28

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK131	Northumberland	100.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

Coquet Island
Standard Natura 2000 Data Form
Page 1 of
Produced by JNCC. Version 1.1, 05/05/06

UK SPA data form

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

		Population				Site assessment			
		Resident	Migratory						
Code	Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
A192	*Sterna dougallii*		31 P			A		A	
A193	*Sterna hirundo*		740 P			B		C	
A194	*Sterna paradisaea*		700 P			C		C	
A191	*Sterna sandvicensis*		1590 P			B		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	66.1
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	6.1
Inland water bodies (standing water, running water)	0.5
Bogs. Marshes. Water fringed vegetation. Fens	
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	24.5
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	2.8
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Boulder, Metamorphic, Neutral, Nutrient-rich, Peat, Sand, Sandstone, Sedimentary

Geomorphology & landscape:

Intertidal rock, Intertidal sediments (including sandflat/mudflat), Islands, Subtidal rock (including rocky reefs)

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

Sterna dougallii (Europe - breeding)	48.4% of the GB breeding population 5 year mean, 1993-1997
Sterna hirundo (Northern/Eastern Europe - breeding)	6% of the GB breeding population 5 year mean, 1993-1997

Coquet Island
Standard Natura 2000 Data Form
Page 2 of
Produced by JNCC. Version 1.1, 05/05/06

UK SPA data form

Sterna paradisaea (Arctic - breeding/Southern Oceans - wintering)	1.6% of the GB breeding population Four count mean, 1993 & 1995-1997
Sterna sandvicensis (Western Europe/Western Africa)	11.4% of the GB breeding population 5 year mean, 1993-1997

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

4.3 Vulnerability

The site is managed by the RSPB as a nature reserve within the terms of a management plan agreed with English Nature. Consequently the site is being actively managed for its SPA and other breeding seabird interest. The site is not currently open to visitors.

The thin soils on the island are easily disturbed by burrowing rabbits and puffins which has lead to concern over loss of vegetation and subsequent erosion. The RSPB are currently undertaking vegetation management trials to limit erosion problems.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK04 (SSSI/ASSI)	100.0

Coquet Island
Standard Natura 2000 Data Form
Page 3 of
Produced by JNCC. Version 1.1, 05/05/06

Farne Islands

UK SPA data form

NATURA 2000
STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type J

1.2 Site code UK9006021

1.3 Compilation date 198507

1.4 Update 199902

1.5 Relationship with other Natura 2000 sites

U	K	0	0	1	7	0	7	2

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name Farne Islands

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	198507
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	latitude
01 38 55 W	55 37 13 N

2.2 Site area (ha) 101.86

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK131	Northumberland	100.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

Farne Islands
Standard Natura 2000 Data Form
Page 1 of
Produced by JNCC. Version 1.1, 05/05/06

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

Code	Species name	Population: Resident	Population: Migratory Breed	Population: Migratory Winter	Population: Migratory Stage	Site assessment: Population	Site assessment: Conservation	Site assessment: Isolation	Site assessment: Global
A193	*Sterna hirundo*		230 P			C		C	
A194	*Sterna paradisaea*		2840 P			B		C	
A191	*Sterna sandvicensis*		2070 P			B		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	1.0
Shingle. Sea cliffs. Islets	80.5
Inland water bodies (standing water, running water)	0.1
Bogs. Marshes. Water fringed vegetation. Fens	
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	16.2
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	2.2
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Boulder, Clay, Cobble, Metamorphic, Peat, Sand, Shingle

Geomorphology & landscape:

Cave/tunnel, Cliffs, Coastal, Crags/ledges, Geos (rocky inlets), Intertidal rock, Intertidal sediments (including sandflat/mudflat), Islands, Pools, Subtidal rock (including rocky reefs), Surge gullies

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

Sterna hirundo (Northern/Eastern Europe - breeding) — 1.9% of the GB breeding population, 5 year mean, 1993-1997

Sterna paradisaea (Arctic - breeding/Southern Oceans - wintering) — 6.5% of the GB breeding population, 5 year mean, 1993-1997

Sterna sandvicensis (Western Europe/Western Africa) — 14.8% of the GB breeding population, 5 year mean, 1993-1997

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

4.3 Vulnerability

The site is managed by the National Trust as a National Nature Reserve in accordance with a management plan agreed with English Nature. Two islands are open to visitors, though access is controlled and managed.

The thin soil cap found on the islands is easily disturbed by burrowing rabbits and puffins and by seals during their breeding season. Management of the vegetation/ soil cap and the pupping areas for seals is undertaken by the National Trust.

Marine activities including inshore fishing, recreation and pleasure craft are currently being monitored to assess any potential impact within the SPA.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	95.2
UK04 (SSSI/ASSI)	100.0

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type J

1.2 Site code UK9006101

1.3 Compilation date 199303

1.4 Update 199902

1.5 Relationship with other Natura 2000 sites

U	K	0	0	1	3	0	3	6

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name Flamborough Head and Bempton Cliffs

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	199303
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	latitude
00 06 48 W	54 07 55 N

2.2 Site area (ha) 212.17

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK21	Humberside	85.00%
UK22	North Yorkshire	15.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

		Population				Site assessment			
		Resident	Migratory						
Code	Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
A188	*Rissa tridactyla*		83370 P			A		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	68.0
Inland water bodies (standing water, running water)	
Bogs. Marshes. Water fringed vegetation. Fens	
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	29.0
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	2.0
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	1.0
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Basic, Biogenic reef, Cobble, Limestone/chalk, Sedimentary

Geomorphology & landscape:

Cave/tunnel, Caves, Cliffs, Coastal, Crags/ledges, Intertidal rock

4.2 Quality and importance

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

Rissa tridactyla (Eastern Atlantic - Breeding)	2.6% of the breeding population Count, as at 1987

4.3 Vulnerability

English Nature is working with local regulatory bodies to identify relevant issues through the Sensitive Marine Area (SMA) Project. From 1 July, 1998, this work will form the basis for the development of the joint European marine site management scheme for the SPA and SAC. A Management Group (involving Relevant Authorities) has already been established for the SMA Project and will continue to progress work on the Natura 2000 site. English Nature will continue to work on the setting of conservation objectives; identify key human activities which may affect the ornithological interest; identify the necessary survey management and monitoring systems; and increase the awareness of those most closely involved in the use and management of the SPA and SAC.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK04 (SSSI/ASSI)	100.0

Forth Islands

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **UK9004411**
SITENAME **Firth of Forth**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

A

1.2 SITE CODE

UK9004411

1.3 COMPILATION DATE

01-Oct-2001

1.4 UPDATE

01-Sep-2011

1.6 RESPONDENT(S)

Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY

1.7 SITE NAME

Firth of Forth

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
No data	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
01-Oct-2001	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude -2.883333
Latitude 56.016667

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

6313.7200

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum No data
Maximum No data
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code UKA12
Region Name No data
% Cover 27.60

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A001	Gavia stellata			90 i		B		C	
A157	Limosa lapponica			1974 i		B		C	
A140	Pluvialis apricaria [North-western Europe - breeding]			2949 i		C		C	
A007	Podiceps auritus			84 i		A		C	
A191	Sterna sandvicensis				1617 i	B		C	

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A050	Anas penelope			2139 i		C		C	
A053	Anas platyrhynchos			2564 i		C		C	
A040	Anser brachyrhynchus			10852 i		B		C	
A169	Arenaria interpres			860 i		C		C	
A062	Aythya marila			437 i		B		C	
A067	Bucephala clangula			2465 i		A		C	
A149	Calidris alpina alpina			9514 i		B		C	
A143	Calidris canutus			9258 i		B		C	
A137	Charadrius hiaticula			328 i		C		C	
A064	Clangula hyemalis			1045 i		B		C	

A130	Haematopus ostralegus			7846 i		B		C	
A066	Melanitta fusca			635 i		A		C	
A065	Melanitta nigra			2880 i		B		C	
A069	Mergus serrator			670 i		B		C	
A144	Numenius arquata			1928 i		B		C	
A391	Phalacrocorax carbo			682 i		B		C	
A141	Pluvialis squatarola			724 i		B		C	
A005	Podiceps cristatus			646 i		B		B	
A063	Somateria mollissima			9400 i		B		C	
A048	Tadorna tadorna			4509 i		B		C	
A162	Tringa totanus			4341 i		B		C	
A142	Vanellus vanellus			4148 i		C		C	

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	75.00
Salt marshes, Salt pastures, Salt steppes	4.50
Coastal sand dunes, Sand beaches, Machair	11.00
Shingle, Sea cliffs, Islets	9.50
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
UK04	100.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

Humber Estuary

UK SPA data form

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type J

1.2 Site code UK9006111

1.3 Compilation date 200708

1.4 Update 200708

1.5 Relationship with other Natura 2000 sites

U	K	0	0	3	0	1	7	0

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name **Humber Estuary**

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	200708
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	latitude
00 03 25 E	53 32 59 N

2.2 Site area (ha) 37630.24

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
0	Marine	50.67%
UKE11	Kingston upon Hull, City of	2.61%
UKE12	East Riding of Yorkshire	23.30%
UKE13	North and North East Lincolnshire	11.50%
UKF3	Lincolnshire	11.92%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

UK SPA data form

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

		Population				Site assessment			
		Resident	Migratory						
Code	Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
A052	*Anas crecca*			2322 I		C		C	
A050	*Anas penelope*			5044 I		C		C	
A053	*Anas platyrhynchos*			2456 I		C		C	
A169	*Arenaria interpres*			629 I		C		C	
A059	*Aythya ferina*			719 I		C		C	
A062	*Aythya marila*			127 I		C		C	
A021	*Botaurus stellaris*			4 I		B		C	
A021	*Botaurus stellaris*		2 M			B		B	
A046a	*Branta bernicla bernicla*			2098 I		C		C	
A067	*Bucephala clangula*			467 I		B		C	
A144	*Calidris alba*			486 I		B		C	
A144	*Calidris alba*				818 I	B		C	
A149	*Calidris alpina alpina*				20269 I	B		C	
A149	*Calidris alpina alpina*			22222 I		B		C	
A143	*Calidris canutus*			28165 I		B		C	
A143	*Calidris canutus*				18500 I	B		C	
A137	*Charadrius hiaticula*			403 I		C		C	
A137	*Charadrius hiaticula*				1766 I	B		C	
A081	*Circus aeruginosus*		10 F			B		B	
A082	*Circus cyaneus*			8 I		C		C	
A130	*Haematopus ostralegus*			3503 I		C		C	
A157	*Limosa lapponica*			2752 I		B		C	
A156	*Limosa limosa islandica*			1113 I		B		C	
A156	*Limosa limosa islandica*				915 I	B		C	
A160	*Numenius arquata*			3253 I		C		C	
A158	*Numenius phaeopus*				113 I	C		C	
A151	*Philomachus pugnax*				128 I	C		C	
A140	*Pluvialis apricaria*			30709 I		B		C	
A141	*Pluvialis squatarola*			1704 I		B		C	
A141	*Pluvialis squatarola*				1590 I	B		C	
A132	*Recurvirostra avosetta*			59 I		C		B	
A132	*Recurvirostra avosetta*		64 P			B		B	
A195	*Sterna albifrons*		51 P			B		C	
A048	*Tadorna tadorna*			4464 I		B		C	
A164	*Tringa nebularia*				77 I	C		C	
A162	*Tringa totanus*				7462 I	B		C	
A162	*Tringa totanus*			4632 I		B		C	
A142	*Vanellus vanellus*			22765 I		C		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	

UK SPA data form

Habitat classes	% cover
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	93.6
Salt marshes. Salt pastures. Salt steppes	4.6
Coastal sand dunes. Sand beaches. Machair	0.8
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	0.6
Bogs. Marshes. Water fringed vegetation. Fens	0.3
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Alluvium, Clay, Gravel, Limestone/chalk, Mud, Neutral, Sand, Sandstone, Sandstone/mudstone, Sedimentary, Shingle

Geomorphology & landscape:

Cliffs, Coastal, Estuary, Floodplain, Intertidal sediments (including sandflat/mudflat), Islands, Lagoon, Lowland, Shingle bar, Subtidal sediments (including sandbank/mudbank)

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

Botaurus stellaris (Europe - breeding)	10.5% of the population in Great Britain 2000-2002
Circus aeruginosus	6.3% of the population in Great Britain 1998-2002
Recurvirostra avosetta (Western Europe/Western Mediterranean - breeding)	8.6% of the population in Great Britain 1998-2002
Sterna albifrons (Eastern Atlantic - breeding)	2.1% of the population in Great Britain 1998-2002

Over winter the area regularly supports:

Botaurus stellaris (Europe - breeding)	4% of the population in Great Britain 1998/9 to 2002/3
Circus cyaneus	1.1% of the population in Great Britain 1997/8 to 2001/2

Limosa lapponica (Western Palearctic - wintering)	4.4% of the population in Great Britain 1996/7 to 2000/1
Pluvialis apricaria (North-western Europe - breeding)	12.3% of the population in Great Britain 1996/7 to 2000/1
Recurvirostra avosetta (Western Europe/Western Mediterranean - breeding)	1.7% of the population in Great Britain 1996/7 to 2000/1
On passage the area regularly supports:	
Philomachus pugnax (Western Africa - wintering)	1.4% of the population in Great Britain 1996-2000

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

Over winter the area regularly supports:

Calidris alpina alpina (Northern Siberia/Europe/Western Africa)	1.7% of the population 1996/7 to 2000/1
Calidris canutus (North-eastern Canada/Greenland/Iceland/North-western Europe)	6.3% of the population 1996/7 to 2000/1
Limosa limosa islandica (Iceland - breeding)	3.2% of the population 1996/7 to 2000/1
Tadorna tadorna (North-western Europe)	1.5% of the population 1996/7 to 2000/1
Tringa totanus (Eastern Atlantic - wintering)	3.6% of the population 1996/7 to 2000/1

On passage the area regularly supports:

Calidris alpina alpina (Northern Siberia/Europe/Western Africa)	1.5% of the population 1996-2000
Calidris canutus (North-eastern Canada/Greenland/Iceland/North-western Europe)	4.1% of the population 1996-2000
Limosa limosa islandica (Iceland - breeding)	2.6% of the population 1996-2000
Tringa totanus (Eastern Atlantic - wintering)	5.7% of the population 1996-2000

ARTICLE 4.2 QUALIFICATION (79/409/EEC): AN INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS

In the non-breeding season the area regularly supports:

153934 waterfowl (5 year peak mean 1996/7 to 2000/1)

Including:
Anas crecca , Anas penelope , Anas platyrhynchos , Arenaria interpres , Aythya ferina , Aythya marila , Botaurus stellaris , Branta bernicla bernicla , Bucephala clangula , Calidris alba , Calidris alpina alpina , Calidris canutus , Charadrius hiaticula , Haematopus ostralegus , Limosa lapponica , Limosa limosa islandica , Numenius arquata , Numenius phaeopus , Philomachus pugnax , Pluvialis apricaria , Pluvialis squatarola , Recurvirostra avosetta , Tadorna tadorna , Tringa nebularia , Tringa totanus , Vanellus vanellus

4.3 Vulnerability

The Humber Estuary is subject to the impacts of human activities (past and present) as well as ongoing processes such as sea level rise and climate change. Management intervention is therefore necessary to enable the estuary to recover and to secure the ecological resilience required to respond to both natural and anthropogenic change. Key issues include coastal squeeze, impacts on the sediment budget, and geomorphological structure and function of the estuary (due to sea level rise, flood defence works, dredging, and the construction, operation and maintenance of ports, pipelines and other infrastructure), changes in water quality and flows, pressure from additional built development, and damage and disturbance arising from access, recreation and other activities.

Coastal squeeze is being addressed through the development and implementation of the Humber Flood Risk Management Strategy. All proposals for flood defence, development, dredging, abstractions and discharges which require consent from any statutory body, and land use plans which may have impacts upon the site are subject to assessment under the Conservation (Natural Habitats, &c.) Regulations 1994 (the "Habitats Regulations"). Diffuse pollution will be addressed through a range of measures including implementation of the Waste Water Framework Directive and Catchment Sensitive Farming initiatives.

Other issues are addressed via a range of measures including regulation of on-site land management activities and implementation of the Humber Management Scheme, developed by all relevant statutory bodies to assist in the delivery of their duties under the Habitats Regulations.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	3.5
UK04 (SSSI/ASSI)	100.0

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.
DD MM YY

Designation date — Site Reference Number

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough
Cambridgeshire PE1 1JY
UK
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948
Email: RIS@JNCC.gov.uk

2. Date this sheet was completed/updated:
Designated: 31 August 2007

3. Country:
UK (England)

4. Name of the Ramsar site:
Humber Estuary

5. Designation of new Ramsar site or update of existing site:

This RIS is for: Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area:

The boundary has been extended

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site included:

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✔ -or- *no* ☐;
ii) **an electronic format** (e.g. a JPEG or ArcView image) Yes
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✔ -or- *no* ☐;

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

8. Geographical coordinates (latitude/longitude):
053 32 59 N 000 00 03 E

9. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Kingston-upon-Hull

The Humber Estuary is located on the boundary between the East Midlands Region and the Yorkshire and the Humber Region, on the east coast of England bordering the North Sea.

Administrative region: City of Kingston upon Hull; East Riding of Yorkshire; Humberside; Lincolnshire; North East Lincolnshire; North Lincolnshire

10. Elevation (average and/or max. & min.) (metres): **11. Area** (hectares): 37987.8

Min. -13
Max. 10
Mean No information available

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Humber Estuary is the largest macro-tidal estuary on the British North Sea coast. It drains a catchment of some 24,240 square kilometres and is the site of the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (max 7.4 m) and approximately one-third of the estuary is exposed as mud or sand flats at low tide. 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.

13. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

1, 3, 5, 6, 8

UK SAC data form

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type K

1.2 Site code UK0017072

1.3 Compilation date 199610

1.4 Update 200103

1.5 Relationship with other Natura 2000 sites

U	K	9	0	0	4	2	7	1
U	K	9	0	0	6	0	1	1
U	K	9	0	0	6	0	2	1

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name Berwickshire and North Northumberland Coast

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	199610
date confirmed as SCI	200412
date site classified as SPA	
date site designated as SAC	200504

2. Site location:

2.1 Site centre location

longitude	latitude
01 40 20 W	55 39 14 N

2.2 Site area (ha) 65045.5

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UKA11	Borders	0.15%
UK131	Northumberland	1.45%
0	Marine	98.84%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

Berwickshire and North Northumberland Coast
Natura 2000 Data Form
Page 1
Produced by JNCC, 27/07/11

UK SAC data form

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment
Sandbanks which are slightly covered by sea water all the time	0.5	D			
Estuaries	10	D			
Mudflats and sandflats not covered by seawater at low tide	8.94	A	B	A	**A**
Large shallow inlets and bays	7	C	C	B	**B**
Reefs	57.04	A	B	A	**A**
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	0.2	D			
Submerged or partially submerged sea caves	2.01	A	C	A	**A**

3.2 Annex II species

	Population				Site assessment			
	Resident	Migratory						
Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
Lutra lutra	Present	-	-	-	D			
Halichoerus grypus	501-1000	-	-	-	B	B	C	**B**

4. Site description

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	73.2
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	13.4
Salt marshes. Salt pastures. Salt steppes	1.3
Coastal sand dunes. Sand beaches. Machair	4.5
Shingle. Sea cliffs. Islets	6.7
Inland water bodies (standing water, running water)	
Bogs. Marshes. Water fringed vegetation. Fens	
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	0.5
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	0.4
Total habitat cover	**100%**

Berwickshire and North Northumberland Coast
Natura 2000 Data Form
Page 2
Produced by JNCC, 27/07/11

UK SAC data form

4.1 Other site characteristics

Soil & geology:

Biogenic reef, Boulder, Igneous, Limestone, Limestone/chalk, Metamorphic, Mud, Sand, Sandstone, Slate/shale

Geomorphology & landscape:

Barrier beach, Cave/tunnel, Cliffs, Coastal, Estuary, Intertidal rock, Intertidal sediments (including sandflat/mudflat), Islands, Open coast (including bay), Subtidal rock (including rocky reefs), Subtidal sediments (including sandbank/mudbank), Surge gullies

4.2 Quality and importance

Mudflats and sandflats not covered by seawater at low tide
- for which this is considered to be one of the best areas in the United Kingdom.

Large shallow inlets and bays
- for which this is considered to be one of the best areas in the United Kingdom.

Reefs
- for which this is considered to be one of the best areas in the United Kingdom.

Submerged or partially submerged sea caves
- for which this is considered to be one of the best areas in the United Kingdom.

Halichoerus grypus
- for which this is considered to be one of the best areas in the United Kingdom.

4.3 Vulnerability

The varied geological sequence along the coast forms a mixture of cliffs, rocky shores and sandy bays that attract a variety of recreational users for angling, diving, watersports, etc. In the case of diving, the most popular areas are subject to a voluntary code of practice. Any difficulties arising from recreational activities would be addressed by the site management scheme.
The estuarine reef communities support an important crustacean fishery whilst offshore fisheries exist for *Nephrops* and some pelagic and demersal fish species. Wastewater discharges could have a localised effect on the site but will be subject to EC water quality legislation. Much of the inshore area in Scotland is a voluntary Marine Nature Reserve.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	0.1
UK00 (N/A)	99.7
UK04 (SSSI/ASSI)	0.3

Berwickshire and North Northumberland Coast
Natura 2000 Data Form
Page 3
Produced by JNCC, 27/07/11

The Wash and North Norfolk Coast

UK SAC data form

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type K

1.2 Site code UK0017075

1.3 Compilation date 199610

1.4 Update 200103

1.5 Relationship with other Natura 2000 sites

U	K	9	0	0	8	0	2	1
U	K	9	0	0	8	0	2	2
U	K	9	0	0	9	0	3	1

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name The Wash and North Norfolk Coast

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	199610
date confirmed as SCI	200412
date site classified as SPA	
date site designated as SAC	200504

2. Site location:

2.1 Site centre location

longitude	latitude
00 19 05 E	52 56 13 N

2.2 Site area (ha) 107761.28

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK33	Lincolnshire	61.00%
UK402	Norfolk	39.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

The Wash and North Norfolk Coast
Natura 2000 Data Form
Page 1
Produced by JNCC, 27/07/11

UK SAC data form

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment
Sandbanks which are slightly covered by sea water all the time	41	A	B	B	**A**
Mudflats and sandflats not covered by seawater at low tide	17	A	B	A	**A**
Coastal lagoons	0.02	C	C	B	**C**
Large shallow inlets and bays	39	A	B	B	**A**
Reefs	0	A	C	A	**A**
Salicornia and other annuals colonising mud and sand	0.4	A	A	A	**A**
Spartina swards (*Spartinion maritimae*)	0	D			
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	2.6	A	B	A	**A**
Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	0.1	A	A	A	**A**

3.2 Annex II species

	Population				Site assessment			
	Resident	Migratory						
Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
Lutra lutra	Very rare	-	-	-	C	C	C	**C**
Halichoerus grypus	Present	-	-	-	D			
Phoca vitulina	1001-10,000	-	-	-	B	B	C	**A**

4. Site description

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	51.0
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	46.0
Salt marshes. Salt pastures. Salt steppes	3.0
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	
Bogs. Marshes. Water fringed vegetation. Fens	
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Alluvium, Biogenic reef, Chert/flint, Clay, Gravel, Limestone/chalk, Mud, Nutrient-rich, Peat, Sand, Sandstone, Shingle

Geomorphology & landscape:

Barrier beach, Coastal, Enclosed coast (including embayment), Estuary, Intertidal sediments (including sandflat/mudflat), Lagoon, Open coast (including bay), Shingle bar, Subtidal sediments (including sandbank/mudbank)

4.2 Quality and importance

Sandbanks which are slightly covered by sea water all the time
- for which this is considered to be one of the best areas in the United Kingdom.

Mudflats and sandflats not covered by seawater at low tide
- for which this is considered to be one of the best areas in the United Kingdom.

Coastal lagoons
- for which the area is considered to support a significant presence.

Large shallow inlets and bays
- for which this is considered to be one of the best areas in the United Kingdom.

Reefs
- for which this is considered to be one of the best areas in the United Kingdom.

Salicornia and other annuals colonising mud and sand
- for which this is considered to be one of the best areas in the United Kingdom.

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- for which this is considered to be one of the best areas in the United Kingdom.

Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)
- for which this is one of only four known outstanding localities in the United Kingdom.
- which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 1000 hectares.

Lutra lutra
- for which the area is considered to support a significant presence.

Phoca vitulina
- for which this is considered to be one of the best areas in the United Kingdom.

4.3 Vulnerability

The Wash and North Norfolk Coast is one of the most diverse coastal systems in Britain. This diversity is largely dependent on physical processes that dominate the natural system; consequently the vulnerability of habitats is linked to changes in the physical environment. The intertidal zone is being threatened from coastal squeeze as a result of land-claim and coastal defence works as well as sea-level rise and storm-surges. Changes in the sediment budgets also threaten these habitats. At present activities which alter the sediment characteristics include dredging and coastal protection works. Current management is underway to address concerns over declines in shellfisheries.

The area supports internationally important seal populations that are vulnerable to disturbance and disruption of the marine ecosystem upon which they depend. Such issues should be addressed through the Marine Scheme of Management.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	2.8
UK00 (N/A)	38.7
UK04 (SSSI/ASSI)	61.4

UK SAC data form

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type K

1.2 Site code UK0030253

1.3 Compilation date 200103

1.4 Update

1.5 Relationship with other Natura 2000 sites

U	K	9	0	0	6	0	9	2

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name River Derwent

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	200103
date confirmed as SCI	200412
date site classified as SPA	
date site designated as SAC	200504

2. Site location:

2.1 Site centre location

longitude	latitude
00 55 40 W	53 55 03 N

2.2 Site area (ha) 411.23

2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK22	North Yorkshire	100.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

UK SAC data form

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	0.1	C	C	B	C

3.2 Annex II species

Species name	Population: Resident	Population: Migratory Breed	Population: Migratory Winter	Population: Migratory Stage	Site assessment: Population	Site assessment: Conservation	Site assessment: Isolation	Site assessment: Global
Austropotamobius pallipes	Present	-	-	-	D			
Petromyzon marinus	Rare	-	-	-	C	C	B	C
Lampetra planeri	Present	-	-	-	D			
Lampetra fluviatilis	Common	-	-	-	C	B	C	B
Salmo salar	Present	-	-	-	D			
Cottus gobio	Common	-	-	-	C	B	C	C
Lutra lutra	Common	-	-	-	C	B	C	C

4. Site description

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	95.0
Bogs. Marshes. Water fringed vegetation. Fens	2.0
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	3.0
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	**100%**

H.2 Belgium sites

SBZ 1/ ZPS 1

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **BEMNZ0002**
SITENAME **SBZ 1 / ZPS 1**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

J

1.2 SITE CODE

BEMNZ0002

1.3 COMPILATION DATE

01-Apr-2006

1.5 RELATION WITH OTHER NATURA 2000 SITES

BEMNZ0001

1.6 RESPONDENT(S)

DG Leefmilieu van de FOD Volksgez., Veiligheid van de Voedselketen en Leefmilieu - SPF Santé pub., Sécurité de la Chaîne alim. et Env., DG Env. Section Milieu Marin - Pl. V. Hortaplein, 40B10, B-1060 Bruxelles/Brussel

1.7 SITE NAME

SBZ 1 / ZPS 1

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
No data	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
01-Oct-2005	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 2.606667
Latitude 51.168056

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

10993.0000

2.4 ALTITUDE (M)

Minimum -14
Maximum 0
Mean -5

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	41.00	A	B	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and
listed in Annex II of Directive 92/43/EEC and
site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A002	Gavia arctica			P		B	B	C	C
A001	Gavia stellata			P		B	B	C	B
A177	Larus minutus				C	B	B	C	B
A193	Sterna hirundo				C	B	B	C	B
A191	Sterna sandvicensis		C		C	A	B	C	A

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax				C	B	B	C	B
A065	Melanitta nigra			C		A	B	C	B
A005	Podiceps cristatus			C		A	B	C	A
A199	Uria aalge			C		C	B	C	C

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				

1364	Halichoerus grypus				R	B	B	C	C
1365	Phoca vitulina				R	B	B	C	C
1351	Phocoena phocoena				C	B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1095	Petromyzon marinus				R	C	B	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Ensis directus	C	D
I	Spisula subtruncata	C	D
I	Crangon crangon	C	D
F	Pleuronectes platessa	C	D
F	Solea solea	C	D

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
BE15	28.00
BE15	56.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN00	Vlaamse Banken	*	28.00
IN06	Trapegeer-Stroombank	*	56.00

5.3 RELATION OF THE DESCRIBED SITE WITH CORINE BIOTOPE SITES

CORINE SITE CODE	OVERLAP	
	TYPE	% COVER
500190100	*	28.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
200	C	1.00	0
211	C	10.00	-
212	A	80.00	-
220	B	50.00	-
520	B	50.00	-
621	B	100.00	-
701	C	100.00	-
871	C	1.00	-

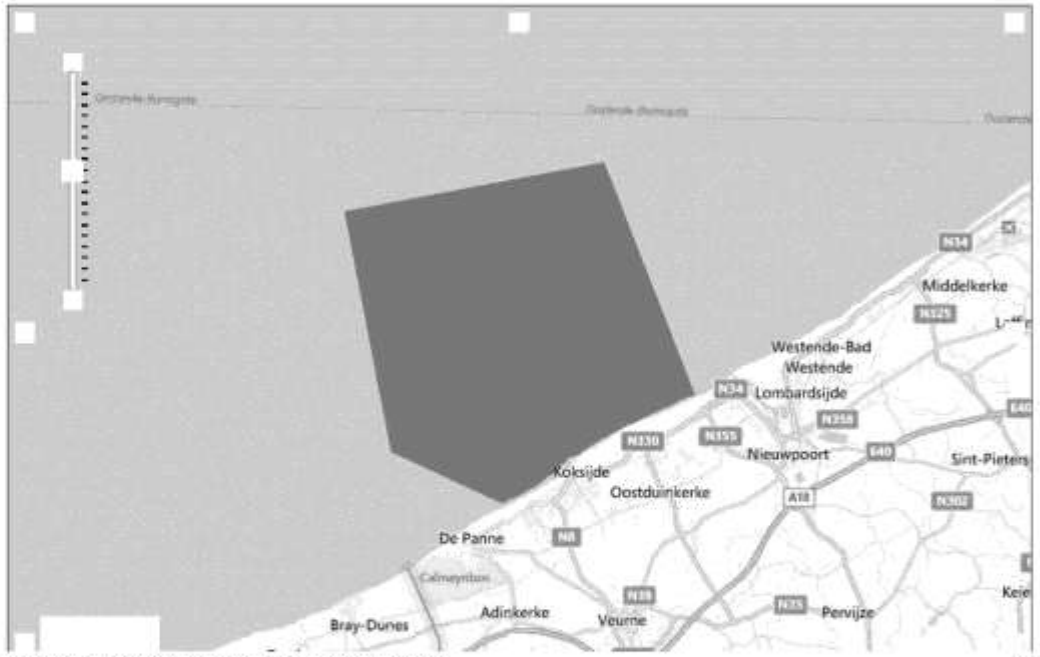
Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
504	B	-
952	B	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
Adm. Ch.1872/2005	100000	Mercator WGS 84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

De digitale afbakening van BEMNZ0002 wordt afgebakend door de basislijn en een lijn die de punten 1 tot 5 verbindt (coördinaten zie 4.4). De referentie voor de basislijn is de digitale basislijn van de meest recente uitgave van de officiële zeekaart (digitale versie) uitgegeven door de Vlaamse Hydrografische dienst van de afdeling Kust.

SBZ 2 / ZPS 2

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **BEMNZ0003**
SITENAME **SBZ 2 / ZPS 2**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

J

1.2 SITE CODE

BEMNZ0003

1.3 COMPILATION DATE

01-Apr-2006

1.5 RELATION WITH OTHER NATURA 2000 SITES

BEMNZ0001

1.6 RESPONDENT(S)

DG Leefmilieu van de FOD Volksgez., Veiligheid van de Voedselketen en Leefmilieu - SPF Santé pub., Sécurité de la Chaîne alim. et Env., DG Env. Section Milieu Marin - Pl. V. Hortaplein, 40B10, B-1060 Bruxelles/Brussel

1.7 SITE NAME

SBZ 2 / ZPS 2

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
No data	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
01-Oct-2005	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 2.872222
Latitude 51.282778

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

14468.0000

2.4 ALTITUDE (M)

Minimum -20
Maximum 0
Mean -5

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	11.00	B	B	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A002	Gavia arctica			P		B	B	C	C
A001	Gavia stellata			P		B	B	C	B
A177	Larus minutus				C	A	B	C	B
A193	Sterna hirundo				C	B	B	C	B
A191	Sterna sandvicensis		C		C	A	B	C	B

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax				C	B	B	C	B
A065	Melanitta nigra			C		A	B	C	B
A005	Podiceps cristatus			C		A	B	C	A
A199	Uria aalge			C		C	B	C	C

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus				R	B	B	C	C
1365	Phoca vitulina				R	B	B	C	C
1351	Phocoena phocoena				C	B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1095	Petromyzon marinus				R	C	B	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Ensis directus	C	D
I	Spisula subtruncata	C	D
I	Crangon crangon	C	D
F	Pleuronectes platessa	C	D
F	Solea solea	C	D

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
BE15	4.00
BE15	20.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN00	Vlaamse Banken	*	4.00
IN06	Trapegeer-Stroombank	*	20.00

5.3 RELATION OF THE DESCRIBED SITE WITH CORINE BIOTOPE SITES

CORINE SITE CODE	OVERLAP	
	TYPE	% COVER
500190100	*	4.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
211	C	10.00	-
212	A	80.00	-
220	B	50.00	-
520	B	50.00	-
621	B	100.00	-
701	C	100.00	-
820	B	5.00	-

Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
504	B	-
952	B	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
Adm. Ch.1872/2005	100000	Mercator WGS 84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

De digitale afbakening van BEMNZ0003 wordt afgebakend door de basislijn en een lijn die de punten 1 tot 8 verbindt (coördinaten zie 4.4). De referentie voor de basislijn is de digitale basislijn van de meest recente uitgave van de officiële zeekaart (digitale versie) uitgegeven door de Vlaamse Hydrografische dienst van de afdeling Kust.

SBZ 3 / ZPS 3

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **BEMNZ0004**
SITENAME **SBZ 3 / ZPS 3**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

A

1.2 SITE CODE

BEMNZ0004

1.3 COMPILATION DATE

01-Apr-2006

1.6 RESPONDENT(S)

DG Leefmilieu van de FOD Volksgez., Veiligheid van de Voedselketen en Leefmilieu - SPF Santé pub., Sécurité de la Chaîne alim. et Env., DG Env. Section Milieu Marin - Pl. V. Hortaplein, 40B10, B-1060 Bruxelles/Brussel

1.7 SITE NAME

SBZ 3 / ZPS 3

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
No data	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
01-Oct-2005	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 3.169444
Latitude 51.360556

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

5681.0000

2.4 ALTITUDE (M)

Minimum -15
Maximum 0
Mean -5

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	40.00	B	C	C	C

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A177	Larus minutus				C	A	B	C	B
A195	Sterna albifrons		C		C	A	B	C	A
A193	Sterna hirundo		C		C	A	B	C	A
A191	Sterna sandvicensis		C		C	A	B	C	B

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax				C	B	B	C	B
A005	Podiceps cristatus			C		B	B	C	C

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus				R	B	B	C	C
1365	Phoca vitulina				R	B	B	C	C
1351	Phocoena phocoena				P	B	B	C	C

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1095	Petromyzon marinus				R	C	B	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Ensis directus	C	D
I	Spisula subtruncata	C	D
I	Crangon crangon	C	D
F	Pleuronectes platessa	C	D
F	Solea solea	C	D

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
BE00	100.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
211	C	10.00	-
212	A	80.00	-
220	B	50.00	-
512	C	2.00	-
520	B	50.00	-

621	B	100.00	-
701	C	100.00	-
820	A	5.00	-

Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
504	B	-
952	A	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
Adm. Ch.1872/2005	100000	Mercator WGS 84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

De digitale afbakening van BEMNZ0004 wordt afgebakend door de basislijn en een lijn die de punten 1 tot 9 verbindt (coördinaten zie 4.4). De referentie voor de basislijn is de digitale basislijn van de meest recente uitgave van de officiële zeekaart (digitale versie) uitgegeven door de Vlaamse Hydrografische dienst van de afdeling Kust.

Vlakte van de Raan

7/1/13 N2K BEMNZ0005 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **BEMNZ0005**
SITENAME **Vlakte van de Raan**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

BEMNZ0005

1.3 COMPILATION DATE

01-Apr-2006

1.6 RESPONDENT(S)

DG Leefmilieu van de FOD Volksgez., Veiligheid van de Voedselketen en Leefmilieu - SPF Santé pub., Sécurité de la Chaîne alim. et Env., DG Env. Section Milieu Marin - Pl. V. Hortaplein, 40B10, B-1060 Bruxelles/Brussel

1.7 SITE NAME

Vlakte van de Raan

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Oct-2005	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 3.243056
Latitude 51.441111

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

1925.0000

2.4 ALTITUDE (M)

Minimum -6
Maximum -3
Mean -4

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	100.00	B	A	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A002	Gavia arctica			P		C	B	C	C
A001	Gavia stellata			P		B	B	C	C
A177	Larus minutus				C	C	B	C	C
A193	Sterna hirundo				C	B	B	C	C
A191	Sterna sandvicensis		C		C	C	B	C	C

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax				C	B	B	C	B
A005	Podiceps cristatus			C		B	B	C	B

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus				R	C	B	C	C
1365	Phoca vitulina				R	B	B	C	C
1351	Phocoena phocoena				C	C	B	C	C

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1095	Petromyzon marinus				R	C	B	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Ensis directus	C	D
I	Spisula subtruncata	C	D
I	Abra alba	C	D
I	Crangon crangon	C	D
I	Macropipus holsatus	C	D
F	Pleuronectes platessa	C	D
F	Solea solea	C	D

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
BE00	100.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
212	A	100.00	-
220	B	100.00	-
520	C	100.00	-
621	C	100.00	-
701	C	100.00	-

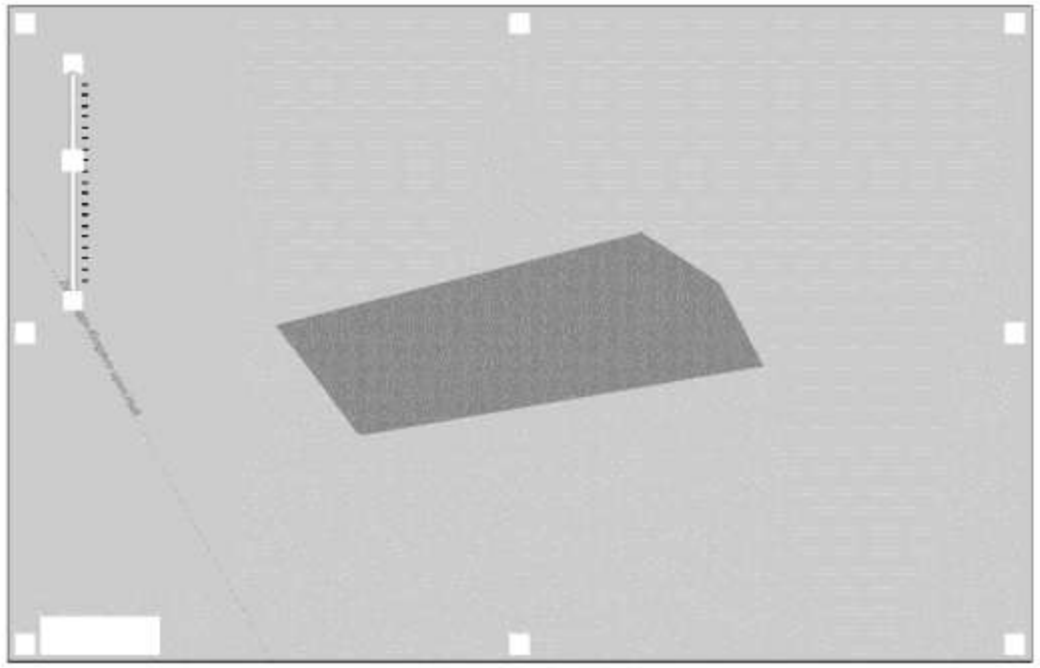
Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
504	A	-
820	A	-
952	B	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
Adm. Ch.1872/2005	100000	Mercator WGS 84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

De digitale afbakening van BEMNZ0005 wordt afgebakend door de basislijn en een lijn die de punten 1 tot 5 verbindt (coördinaten zie 4.4). De referentie voor de basislijn is de digitale basislijn van de meest recente uitgave van de officiële zeekaart (digitale versie) uitgegeven door de Vlaamse Hydrografische dienst van de afdeling Kust.

H.3 Germany sites

NTP S-H Wattenmeer und Angrenzende Küstengebiete

N2K DE0916391 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE0916391**

SITENAME **NTP S-H Wattenmeer und angrenzende Küstengebiete**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

K

1.2 SITE CODE

DE0916391

1.3 COMPILATION DATE

01-Jun-2004

1.4 UPDATE

01-Sep-2010

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE0916491

1.6 RESPONDENT(S)

Fleet, Hildebrandt, Augst LKN & LLUR S-H Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein Landesamt für Landwirtscahft, Umwelt und ländliche Räume Schleswig-Holstein

1.7 SITE NAME

NTP S-H Wattenmeer und angrenzende Küstengebiete

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Sep-2004	01-Nov-2007
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE0916391[05/07/2013 16:45:07]

N2K DE0916391 dataform

No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 8.461389
Latitude 54.533333

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

452455.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum 0
Maximum 0
Mean 0

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Dithmarschen
% Cover 80.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	2.10	A	B	A	A
1130	3.32	A	B	A	B
1140	28.73	A	A	A	A
1150	0.00	A	C	B	B
1160	64.38	A	A	A	A

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE0916391[05/07/2013 16:45:07]

1170	0.14	A	C	B	B
1210	0.00	A	B	B	B
1220	0.01	A	B	B	B
1310	0.38	A	A	B	A
1320	0.36	A	A	B	A
1330	1.57	A	A	C	C
2110	0.00	B	B	B	B
2120	0.01	B	C	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax	i C				B	B	C	A

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	i ~ 120				A	B	C	A
1365	Phoca vitulina	i ~ 10000				A	B	C	A
1351	Phocoena phocoena	i ~ 1000				A	B	C	A

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1113	Coregonus oxyrhynchus					D			
1099	Lampetra fluviatilis				i C	B	B	C	A
1095	Petromyzon marinus				i R	A	C	C	A

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	64.00
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	32.00
Salt marshes, Salt pastures, Salt steppes	2.00
Coastal sand dunes, Sand beaches, Machair	1.00
Humid grassland, Mesophile grassland	1.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE01	97.41
DE02	35.84
IN00	97.95
IN03	97.83
IN05	97.83

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE02	Nord-Sylt	/	0.00
DE02	Nordspitze Amrum auf der Insel Amrum	/	0.00
DE02	Kampener Vogelkoje auf Sylt	/	0.00
DE02	Braderuper Heide	/	0.00
DE02	Wöhrdener Loch/Speichkoog Dithmarschen	+	0.11
DE02	Dithmarscher Eidervorland mit Watt	/	0.00
DE02	Nielönn/Sylt	/	0.00

DE02	Dünenlandschaft auf dem Roten Kliff/Sylt	/	0.00
DE02	Grüne Insel mit Eiderwatt	/	0.00
DE02	Wattenmeer nördlich des Hindenburgdammes	+	4.46
DE02	Wester-Spätinge	+	0.01
DE02	Nordfriesisches Wattenmeer	+	30.18
DE02	Morsum-Kliff/Sylt	/	0.00
DE02	Baakdeel-Rantum/Sylt	/	0.00
DE02	Rantumbecken	/	0.00
DE02	Kronenloch/Speicherkoog Dithmarschen	+	0.12
DE02	Hörnum-Odde/Sylt	/	0.00
DE02	Hamburger Hallig	+	0.10
DE02	Rickelsbüller Koog	+	0.11
DE02	Amrumer Dünen	/	0.00
DE02	Rantumer Dünen/Sylt	/	0.00
DE02	Beltringharder Koog	+	0.75
DE01	Schleswig-Holsteinisches Wattenmeer	+	97.41

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN03	Schleswig-Holsteinisches Wattenmeer und Halligen	*	97.83
IN00	Schl.-Holst. Wattenmeer und angr. Gebiete	*	97.95
IN05	Wattenmeer der Nordsee	*	97.83

5.3 RELATION OF THE DESCRIBED SITE WITH CORINE BIOTOPE SITES

CORINE SITE CODE	OVERLAP	
	TYPE	% COVER
111117103	+	0.11
111418100	+	62.41
111819106	+	0.09
111920107	+	0.12

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
140	A	2.00	-
140	A	2.00	+
141	A	1.00	+
210	B	65.00	-

220	C	1.00	-
230	C	1.00	-
300	B	1.00	-
320	B	1.00	-
430	B	1.00	-
500	B	1.00	-
501	B	1.00	-
504	B	1.00	-
509	B	1.00	-
510	B	1.00	-
520	C	65.00	-
610	B	1.00	+
620	C	10.00	0
620	B	1.00	-
700	C	95.00	-
720	C	1.00	-
730	B	4.00	-
810	A	1.00	-
820	B	1.00	-
850	A	2.00	-
851	A	2.00	-
860	B	1.00	-
870	A	1.00	-
871	A	1.00	-
900	A	90.00	0
910	A	90.00	0
930	A	95.00	0
940	A	100.00	0
947	A	95.00	0
950	A	90.00	+
960	A	100.00	+
970	A	100.00	+
990	A	100.00	+

Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
110	B	-
120	A	-
210	A	-
230	A	-
400	B	-
410	B	-
500	B	-

520	B	-
600	C	-
610	A	+
700	B	-
730	B	-
820	B	-
850	A	-
870	A	-
871	A	-
950	A	+
960	A	+
970	A	+
990	A	+

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
0916	25000	Gauss-Krüger (DE)

1015	25000	Gauss-Krüger (DE)
1016	25000	Gauss-Krüger (DE)
1017	25000	Gauss-Krüger (DE)
1115	25000	Gauss-Krüger (DE)
1116	25000	Gauss-Krüger (DE)
1117	25000	Gauss-Krüger (DE)
1215	25000	Gauss-Krüger (DE)
1216	25000	Gauss-Krüger (DE)
1217	25000	Gauss-Krüger (DE)
1218	25000	Gauss-Krüger (DE)
1315	25000	Gauss-Krüger (DE)
1316	25000	Gauss-Krüger (DE)
1317	25000	Gauss-Krüger (DE)
1318	25000	Gauss-Krüger (DE)
1319	25000	Gauss-Krüger (DE)
1417	25000	Gauss-Krüger (DE)
1418	25000	Gauss-Krüger (DE)
1419	25000	Gauss-Krüger (DE)
1420	25000	Gauss-Krüger (DE)
1517	25000	Gauss-Krüger (DE)
1518	25000	Gauss-Krüger (DE)
1519	25000	Gauss-Krüger (DE)
1520	25000	Gauss-Krüger (DE)
1617	25000	Gauss-Krüger (DE)
1618	25000	Gauss-Krüger (DE)
1717	25000	Gauss-Krüger (DE)
1718	25000	Gauss-Krüger (DE)
1719	25000	Gauss-Krüger (DE)
1818	25000	Gauss-Krüger (DE)
1819	25000	Gauss-Krüger (DE)
1918	25000	Gauss-Krüger (DE)
1919	25000	Gauss-Krüger (DE)
2019	25000	Gauss-Krüger (DE)
2119	25000	Gauss-Krüger (DE)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

1:25.000, Gauß-Krüger, 3. Streifen

Doggerbank

7/1/13 N2K DE1003301 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE1003301**

SITENAME **Doggerbank**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

DE1003301

1.3 COMPILATION DATE

01-Apr-2004

1.4 UPDATE

01-Aug-2011

1.6 RESPONDENT(S)

Bundesamt für Naturschutz FG Meeres- und Küstennaturschutz Insel Vilm 18581 Putbus (Lauterbach)

1.7 SITE NAME

Doggerbank

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-May-2004	01-Nov-2007
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 4.167500
Latitude 55.595833

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

169895.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum -48
Maximum -28
Mean -37

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	95.57	A	A	C	A

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A009	Fulmarus glacialis	i 11-50				B	B	C	B
A183	Larus fuscus				i 11-50	C	B	C	C
A016	Morus bassanus	i 11-50				C	B	C	B
A188	Rissa tridactyla				i 501-1000	B	B	C	B
A199	Uria aalge	i 1001-10.000				B	B	C	B

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1365	Phoca vitulina				i P	C	B	C	C
1351	Phocoena phocoena	i 501-1000				B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Abra nitida	P	A
I	Acanthocardia echinata	P	A
I	Alcyonium digitatum	P	A
I	Amphiura spec.	P	A
I	Amphiura filiformis	P	A
I	Aporrhais pespelecani	P	A
I	Arctica islandica	P	A
I	Aricidia minuta	P	A
I	Ascidiella aspersa	P	A
I	Astarte montagui	P	A
I	Astropecten irregularis	P	A
I	Bathyporeia spec.	P	D
I	Bathyporeia elegans	P	D
I	Buccinum undatum	P	A
I	Callianassa subterranea	P	A
I	Chaetozone spec.	P	A
I	Corbula gibba	P	A
I	Corymorpha nutans	P	A
I	Echiurus echiurus	P	A
I	Echinocyamus pusillus	P	A
F	Echiichthys vipera	P	A
I	Ensis ensis	P	A
I	Glycera spp.	P	A
I	Harmothoe impar	P	A
I	Leptosynapta inhaerens	P	A
I	Levinsenia gracilis	P	A
I	Magelona alleni	P	A
I	Mysella bidentata	P	A
I	Ophiothrix fragilis	P	A
I	Pagurus pubescens	P	A
I	Pectinaria (Lagis) koreni	P	A
I	Phaxas pellucidus	P	A
I	Pontophilus trispinosus	P	A
I	Psammechinus miliaris	P	A
I	Scalibregma inflatum	P	A
I	Sigalion mathildae	P	A
I	Spisula elliptica	P	A
I	Spisula solida	P	A
I	Spisula subtruncata	P	A
I	Streptosyllis websteri	P	A
I	Tellina fabula	P	D
I	Terebellides stroemi	P	A
I	Travisia forbesii	P	A

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
210	A	100.00	-
211	B	10.00	-
212	A	50.00	-
320	B	50.00	-
510	C	5.00	-
520	B	25.00	-
790	A	5.00	-

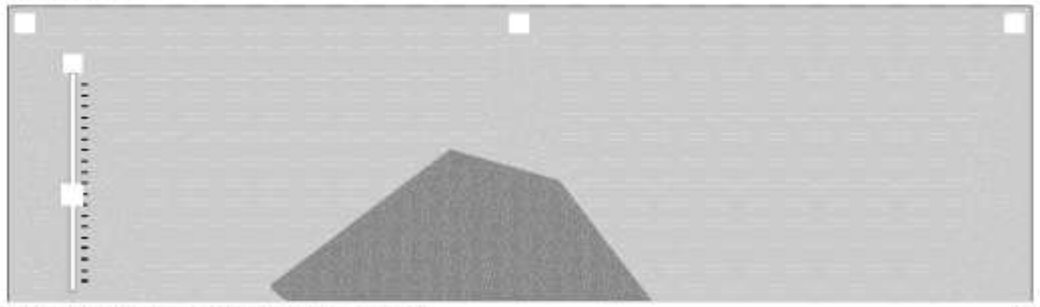
Impacts and activities around the site

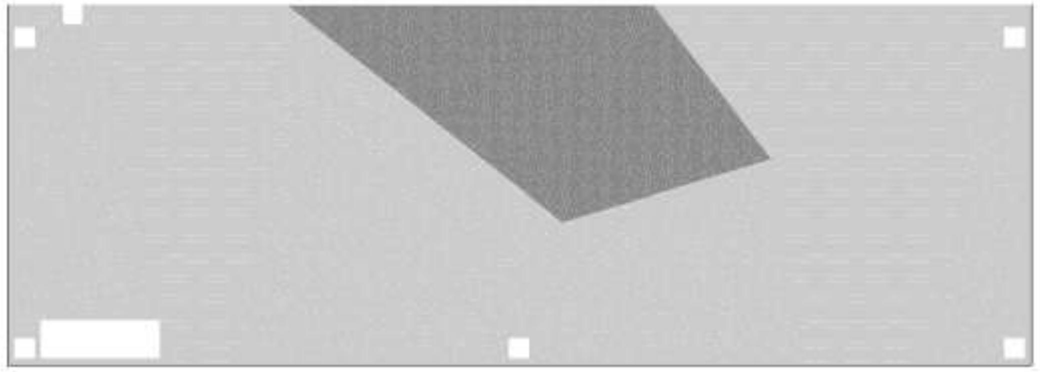
CODE	INTENSITY	INFLUENCE
701	B	-
702	B	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY





PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SK2920	375000	Mercator-Abbildung

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

ArcView: Grundlage Seekarte BSH 2920

Östliche Deutsche Bucht

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE1011401**
SITENAME **SPA Östliche Deutsche Bucht**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

J

1.2 SITE CODE

DE1011401

1.3 COMPILATION DATE

01-Apr-2004

1.4 UPDATE

01-Mar-2006

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE1209301

1.6 RESPONDENT(S)

Bundesamt für Naturschutz FG Meeres- und Küstennaturschutz Insel Vilm 18581 Putbus (Lauterbach)

1.7 SITE NAME

SPA Östliche Deutsche Bucht

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
No data	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
01-May-2004	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 7.686111
Latitude 54.843611

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

313513.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum -48
Maximum -8
Mean -25

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	2.78	A	C	C	B
1170	2.07	A	B	C	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMEN		
		Resident	Migratory			Population	Conservation	Isc
			Breed	Winter	Stage			
A002	Gavia arctica			i = 280		B	B	
A001	Gavia stellata			i = 3300		A	B	
A177	Larus minutus			i = 330		A	B	
A193	Sterna hirundo				i = 900	B	B	
A194	Sterna paradisaea				i = 650	B	B	
A191	Sterna sandvicensis				i = 140	C	B	

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT		
		Resident	Migratory			Population	Conservation	Isoli
			Breed	Winter	Stage			
A200	Alca torda			i = 700		B	B	[illegible]
1103	Alosa fallax	i P				C	B	[illegible]
A009	Fulmarus glacialis			i = 100		C	B	[illegible]
A184	Larus argentatus			i = 900		C	B	[illegible]
A812	Larus canus			i = 7800		B	B	[illegible]
A183	Larus fuscus				i = 1600	B	B	[illegible]

A187	Larus marinus			i = 390		B	B	[illegible]
A179	Larus ridibundus				i = 1200	C	B	[illegible]
A065	Melanitta nigra			i = 550		C	B	[illegible]
A016	Morus bassanus				i = 230	B	B	[illegible]
A005	Podiceps cristatus				i 11-50	C	B	[illegible]
A188	Rissa tridactyla				i = 3500	A	B	[illegible]
A199	Uria aalge			i = 2600		B	B	[illegible]

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT		
		Resident	Migratory			Population	Conservation	Isol
			Breed	Winter	Stage			
1364	Halichoerus grypus	i 11-50				A	B	
1365	Phoca vitulina	i 1001-10.000				A	B	
1351	Phocoena phocoena	i 1001-10.000				A	B	

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT		
		Resident	Migratory			Population	Conservation	Isolat
			Breed	Winter	Stage			
1099	Lampetra fluviatilis	i P				C	B	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Abra nitida	P	A
I	Alcyonium digitatum	P	A
I	Amphiura spec.	P	A
I	Amphipholus squamata	P	A

I	Angulus tenuis	P	A
I	Aporrhais pespelecani	P	A
I	Arctica islandica	P	A
I	Aricidia minuta	P	A
I	Ascidiella aspersa	P	A
I	Astarte montagui	P	A
I	Astropecten irregularis	P	A
I	Bathyporeia elegans	P	D
I	Bathyporeia guilliamsoniana	P	D
I	Buccinum undatum	P	A
F	Callionymus reticulatus	i P	A
I	Callianassa subterranea	P	A
I	Chaetozone spec.	P	A
I	Chaetopterus variopedatus	P	A
I	Corbula gibba	P	A
I	Corymorpha nutans	P	A
I	Cucumaria elongata	P	A
I	Echinus esculentus	P	A
I	Echinocyamus pusillus	P	A
I	Ensis ensis	P	A
I	Epitonium clathrus	P	A
I	Galathea spec.	P	A
I	Glycera sp.	P	A
I	Leptosynapta inhaerens	P	A
I	Liocarcinus pusillus	P	A
F	Liparis montagui	i P	A
I	Mactra stultorum cinerea	P	A
I	Magelona alleni	P	A
I	Modiolus modiolus	P	A
I	Mya truncata	P	A
I	Ophiothrix fragilis	P	A
I	Pectinaria koreni	P	A
I	Phaxas pellucidus	P	A
F	Pomatoschistus pictus	P	A
I	Pontophilus bispinosus	P	A
I	Pontophilus trispinosus	P	A
I	Psammechinus miliaris	P	A
I	Sertularia cupressina	P	A

I	Spisula elliptica	P	A
I	Spisula solida	P	A
I	Spisula subtruncata	C	A
F	Syngnathus rostellatus	i R	A
I	Tellina fabula	P	D
I	Travisia forbesii	P	A
I	Upogebia deltaura	P	A
I	Scalibregma inflatum	P	A

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE02	100.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE02	Östliche Deutsche Bucht	=	100.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
210	A	100.00	-
212	A	90.00	-
220	C	10.00	-
320	C	5.00	-
419	A	6.00	-
510	C	3.00	-
520	B	50.00	-
621	C	100.00	-
710	A	6.00	-
730	B	80.00	-
790	B	100.00	-

Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
701	B	-
702	B	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SK2920	375000	Mercator-Abbildung

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

ArcView: Grundlage Seekarte BSH 2920

Sylter Außenriff

Database release: End2011

SDF Full SDF Validation Form

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE1209301**
SITENAME **Sylter Außenriff**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

K

1.2 SITE CODE

DE1209301

1.3 COMPILATION DATE

01-Apr-2004

1.4 UPDATE

01-Aug-2011

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE1011401

1.6 RESPONDENT(S)

Bundesamt für Naturschutz FG Meeres- und Küstennaturschutz Insel Vilm 18581 Putbus (Lauterbach)

1.7 SITE NAME

Sylter Außenriff

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-May-2004	01-Nov-2007
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 7.184167
Latitude 54.783056

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

531429.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum -48
Maximum -8
Mean -25

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	1.64	A	C	C	B
1170B	2.89	A	B	C	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A002	Gavia arctica			i 251-500		A	B	C	A
A001	Gavia stellata			i 1001-10.000		A	B	C	A
A177	Larus minutus			i 251-500		A	B	C	B
A193	Sterna hirundo				i 501-1000	B	B	C	B
A194	Sterna paradisaea				i 101-250	B	B	C	B
A191	Sterna sandvicensis				i 251-500	B	B	C	B

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax	i P				C	B	C	C
A812	Larus canus			i >10.000		A	B	C	A
A183	Larus fuscus				i 1001-10.000	B	B	C	B
A187	Larus marinus			i 1001-10.000		A	B	C	B
A016	Morus bassanus			i 251-500		A	B	A	B
A188	Rissa tridactyla			i 1001-10.000		A	B	A	B
A199	Uria aalge			i 1001-10.000		B	B	A	B

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	i 11-50				A	B	C	B
1365	Phoca vitulina	i 1001-10.000				A	B	C	A
1351	Phocoena phocoena	i 1001-10.000				A	B	C	A

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1099	Lampetra fluviatilis	i P				C	B	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Abra nitida	P	A
I	Acanthocardia echinata	P	A
I	Alcyonium digitatum	P	A
I	Amphiura spec.	P	A
I	Amphipholus squamata	P	A
I	Angulus tenuis	P	A
I	Aporrhais pespelecani	P	A
I	Arctica islandica		A
I	Aricidia minuta	P	A
I	Ascidiella aspersa	P	A
I	Astarte montagui	P	A
I	Astropecten irregularis	P	A
I	Bathyporeia elegans	P	D
I	Bathyporeia guilliamsoniana	P	D
I	Buccinum undatum	P	A
F	Callionymus reticulatus	P	A
I	Callianassa subterranea	P	A

I	Cancer pagurus	P	D
I	Chaetozone spec.	P	A
I	Chaetopterus variopedatus	P	A
I	Corbula gibba	P	A
I	Corymorpha nutans	P	A
I	Cucumaria elongata	P	A
I	Echinus esculentus	P	A
I	Echinocyamus pusillus	P	A
I	Ensis ensis	P	A
I	Epitonium clathrus	P	A
I	Galathea spec.	P	A
I	Glycera spp.	P	A
I	Leptosynapta inhaerens	P	A
I	Liocarcinus pusillus	P	A
F	Liparis montagui	P	A
I	Mactra stultorum cinerea	P	A
I	Magelona alleni	P	A
I	Modiolus modiolus	P	A
I	Mya truncata	P	A
I	Ophiothrix fragilis	P	A
I	Pectinaria (Lagis) koreni	P	A
I	Phaxas pellucidus	P	A
F	Pomatoschistus pictus	P	A
I	Pontophilus bispinosus	P	A
I	Pontophilus trispinosus	P	A
I	Psammechinus miliaris	P	A
I	Scalibregma inflatum	P	A
I	Sertularia cupressina	P	A
I	Spisula elliptica	P	A
I	Spisula solida	P	A
I	Spisula subtruncata	P	A
F	Syngnathus rostellatus	P	A
I	Tellina fabula	P	D
I	Travisia forbesii	P	A
I	Upogebia deltaura	P	A

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE02	53.69

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE02	Östliche Deutsche Bucht	*	53.69

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
210	A	100.00	-
212	A	90.00	-
220	C	10.00	-
300	B	10.00	-
320	C	10.00	-
419	A	100.00	-
510	C	3.00	-
520	B	50.00	-
621	C	100.00	-
710	A	100.00	-
730	B	80.00	-
790	B	100.00	-

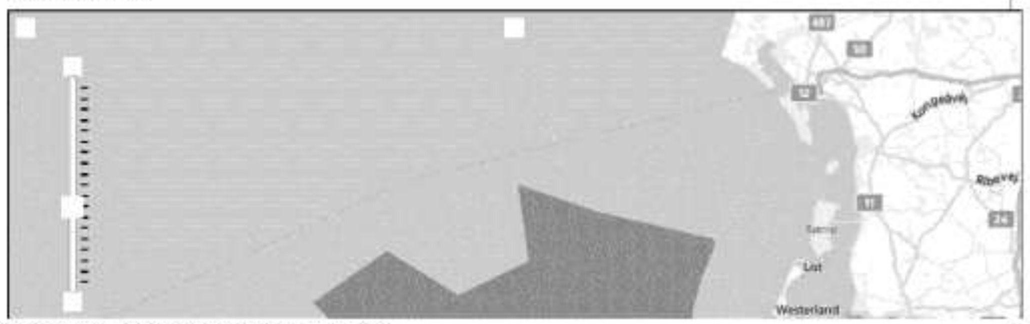
Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
701	B	-
702	B	-

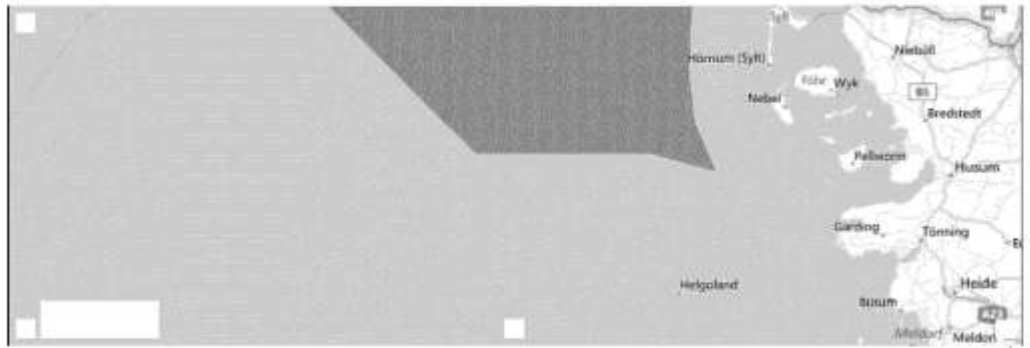
7. MAP OF THE SITE

Back to top

SITE DISPLAY



Steingrund



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SK2920	375000	Mercator-Abbildung

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

ArcView: Grundlage Seekarte BSH 2920

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE1714391**
SITENAME **Steingrund**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

G

1.2 SITE CODE

DE1714391

1.3 COMPILATION DATE

01-Jun-2004

1.4 UPDATE

01-Jan-2006

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE1813491

1.6 RESPONDENT(S)

Augst Schleswig-Holstein, Landesamt Landesamt für Landwirtschaft, Umwelt und ländliche Räume Abteilung Naturschutz Hamburger Chaussee 25 24220 Flintbek

1.7 SITE NAME

Steingrund

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Sep-2004	01-Dec-2004
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 8.111667
Latitude 54.226111

Latitude 54.236111

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

17450.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum 0
Maximum 0
Mean 0

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	91.69	A	B	B	B
1170B	5.73	A	C	B	A

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A191	Sterna sandvicensis				i P				

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A188	Rissa tridactyla				i P				
A199	Uria aalge				i P				

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				

1364	Halichoerus grypus	I 11-50				A	A	B	B
1365	Phoca vitulina	i 11-50				C	A	C	B
1351	Phocoena phocoena	I 11-50				C	B	C	C

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
211	A	50.00	-
212	A	100.00	-
220	B	5.00	-
520	B	100.00	-
621	C	100.00	0
701	A	100.00	-

Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
300	B	0

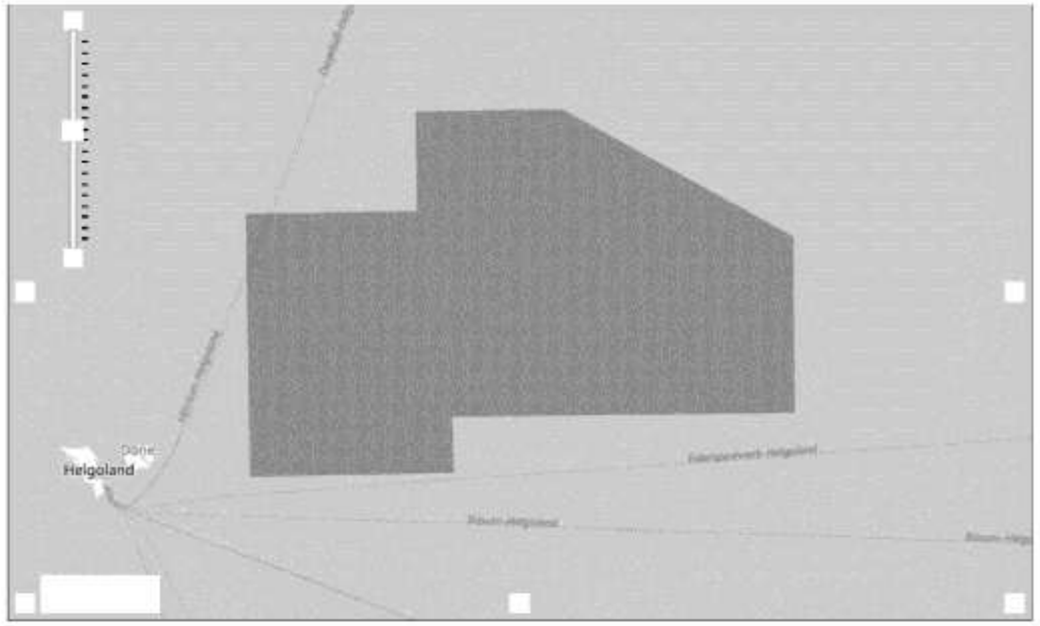
7. MAP OF THE SITE

Back to top

SITE DISPLAY

Helgoland mit Helgoländer Felssockel

7/1/13 N2K DE1714391 dataform



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
1813	25000	Gauss-Krüger (DE)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

1:25.000, Gauß-Krüger, 3. Streifen

natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE1714391 4/4

N2K DE1813391 dataform

Database release:

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE1813391**

SITENAME **Helgoland mit Helgoländer Felssockel**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

G

1.2 SITE CODE

DE1813391

1.3 COMPILATION DATE

01-Jun-2004

1.4 UPDATE

01-Mar-2009

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE1813491

1.6 RESPONDENT(S)

Augst Schleswig-Holstein, Landesamt Landesamt für Landwirtschaft, Umwelt und ländliche Räume Abteilung Naturschutz Hamburger Chaussee 25 24220 Flintbek

1.7 SITE NAME

Helgoland mit Helgoländer Felssockel

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Sep-2004	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE1813391[05/07/2013 16:54:58]

No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 7.897222
Latitude 54.208611

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

5509.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum 0
Maximum 0
Mean 0

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Pinneberg
% Cover 99.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1170	99.26	A	B	A	A
1210	0.04	A	C	B	B
1220	0.15	A	C	B	B
1230	0.16	A	C	B	B
2110	0.04	A	C	B	B
2120	0.07	B	C	B	B
2130	0.16	B	C	B	B
2160	0.04	A	C	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	i 11-50				A	A	B	A
1365	Phoca vitulina	i C				C	A	C	B
1351	Phocoena phocoena	i 51-100				C	A	C	C

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	97.00
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	1.00
Coastal sand dunes, Sand beaches, Machair	1.00
Shingle, Sea cliffs, Islets	1.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE02	93.28

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE02	Helgoländer Felssockel	+	93.27
DE02	Lummenfelsen der Insel Helgoland	+	0.02

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
211	C	50.00	-
220	C	1.00	-
241	C	1.00	-
501	C	1.00	0
622	C	1.00	0
870	C	1.00	0
871	C	1.00	-
947	A	97.00	+
961	C	1.00	0

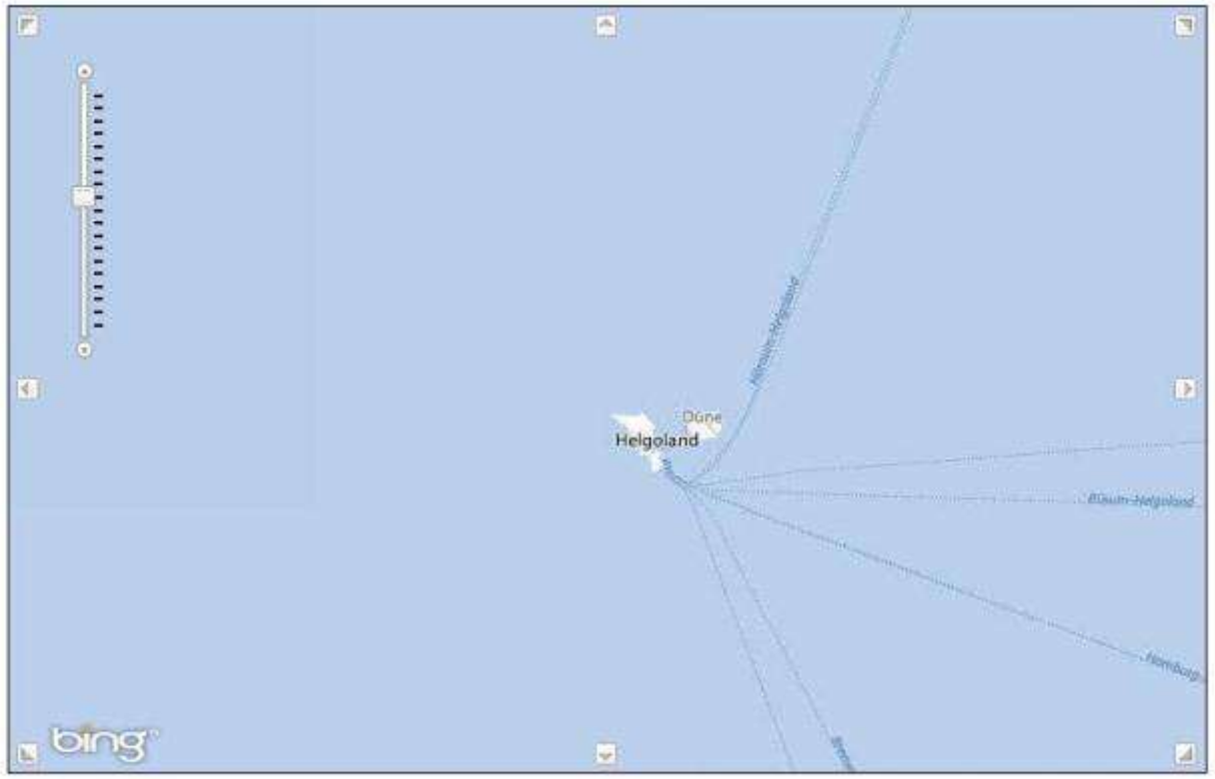
Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
402	C	0
504	C	0
505	C	-
520	C	-
608	C	-
621	C	0
700	C	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
1813	25000	Gauss-Krüger (DE)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

1:25.000, Gauß-Krüger, 3. Streifen

Borkum-Riffgrund

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE2104301**
SITENAME **Borkum-Riffgrund**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

DE2104301

1.3 COMPILATION DATE

01-Apr-2004

1.4 UPDATE

01-Aug-2011

1.6 RESPONDENT(S)

Bundesamt für Naturschutz FG Meeres- und Küstennaturschutz Insel Vilm 18581 Putbus (Lauterbach)

1.7 SITE NAME

Borkum-Riffgrund

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-May-2004	01-Nov-2007
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 6.413889
Latitude 53.870556

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

62548.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum -33
Maximum -18
Mean -27

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	83.30	A	B	C	B
1170B	3.64	B	C	C	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A002	Gavia arctica			i 6-10		C	B	C	C
A001	Gavia stellata			i 11-50		C	B	C	C
A177	Larus minutus			i 101-250		B	B	C	B
A193	Sterna hirundo				i 6-10	C	B	C	C
A194	Sterna paradisaea				i 1-5	C	B	C	C
A191	Sterna sandvicensis				i 51-100	C	B	C	B

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax	i P				C	B	C	C
A812	Larus canus			i 251-500		C	C	C	C
A183	Larus fuscus				i 1001-10.000	B	C	C	B

RPS

SMart Wind

A187	Larus marinus			i 1001-10.000		B	C	C	B
A016	Morus bassanus			i 51-100		B	B	A	B
A188	Rissa tridactyla			i 501-1000		B	B	C	B
A199	Uria aalge			i 1001-10.000		B	C	C	B

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	i P				C	B	C	C
1365	Phoca vitulina	i 251-500				B	B	C	B
1351	Phocoena phocoena	i 51-100				C	C	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
I	Alcyonium spec.	P	A
I	Amphiura spec.	P	A
I	Aricidia minuta	P	A
I	Astropecten irregularis	P	A
I	Bathyporeia elegans	P	D
I	Buccinum undatum	P	A
F	Callionymus reticulatus	P	A
I	Chaetozone setosa	P	A
I	Corbula gibba	P	A
I	Corymorpha nutans	P	A
I	Echinocyamus pusillus	P	A
F	Echiichthys vipera	P	A
I	Ensis ensis	P	A
F	Entelurus aequoreus	P	A
I	Galathea spec.	P	A
I	Glycera spp.	P	A
I	Goodallia triangularis	P	D
I	Liocarcinus pusillus	P	A
I	Littorina saxatilis	P	A
I	Metridium senile	P	A
I	Nereis pelagica	P	A
I	Pectinaria koreni	P	A
I	Phaxas pellucidus	P	A
I	Pontophilus bispinosus	P	A
I	Pontophilus trispinosus	P	A
I	Psammechinus miliaris	P	A
I	Scalibregma inflatum	P	A
I	Sertularia cupressina	P	A

I	Spisula elliptica	P	A
I	Spisula solida	P	A
I	Streptosyllis websteri	P	A
F	Syngnathus rostellatus	P	A
I	Thia scutellata	P	A
I	Travisia forbesii	P	A

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
210	A	100.00	-
212	A	90.00	-
220	C	10.00	-
510	C	5.00	-
520	A	75.00	-
621	C	100.00	-
710	A	100.00	-
790	B	100.00	-

Impacts and activities around the site

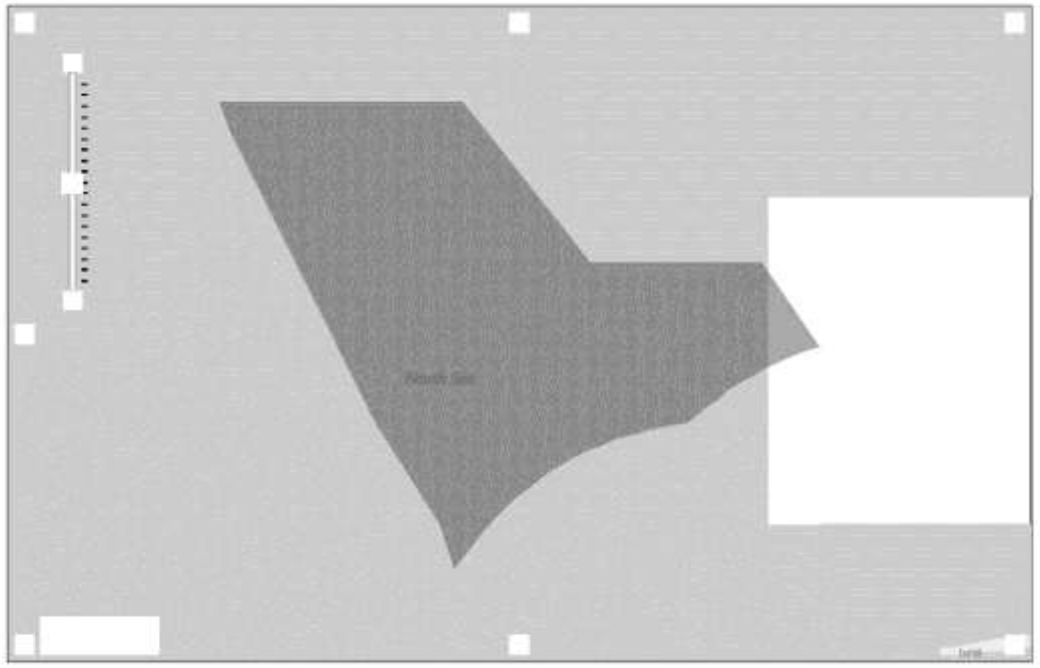
CODE	INTENSITY	INFLUENCE
419	B	-
701	B	-
702	B	-
710	B	-

7. MAP OF THE SITE

7/1/13 N2K DE2104301 dataform

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SK2920	375000	Mercator-Abbildung

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

ArcView: Grundlage Seekarte BSH 2920

natura2000.eea.europa.eu/natura2000/SDFPublic.aspx?site=DE2104301 5/5

N2K DE2016301 dataform

Database release:

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE2016301**

SITENAME **Hamburgisches Wattenmeer**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

I

1.2 SITE CODE

DE2016301

1.3 COMPILATION DATE

01-Aug-1998

1.4 UPDATE

01-May-2011

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE2016401

1.6 RESPONDENT(S)

Dr.Janke, Hr.Körber, Hr.Michalczyk Beh. f. Stadtentwicklung u. Umwelt Naturschutzamt Billstr. 84 20539 Hamburg

1.7 SITE NAME

Hamburgisches Wattenmeer

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Aug-2004	01-Jan-2008
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2016301[05/07/2013 16:59:01]

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 8.283333
Latitude 53.883333

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

13750.0000

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum -17
Maximum 6
Mean -5

2.5 ADMINISTRATIVE REGION

Nuts Code DE601
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	20.36	A	C	B	A
1140	73.83	A	B	A	A
1160	98.09	B	C	A	A
1210	0.00	A	C	A	B
1310	1.02	A	B	A	B
1320	0.11	B	C	A	B
1330	1.45	A	C	C	C
2110	0.01	A	C	A	B
2120	0.15	A	C	A	B
2130	0.17	B	C	A	B
2190	0.01	B	C	A	C

N2K DE2016301 dataform

3.2. SPECIES

Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax				i R	C	B	C	C

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1365	Phoca vitulina	i 501-1000				B	A	C	B
1351	Phocoena phocoena	i R				C	B	C	C

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1099	Lampetra fluviatilis				i R	C	B	C	C
1095	Petromyzon marinus				i V	C	B	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2016301[05/07/2013 16:59:01]

Habitat Classes	% Cover
Marine areas, Sea inlets	11.00
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	85.00
Salt marshes, Salt pastures, Salt steppes	2.00
Coastal sand dunes, Sand beaches, Machair	1.00
Humid grassland, Mesophile grassland	1.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE01	100.00
IN00	100.00
IN03	85.09

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE01	Nationalpark Hamburgisches Wattenmeer	=	100.00

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN03	Hamburgisches Wattenmeer	+	85.09
IN00	Hamburgisches Wattenmeer	=	100.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
140	C	2.00	-
141	C	1.00	+
212	A	5.00	-
402	C	1.00	-
500	C	1.00	-
520	C	3.00	-
610	C	1.00	+
620	B	3.00	-
830	C	1.00	0
870	C	1.00	-
941	A	99.00	+
947	A	99.00	+
961	A	1.00	-
967	B	1.00	-

N2K DE2016301 dataform

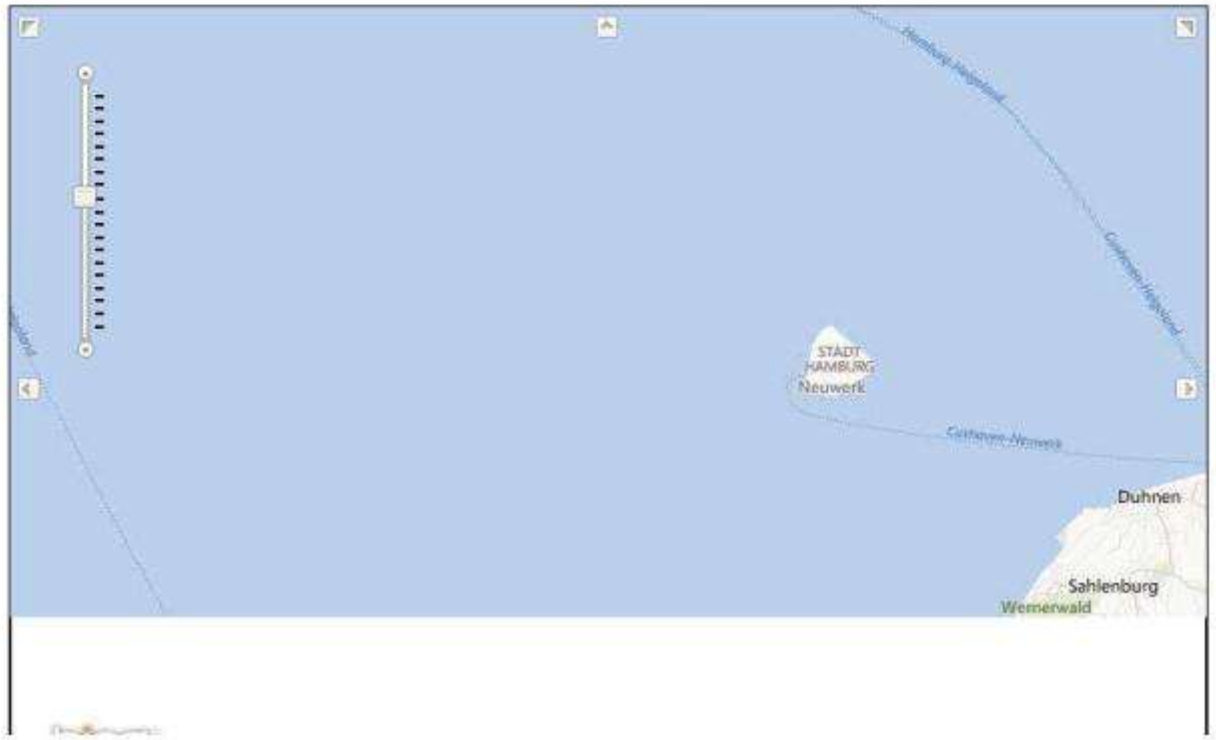
Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
320	C	-
520	C	-

7. MAP OF THE SITE

Back to top

SITE DISPLAY



http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2016301[05/07/2013 16:59:01]

Unterelbe

N2K DE2016301 dataform

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
2016	25000	Gauss-Krüger (DE)
2017	25000	Gauss-Krüger (DE)
2117	25000	Gauss-Krüger (DE)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

1:35.000, Gauß-Krüger, 3. Streifen

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2016301[05/07/2013 16:59:01]

7/1/13 N2K DE2018331 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE2018331**
SITENAME **Unterelbe**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

K

1.2 SITE CODE

DE2018331

1.3 COMPILATION DATE

01-Jan-2000

1.4 UPDATE

01-Oct-2010

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE2121401
DE2306301

1.6 RESPONDENT(S)

O.v.Drachenfels Niedersachsen: Landesbetrieb NLWKN Nieders. Landesbetrieb f. Wasserwirtschaft, Küsten- und Naturschutz, Betriebsstelle H-HI, GB 4 Göttinger Chaussee 76A 30453 Hannover

1.7 SITE NAME

Unterelbe

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	**DATE CONFIRMED AS SCI**
01-Jan-2005	01-Nov-2007
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 9.429722

natura2000.eea.europa.eu/natura2000/SDFPublic.aspx?site=DE2018331 1/5

Latitude 53.726944

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

18789.6992

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum 0
Maximum 0
Mean 0

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Cuxhaven
% Cover 30.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1130θ	98.46	A	B	C	A
1140θ	16.26	B		B	B
1330θ	1.09	A	C	B	B
3150θ	0.03	B	C	B	C
6430θ	0.04	A	C	B	B
6510θ	0.68	A	C	B	C
91E0θ	0.50	B	C	B	C

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax	i R				A	C	C	B

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1365	Phoca vitulina	i 51-100				C	B	C	C

1351	Phocoena phocoena	i 11-50				C	C	C	A

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1130	Aspius aspius				i V	C	C	B	C
1113	Coregonus oxyrhynchus				i P	D			
1099	Lampetra fluviatilis				i 1001-10.000	B	C	C	B
1095	Petromyzon marinus				i 501-1000	A	C	B	B
1106	Salmo salar	i P				B	C	C	C

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1601	Oenanthe conioides	i 251-500				A	B	A	A

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
P	Deschampsia wibeliana	i 1001-10.000	B
P	Fritillaria meleagris	i >10.000	A
P	Hordeum secalinum	i >10.000	A
P	Schoenoplectus americanus	i >10.000	A
P	Schoenoplectus triqueter	i 1001-10.000	A

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	83.00
Humid grassland, Mesophile grassland	3.00
Improved grassland	14.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE01	0.00
DE02	29.26
DE07	0.50
IN00	0.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE07	Lühesand	*	0.50
DE02	Außendeich Nordkehdingen I	+	4.29
DE02	Schwarztonnensand	+	3.11
DE02	Vogelschutzgebiet Hullen	+	2.32
DE02	Borsteler Binnenelbe und Großes Brack	+	0.32
DE02	Hadelner und Belumer Außendeich	+	6.60
DE02	Asselersand	+	3.28
DE02	Neßsand	+	0.89
DE02	Allwördener Außendeich/Brammersand	+	3.29
DE02	Ostemündung	+	0.79
DE02	Schnook, Außendeichfladen bei Geversdorf	*	0.31
DE02	Hahnöfer Sand	+	0.58
DE02	Außendeich Nordkehdingen II	+	3.46
DE01	Nationalpark Niedersächsisches Wattenmeer	/	0.00

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN00	Niederelbe zwischen Stade und Otterndorf	*	0.00

5.3 RELATION OF THE DESCRIBED SITE WITH CORINE BIOTOPE SITES

CORINE SITE CODE	OVERLAP	
	TYPE	% COVER
?	*	0.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
2118	25000	Gauss-Krüger (DE)
2119	25000	Gauss-Krüger (DE)
2120	25000	Gauss-Krüger (DE)
2121	25000	Gauss-Krüger (DE)
2122	25000	Gauss-Krüger (DE)
2220	25000	Gauss-Krüger (DE)
2221	25000	Gauss-Krüger (DE)
2222	25000	Gauss-Krüger (DE)
2223	25000	Gauss-Krüger (DE)
2322	25000	Gauss-Krüger (DE)
2323	25000	Gauss-Krüger (DE)
2423	25000	Gauss-Krüger (DE)
2424	25000	Gauss-Krüger (DE)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

1:50.000, Gauß-Krüger, 3 Meridian

Nationalpark Niedersächsisches Wattenmeer

N2K DE2306301 dataform

Database release: [illegible]

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DE2306301**

SITENAME **Nationalpark Niedersächsisches Wattenmeer**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

I

1.2 SITE CODE

DE2306301

1.3 COMPILATION DATE

01-Nov-1997

1.4 UPDATE

01-Mar-2008

1.5 RELATION WITH OTHER NATURA 2000 SITES

DE2018331
DE2117331
DE2210401
DE2213401
DE2309431
DE2312331
DE2316331
DE2408401
DE2416431
DE2507331
DE2508401
DE2514431
DE2609401
DE2709401

1.6 RESPONDENT(S)

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2306301[05/07/2013 17:14:09]

N2K DE2306301 dataform

Olaf von Drachenfels Niedersachsen: Landesbetrieb NLWKN Nieders. Landesbetrieb f. Wasserwirtschaft, Küsten- und Naturschutz, Betriebsstelle H-HI, GB 4 Göttinger Chaussee 76A 30453 Hannover

1.7 SITE NAME

Nationalpark Niedersächsisches Wattenmeer

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Oct-1998	01-Dec-2004
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 6.920278
Latitude 53.603611

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

276956.2188

2.3 SITE LENGTH (KM)

0.00

2.4 ALTITUDE (M)

Minimum 0
Maximum 0
Mean 0

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Cuxhaven
% Cover 93.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2306301[05/07/2013 17:14:09]

1110	14.62	A	B	A	A
1130	0.87	A	C	A	A
1140	47.48	A	A	A	A
1150	0.00	B	C	B	C
1160	29.25	A	A	B	A
1170	0.47	A	C	C	A
1310	1.16	A	A	A	A
1320	0.04	C	B	B	C
1330	2.78	A	A	A	A
2110	0.05	A	A	A	A
2120	0.20	A	A	A	A
2130	0.90	A	A	B	A
2140	0.09	A	A	A	A
2150	0.01	A	C	B	B
2160	0.05	A	A	A	A
2170	0.01	A	B	A	A
2180	0.01	A	C	B	A
2190	0.09	A	A	B	A
3130	0.00	C	C	B	C

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1365	Phoca vitulina	I ~ 4300				A	B	C	A
1351	Phocoena phocoena	I P				B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1095	Petromyzon marinus	I P				D			

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1903	Liparis loeselii	I = 2541				B	A	C	A

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
P	Alopecurus bulbosus	i >10.000	D
P	Atriplex laciniata	i 6-10	A
P	Calystegia soldanella	i 101-250	D
P	Carex punctata	i 101-250	D
P	Equisetum variegatum	i 51-100	D
P	Gentianella baltica	1-5	D
P	Gentianella uliginosa	101-250	D
P	Lathyrus maritimus	i 1001-10.000	D
P	Odontites litoralis	i 1001-10.000	D
P	Tuberaria guttata	i 51-100	D

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	34.00
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	55.00
Salt marshes, Salt pastures, Salt steppes	3.00
Coastal sand dunes, Sand beaches, Machair	5.00
Inland water bodies (Standing water, Running water)	0.00
Humid grassland, Mesophile grassland	3.00
Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	0.00

TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
DE01	100.00
DE06	0.00
IN00	0.00
IN03	0.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
DE06			0.00
DE01	Niedersächsisches Wattenmeer	-	100.00

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN03			0.00
IN00	Ostfriesisches Wattenmeer mit Dollart	*	0.00
IN00	Wattenmeer: Jadebusen und westliche Wesermündung	*	0.00
IN00	Wattenmeer: Elbe-Weser-Dreieck	*	0.00

5.3 RELATION OF THE DESCRIBED SITE WITH CORINE BIOTOPE SITES

CORINE SITE CODE	OVERLAP	
	TYPE	% COVER
132116025	+	18.05
13230800	+	43.33

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
2117	25000	Gauss-Krüger (DE)
2209	25000	Gauss-Krüger (DE)
2210	25000	Gauss-Krüger (DE)
2211	25000	Gauss-Krüger (DE)
2212	25000	Gauss-Krüger (DE)
2213	25000	Gauss-Krüger (DE)
2214	25000	Gauss-Krüger (DE)
2217	25000	Gauss-Krüger (DE)
2306	25000	Gauss-Krüger (DE)
2307	25000	Gauss-Krüger (DE)
2308	25000	Gauss-Krüger (DE)
2309	25000	Gauss-Krüger (DE)
2310	25000	Gauss-Krüger (DE)
2311	25000	Gauss-Krüger (DE)
2312	25000	Gauss-Krüger (DE)
2314	25000	Gauss-Krüger (DE)

N2K DE2306301 dataform

2315	25000	Gauss-Krüger (DE)
2316	25000	Gauss-Krüger (DE)
2317	25000	Gauss-Krüger (DE)
2405	25000	Gauss-Krüger (DE)
2406	25000	Gauss-Krüger (DE)
2407	25000	Gauss-Krüger (DE)
2408	25000	Gauss-Krüger (DE)
2414	25000	Gauss-Krüger (DE)
2415	25000	Gauss-Krüger (DE)
2416	25000	Gauss-Krüger (DE)
2417	25000	Gauss-Krüger (DE)
2507	25000	Gauss-Krüger (DE)
2508	25000	Gauss-Krüger (DE)
2514	25000	Gauss-Krüger (DE)
2515	25000	Gauss-Krüger (DE)
2608	25000	Gauss-Krüger (DE)
2609	25000	Gauss-Krüger (DE)
2709	25000	Gauss-Krüger (DE)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

1:50.000, Gauß-Krüger, 3 Meridian

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DE2306301[05/07/2013 17:14:09]

H.4 Denmark Sites

Gule Rev

N2K DK00VA259 dataform

Database release: [illegible]

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DK00VA259**

SITENAME **Gule Rev**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

DK00VA259

1.3 COMPILATION DATE

01-Aug-2009

1.4 UPDATE

01-Dec-2011

1.6 RESPONDENT(S)

Miljøministeriet, Naturstyrelsen, Haraldsgade 53, DK-2100 Kbh. Ø, nst@nst.dk

1.7 SITE NAME

Gule Rev

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Aug-2009	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	01-Dec-2011

2. SITE LOCATION

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DK00VA259[05/07/2013 14:56:52]

Back to top

2.1 SITE CENTRE LOCATION

Longitude 8.176667
Latitude 57.316389

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

47059.0000

2.4 ALTITUDE (M)

Minimum No data
Maximum 259
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1170	59.00	A	B	A	A

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1351	Phocoena phocoena	C				C	C	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY

N2K DK00VA259 dataform

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
259	100000	UTM 32 euref89 [EPSG:25832]

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

DK_SCI_MAPS_2009_euref89 (MAPinfo)

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DK00VA259[05/07/2013 14:56:52]

N2K DK00VA347 dataform Page 1 of 6

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **DK00VA347**

SITENAME **Sydlige Nordsø**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

C

1.2 SITE CODE

DK00VA347

1.3 COMPILATION DATE

01-Dec-2004

1.4 UPDATE

01-Dec-2011

1.6 RESPONDENT(S)

Miljøministeriet, Naturstyrelsen, Haraldsgade 53, DK-2100 Kbh. Ø, nst@nst.dk

1.7 SITE NAME

Sydlige Nordsø

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Aug-2009	No data

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=DK00VA347 18/07/2013

DATE SITE CLASSIFIED AS SPA	DATE SITE DESIGNATED AS SAC
01-Nov-2004	01-Dec-2011

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 7.434167
Latitude 55.363333

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

246296.0000

2.4 ALTITUDE (M)

Minimum No data
Maximum 255
Mean 113

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	5.00	A	B	A	A

3.2. SPECIES

Covered by Article 4 of Directive 79/409/EEC and

listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT		
		Resident	Migratory			Population	Conservation	Isolati
			Breed	Winter	Stage			
A002	Gavia arctica			1000-10000 i		A	A	C
A001	Gavia stellata			1000-10000 i		A	A	C
A177	Larus minutus			2200 i		A	A	C

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMEN		
		Resident	Migratory			Population	Conservation	Iso
			Breed	Winter	Stage			
A200	Alca torda			2000 i	2000 i	D		
A203	Alle alle			R	R	D		
A065	Melanitta nigra			R	75 i	D		
A063	Somateria mollissima			R	R	D		
A175	Stercorarius skua			R	R	D		
A016	Sula bassana				100 i	D		
A199	Uria alge			2000 i	2000 i	D		

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT		
		Resident	Migratory			Population	Conservation	Isol
			Breed	Winter	Stage			
1364	Halichoerus grypus	R				B	B	
1365	Phoca vitulina	P				B	B	
1351	Phocoena phocoena	C				B	C	

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

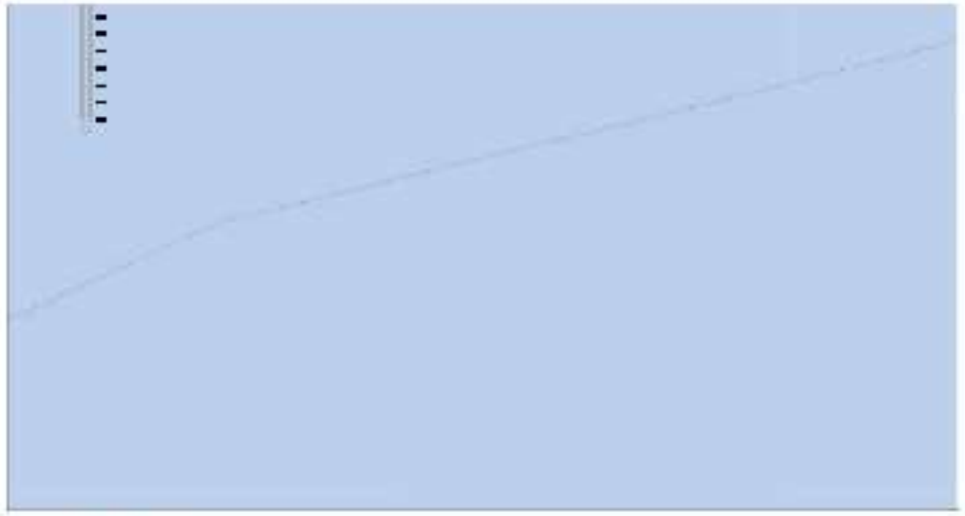
6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
F113	100000	UTM 32 euref89 [EPSG:25832]

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

DK_SPA_MAPS_2009_euref89 (MAPinfo)

H.5 France Sites

Falaises du Cran aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant

N2K FR3100478 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE	**FR3100478**
SITENAME	**FALAISES DU CRAN AUX OEUFS ET DU CAP GRIS-NEZ, DUNES DU CHATELET, MARAIS DE TARDINGHEN ET DUNES DE WISSANT**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

K

1.2 SITE CODE

FR3100478

1.3 COMPILATION DATE

01-Feb-1996

1.4 UPDATE

01-Apr-2007

1.5 RELATION WITH OTHER NATURA 2000 SITES

FR3110085

1.6 RESPONDENT(S)

DIREN Nord-Pas-de-Calais / SPN-IEGB-MNHN

1.7 SITE NAME

FALAISES DU CRAN AUX OEUFS ET DU CAP GRIS-NEZ, DUNES DU CHATELET, MARAIS DE TARDINGHEN ET DUNES DE WISSANT

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Apr-2002	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3100478[05/07/2013 16:09:20]

N2K FR3100478 dataform

No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 1.627500
Latitude 50.877222

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

1023.0000

2.4 ALTITUDE (M)

Minimum 0
Maximum 55
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Pas-de-Calais
% Cover 75.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	4.00	B	C	B	B
1140	50.00	B	C	B	B
1230	2.00	A	C	B	A
2110	0.00	B	C	B	C
2120	1.00	B	C	B	B
2130	0.00	C	C	B	B
2160	2.00	B	B	B	B

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3100478[05/07/2013 16:09:20]

N2K FR3100478 dataform

2170	0.00	D			
2190	0.00	D			
3130	0.00	C	C	B	C
3140	0.00	C	C	B	C
3150	0.00	C	C	B	C
6230	0.00	B	C	B	B
6410	0.00	B	C	B	C
6430	0.00	B	C	B	B
6510	0.00	D			
7220	0.00	B	C	B	B
7230	0.00	D			
1170	9.00	A	C	B	A
2180	0.00	C	C	B	C

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	3i				B	C	B	C
1321	Myotis emarginatus	P				D			
1365	Phoca vitulina	3i				C	C	C	C
1351	Phocoena phocoena	30i				A			
1349	Tursiops truncatus	P				D			

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3100478[05/07/2013 16:09:20]

N2K FR3100478 dataform

1166	Triturus cristatus	P				C	C	C	C

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
P	Pyrola rotundifolia var. arenaria		A
P	Viola curtisii		D
P	Armeria maritima subsp. maritima		A
P	Limonium binervosum (G.E.Sm.)C.E.Salmon		A
P	Aira caryophyllea		D
P	Apium graveolens		D
P	Apium inundatum		D
P	Atriplex babingtonii		D
P	Baldellia ranunculoides		D
P	Bromus ferronii		D
P	Callitriche hamulata		D
P	Calystegia soldanella		D
P	Carex distans var. vikingensis		D
P	Carex trinervis		D
P	Catapodium marinum		D
P	Catapodium rigidum		D
P	Chenopodium chenopodioides		D
P	Crithmum maritimum		D
P	Dactylorhiza praetermissa		D
P	Daucus carota subsp. gummifer		D
P	Euphrasia officinalis subsp. rostkoviana		D
P	Festuca rubra subsp. pruinosa		D
P	Juncus gerardi		D
P	Juncus subnodulosus		D
P	Oenanthe lachenalii		D
P	Ornithopus perpusillus		D
P	Parapholis incurva		D
P	Parapholis strigosa		D
P	Sagina nodosa var. moniliformis		D
P	Salix repens subsp. argentea		D
P	Sieglingia decumbens		D
P	Silene nutans		D
P	Silene vulgaris subsp. maritima		D
P	Spergularia salina J.& C. Presl		D
P	Stellaria palustris Hoffm.		D

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3100478[05/07/2013 16:09:20]

P	Thymus praecox subsp. britannicus		D
P	Trifolium micranthum Viv.		D
P	Trifolium scabrum L.		D
P	Triglochin maritimum		D
P	Triglochin palustre		D
P	Veronica scutellata		D
P	Cratoneuron filicinum		D

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	60.00
Salt marshes, Salt pastures, Salt steppes	1.00
Coastal sand dunes, Sand beaches, Machair	12.00
Shingle, Sea cliffs, Islets	9.00
Inland water bodies (Standing water, Running water)	3.00
Bogs, Marshes, Water fringed vegetation, Fens	3.00
Dry grassland, Steppes	2.00
Humid grassland, Mesophile grassland	9.00
Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	1.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
FR13	60.00
FR14	12.00
FR15	25.00
FR32	14.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at National or Regional level

N2K FR3100478 dataform

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
FR14	CAP GRIS NEZ	*	6.00
FR14	DUNE D'AVAL-MARAIS DE TARDINGHNE-MOTTE DU BOURG	+	6.00
FR15	NORD PAS DE CALAIS	*	25.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
100	B		-
101	B		-
102	A		-
110	A		-
140	B		-
141	B		-
162	B		-
190	B		-
200	C		0
230	B		0
301			
401	B		-
403	B		-
622	A		-
623	B		-
690	B		-
701	B		-
703	B		-
720	A		-
810	B		-
900	A		-
943	B		-

7. MAP OF THE SITE

Back to top

SITE DISPLAY

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3100478[05/07/2013 16:09:20]

N2K FR3100478 dataform

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
IGN 2103 E	25000	Lambert Conformal Nord (FR)

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3100478[05/07/2013 16:09:20]

Bancs des Flandres

7/1/13 N2K FR3102002 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **FR3102002**

SITENAME **BANCS DES FLANDRES**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

G

1.2 SITE CODE

FR3102002

1.3 COMPILATION DATE

01-Jun-2008

1.5 RELATION WITH OTHER NATURA 2000 SITES

FR3100474
FR3112006

1.6 RESPONDENT(S)

DIREN Nord-Pas-de-Calais / MNHN-SPN

1.7 SITE NAME

BANCS DES FLANDRES

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Jan-2010	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 2.158889
Latitude 51.176111

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

natura2000.eea.europa.eu/natura2000/SDFPublic.aspx?site=FR3102002 1/4

7/1/13 N2K FR3102002 dataform

2.2 AREA (HA)

112919.0000

2.4 ALTITUDE (M)

Minimum -38
Maximum 0
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Nord
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110B	56.00	A	B	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus			P	P	C	A	C	B
1365	Phoca vitulina			P	P	C	B	C	B
1351	Phocoena phocoena		?	C	C	B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

GROUP	SCIENTIFIC NAME	POPULATION	MOTIVATION
M	Lagenorhynchus albirostris	P	C

(B=Birds, M= Mammals, A=Amphibians, R=Reptiles, F=Fish, I=Invertebrates, P=Plants)

4. SITE DESCRIPTION

Back to top

natura2000.eea.europa.eu/natura2000/SDFPublic.aspx?site=FR3102002 2/4

7/1/13 N2K FR3102002 dataform

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

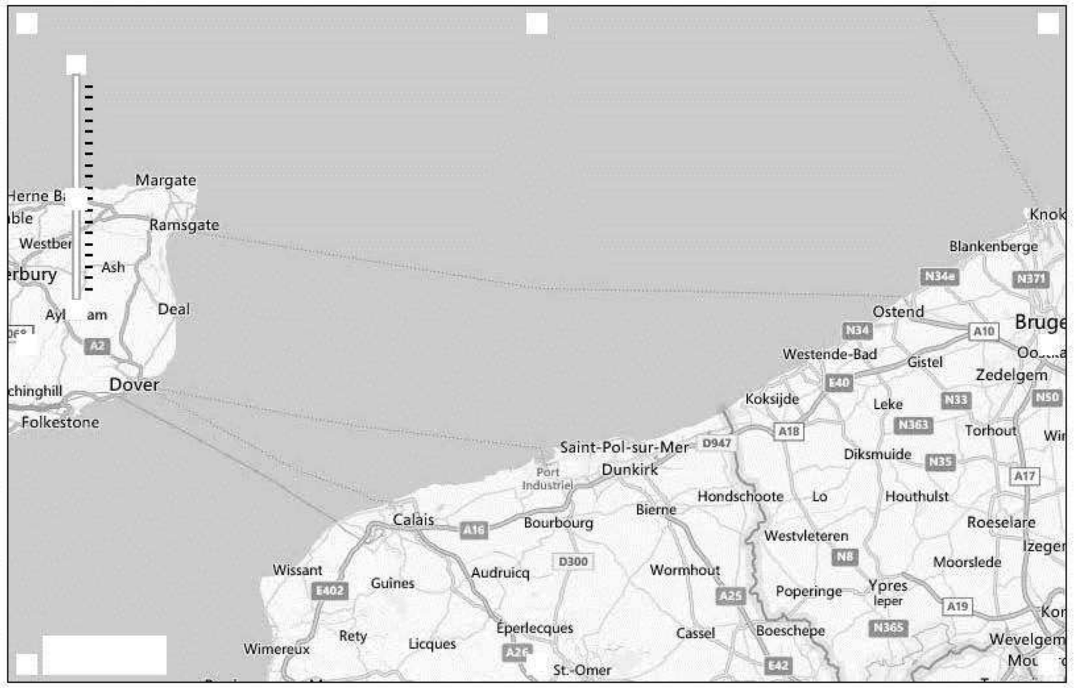
6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SHOM 6651	43000	Mercator WGS84
SHOM 6735	150000	Mercator ED50
SHOM 7214	60000	Mercator WGS84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

natura2000.eea.europa.eu/natura2000/SDFPublic.aspx?site=FR3102002 3/4

Rècifs Gris-Nez Blanc-Nez

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **FR3102003**
SITENAME **RECIFS GRIS-NEZ BLANC-NEZ**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

G

1.2 SITE CODE

FR3102003

1.3 COMPILATION DATE

01-Jun-2008

1.5 RELATION WITH OTHER NATURA 2000 SITES

FR3100477
FR3100478
FR3110085

1.6 RESPONDENT(S)

DIREN Nord-Pas-de-Calais / MNHN-SPN

1.7 SITE NAME

RECIFS GRIS-NEZ BLANC-NEZ

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Oct-2008	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 1.562500
Latitude 50.891667

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

29156.0000

2.4 ALTITUDE (M)

Minimum -69
Maximum 0
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Pas-de-Calais
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1170	13.00	A	C	B	B
1110	17.00	B	C	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus			?	P	C	A	C	B
1365	Phoca vitulina			?	P	C	B	C	B
1351	Phocoena phocoena			C	C	C	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover

Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
200			
210			
213			
220			
520			
621			
944			

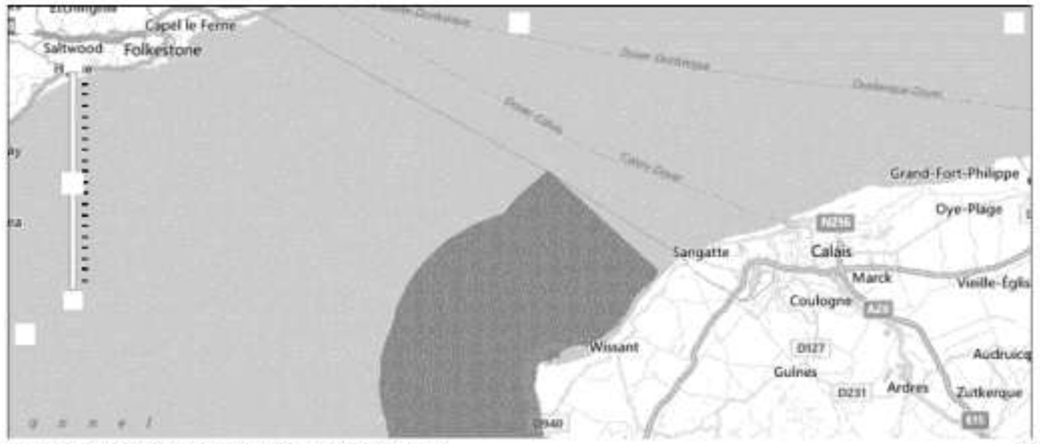
Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
701		
860		

7. MAP OF THE SITE

Back to top

SITE DISPLAY



PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SHOM 7323	74300	Mercator WGS84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

Database release: Eur4 2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **FR3102004**

SITENAME **RIDENS ET DUNES HYDRAULIQUES DU DETROIT DU PAS-DE-CALAIS**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

FR3102004

1.3 COMPILATION DATE

01-Jun-2008

1.6 RESPONDENT(S)

DIREN Nord-Pas-de-Calais / MNHN-SPN

1.7 SITE NAME

RIDENS ET DUNES HYDRAULIQUES DU DETROIT DU PAS-DE-CALAIS

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Sep-2010	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 1.248611
Latitude 50.668333

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

68245.0000

2.4 ALTITUDE (M)

Minimum -56
Maximum 0
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Pas-de-Calais
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	86.00	A	B	B	B
1170	1.00	C	C	B	C

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and
listed in Annex II of Directive 92/43/EEC and
site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus				P	C	A	C	B
1365	Phoca vitulina				P	C	B	C	B
1351	Phocoena phocoena			P	P	C	B	C	B

N2K FR3102004 dataform

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
200	C		
210	A		
213			
220	B		
300			
520			
621			
629			
820			
944			

N2K FR3102004 dataform

7. MAP OF THE SITE

Back to top

SITE DISPLAY

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SHOM 7323	74300	Mercator WGS84
SHOM 7416	75000	Mercator WGS84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3102004[05/07/2013 16:21:24]

Baie de Canche et Couloir des Trois Estuaires

Database release: [illegible]

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **FR3102005**
SITENAME **BAIE DE CANCHE ET COULOIR DES TROIS ESTUAIRES**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

K

1.2 SITE CODE

FR3102005

1.3 COMPILATION DATE

01-Jun-2008

1.5 RELATION WITH OTHER NATURA 2000 SITES

FR2200346
FR2200348
FR2210068
FR3100480
FR3100481
FR3100482
FR3110038

1.6 RESPONDENT(S)

DIREN Nord-Pas-de-Calais / M.N.H.N -SPN

1.7 SITE NAME

BAIE DE CANCHE ET COULOIR DES TROIS ESTUAIRES

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Oct-2008	No data

DATE SITE CLASSIFIED AS SPA	DATE SITE DESIGNATED AS SAC
No data	No data

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 1.488333
Latitude 50.346111

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

33306.0000

2.4 ALTITUDE (M)

Minimum -23
Maximum 0
Mean No data

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Somme
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	88.00	A	B	B	B
1130	2.00	A	C	B	B
1140	8.00	A	C	B	B
1210	0.10	D			

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

N2K FR3102005 dataform

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus			50-60i	C	B	A	C	B
1365	Phoca vitulina			100-175i	C	A	B	C	B
1351	Phocoena phocoena			P	P	C	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1102	Alosa alosa				P	D			
1099	Lampetra fluviatilis				P	D			
1095	Petromyzon marinus				P	D			
1106	Salmo salar				P	D			

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	98.00
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	2.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3102005[05/07/2013 16:26:37]

N2K FR3102005 dataform

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

6.1 GENERAL IMPACTS AND ACTIVITIES AND PROPORTION OF THE SURFACE OF THE SITE AFFECTED

Impacts and activities within the site

CODE	INTENSITY	% OF SITE	INFLUENCE
200			
210			
213			
220			
230			
300			
520			
621			
820			
944			

Impacts and activities around the site

CODE	INTENSITY	INFLUENCE
230		
701		

7. MAP OF THE SITE

Back to top

SITE DISPLAY

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3102005[05/07/2013 16:26:37]

N2K FR3102005 dataform

PHYSICAL MAP

NATIONAL MAP NUMBER	SCALE	PROJECTION
SHOM 7416	75000	Mercator WGS 84

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=FR3102005[05/07/2013 16:26:37]

H.6 Netherlands Sites

Doggersbank

N2K NL2008001 dataform

Database release: End2011

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **NL2008001**

SITENAME **Doggersbank**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

NL2008001

1.3 COMPILATION DATE

01-Dec-2008

1.5 RELATION WITH OTHER NATURA 2000 SITES

UK0030352

1.6 RESPONDENT(S)

Natura 2000 Department, Ministry of Agriculture, Nature and Food Quality P.O.Box 20401 2500 EK Den Haag The Netherlands

1.7 SITE NAME

Doggersbank

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Dec-2008	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008001[08/07/2013 09:17:26]

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 3.483889
Latitude 55.138056

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

471750.0000

2.4 ALTITUDE (M)

Minimum -45
Maximum -20
Mean -33

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	93.00	B	A	C	A

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	C				C	B	C	C

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

Klaverbank

N2K NL2008002 dataform

Database release:

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **NL2008002**
SITENAME **Klaverbank**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

B

1.2 SITE CODE

NL2008002

1.3 COMPILATION DATE

01-Dec-2008

1.6 RESPONDENT(S)

Natura 2000 Department, Ministry of Agriculture, Nature and Food Quality P.O.Box 20401 2500 EK Den Haag The Netherlands

1.7 SITE NAME

Klaverbank

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Dec-2008	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	No data

2. SITE LOCATION

Back to top

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008002[08/07/2013 09:18:07]

N2K NL2008002 dataform

2.1 SITE CENTRE LOCATION

Longitude 3.085278
Latitude 54.022500

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

123733.0000

2.4 ALTITUDE (M)

Minimum -71
Maximum -30
Mean -43

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1170	50.00	B	A	C	A

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	C				C	B	C	C
1365	Phoca vitulina	R				C	B	C	C
1351	Phocoena phocoena	C				B	B	C	B

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008002[08/07/2013 09:18:07]

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

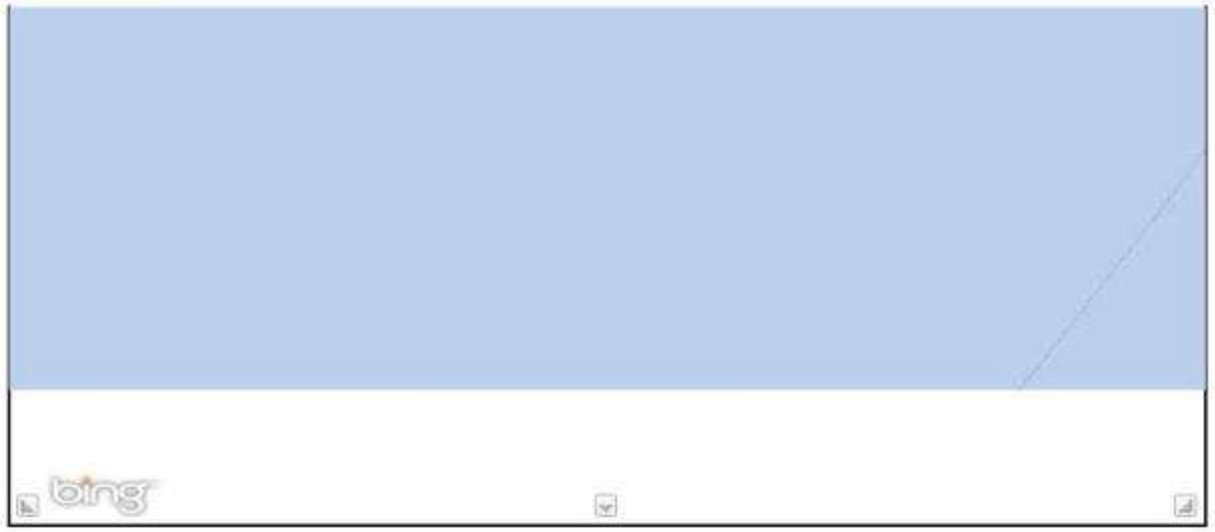
6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY



REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

Vlakte van de Raan

N2K NL2008003 dataform

Database release: [illegible]

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **NL2008003**
SITENAME **Vlakte van de Raan**

TABLE OF CONTENTS

Print Standard Data Form

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

E

1.2 SITE CODE

NL2008003

1.3 COMPILATION DATE

01-Dec-2008

1.4 UPDATE

01-Sep-2011

1.5 RELATION WITH OTHER NATURA 2000 SITES

NL3000027
NL3009018
NL4000017
NL9803061

1.6 RESPONDENT(S)

Natura 2000 Department, Ministry of Agriculture, Nature and Food Quality P.O.Box 20401 2500 EK Den Haag The Netherlands

1.7 SITE NAME

Vlakte van de Raan

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008003[08/07/2013 09:24:02]

N2K NL2008003 dataform

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Dec-2008	No data
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
No data	01-Mar-2011

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 3.309722
Latitude 51.486667

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

17521.0000

2.4 ALTITUDE (M)

Minimum -36
Maximum 1
Mean -8

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name No data
% Cover 100.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	100.00	B	B	B	B

3.2. SPECIES
Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

		POPULATION	SITE ASSESSMENT

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008003[08/07/2013 09:24:02]

N2K NL2008003 dataform

CODE	NAME	Resident	Migratory Breed	Migratory Winter	Migratory Stage	Population	Conservation	Isolation	Global
1103	Alosa fallax	V				C	B	C	C

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	382				B	C	C	C
1365	Phoca vitulina	11 - 50				C	C	C	C
1351	Phocoena phocoena	P				B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1099	Lampetra fluviatilis	P				C	A	C	C
1095	Petromyzon marinus	P				B	A	C	B

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	100.00
TOTAL HABITAT COVER	100 %

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008003[08/07/2013 09:24:02]

N2K NL2008003 dataform

Back to top

7. MAP OF THE SITE

Back to top

SITE DISPLAY

REFERENCE TO AVAILABILITY OF BOUNDARIES IN DIGITIZED FORM

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL2008003[08/07/2013 09:24:02]

Noordzeekustzone

N2K NL9802001 dataform

Database release:

XML

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA)
For Sites Eligible for identification as sites of community importance (SCI) and
For Special Areas of Conservation (SAC)

SITE **NL9802001**
SITENAME **Noordzeekustzone**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 TYPE

C

1.2 SITE CODE

NL9802001

1.3 COMPILATION DATE

01-Mar-2000

1.4 UPDATE

01-Sep-2011

1.5 RELATION WITH OTHER NATURA 2000 SITES

NL1000001

1.6 RESPONDENT(S)

Natura 2000 Department, Ministry of Agriculture, Nature and Food Quality P.O.Box 20401 2500 EK Den Haag The Netherlands

1.7 SITE NAME

Noordzeekustzone

1.8 SITE INDICATION AND DESIGNATION/CLASSIFICATION DATES

DATE SITE PROPOSED AS ELIGIBLE AS SCI	DATE CONFIRMED AS SCI
01-Aug-2002	01-Dec-2004
DATE SITE CLASSIFIED AS SPA	**DATE SITE DESIGNATED AS SAC**
01-Mar-2000	01-Feb-2009

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL9802001[08/07/2013 09:19:13]

N2K NL9802001 dataform

2. SITE LOCATION

Back to top

2.1 SITE CENTRE LOCATION

Longitude 5.012778
Latitude 53.344167

positive values = decimal degrees W/ negative values = decimal degrees E (Greenwich)

2.2 AREA (HA)

144475.0000

2.4 ALTITUDE (M)

Minimum -20
Maximum 0
Mean -10

2.5 ADMINISTRATIVE REGION

Nuts Code 0
Region Name Noord-Friesland
% Cover 98.00

2.6 BIOGEOGRAPHIC REGION

Atlantic

3. ECOLOGICAL INFORMATION

Back to top

NOTE: Protected species are shown with red background.

3.1 HABITAT TYPES PRESENT ON THE SITE AND ASSESSMENT FOR THEM

ANNEX I HABITAT TYPES

CODE	% COVER	REPRESENTATIVITY	RELATIVE SURFACE	CONSERVATION STATUS	GLOBAL ASSESSMENT
1110	80.00	B	A	C	A
1140	2.00	B	B	C	B
1310	0.10	B	B	C	B
1330	0.10	B	C	C	C
2110	0.20	A	A	A	A
2190	0.10	C	C	B	C

3.2. SPECIES

http://natura2000.eea.europa.eu/Natura2000/SDFPublic.aspx?site=NL9802001[08/07/2013 09:19:13]

Covered by Article 4 of Directive 79/409/EEC and listed in Annex II of Directive 92/43/EEC and site assessment for them

3.2.A. BIRDS listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
A138	Charadrius alexandrinus		12			B	C	C	C
A002	Gavia arctica			P		A	B	C	A
A001	Gavia stellata			P		A	B	C	A
A177	Larus minutus			P		A	B	C	A
A157	Limosa lapponica			1800		C	B	C	C
A132	Recurvirostra avosetta			120		C	B	C	C
A195	Sterna albifrons		1			C	C	B	C

3.2.B. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1103	Alosa fallax	V				C	C	C	C
A169	Arenaria interpres			160		B	B	C	B
A062	Aythya marila			P		C	C	C	C
A144	Calidris alba			2000		A	B	C	A
A149	Calidris alpina			7400		C	B	C	C
A143	Calidris canutus			560		C	B	C	C
A137	Charadrius hiaticula		17	510		B	C	C	C
A130	Haematopus ostralegus			3300		C	B	C	C
A065	Melanitta nigra			51900		A	C	C	A
A144	Numenius arquata			640		C	B	C	C
A391	Phalacrocorax carbo			1900		B	B	C	B
A141	Pluvialis squatarola			3200		B	B	C	B
A063	Somateria mollissima			26200		A	C	B	A
A048	Tadorna tadorna			520		C	B	C	C

3.2.C. MAMMALS listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1364	Halichoerus grypus	2000				A	B	C	A
1365	Phoca vitulina	9500				A	B	C	A
1351	Phocoena phocoena	P				B	B	C	B

3.2.D. AMPHIBIANS AND REPTILES listed on Annex II of Council directive 92/43/EEC

3.2.E. FISHES listed on Annex II of Council directive 92/43/EEC

CODE	NAME	POPULATION				SITE ASSESSMENT			
		Resident	Migratory			Population	Conservation	Isolation	Global
			Breed	Winter	Stage				
1099	Lampetra fluviatilis	P				A	A	C	A
1095	Petromyzon marinus	P				A	A	C	A

3.2.F. INVERTEBRATES listed on Annex II of Council directive 92/43/EEC

3.2.G. PLANTS listed on Annex II of Council directive 92/43/EEC

3.3 OTHER IMPORTANT SPECIES OF FLORA AND FAUNA

4. SITE DESCRIPTION

Back to top

4.1 GENERAL SITE CHARACTER

Habitat Classes	% Cover
Marine areas, Sea inlets	97.00
Coastal sand dunes, Sand beaches, Machair	3.00
TOTAL HABITAT COVER	**100 %**

4.2 QUALITY AND IMPORTANCE

4.3 VULNERABILITY

4.4 SITE DESIGNATION

4.5 OWNERSHIP

4.6 DOCUMENTATION

5. SITE PROTECTION STATUS AND RELATION WITH CORINE BIOTOPES

Back to top

5.1 DESIGNATION TYPES at National and Regional Level

CODE	% COVER
NL01	100.00
NL22	4.00

5.2 RELATION OF THE DESCRIBED SITE WITH OTHER SITES

Designated at International level

TYPE CODE	SITE NAME	OVERLAP	
		TYPE	%COVER
IN00	Noordzeekustzone, Breebaart	=	100.00

6. IMPACTS AND ACTIVITIES IN AND AROUND THE SITE

Back to top

RPS

SMart Wind

ANNEX I – CONSERVATION OBJECTIVES FOR NATURA 2000 SITES

Table of Contents

NATURAL ENGLAND

European Site Conservation Objectives for
Alde–Ore Estuary Special Protection Area
Site Code: UK9009112

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A183 *Larus fuscus*; Lesser black-backed gull (Breeding)
A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

Seabird assemblage
Waterbird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Alde Ore & Butley European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Abberton Reservoir SPA

NATURAL ENGLAND

European Site Conservation Objectives for Abberton Reservoir Special Protection Area Site Code: UK9009141

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A005 *Podiceps cristatus*; Great crested grebe (Non-breeding)
A017 *Phalacrocorax carbo*; Great cormorant (Breeding)
A036 *Cygnus olor*; Mute swan (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A051 *Anas strepera*; Gadwall (Non-breeding)
A052 *Anas crecca*; Eurasian teal (Non-breeding)
A056 *Anas clypeata*; Northern shoveler (Non-breeding)
A059 *Aythya ferina*; Common pochard (Non-breeding)
A061 *Aythya fuligula*; Tufted duck (Non-breeding)
A067 *Bucephala clangula*; Common goldeneye (Non-breeding)
A125 *Fulica atra*; Common coot (Non-breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A140 *Pluvialis apricaria*; European golden plover (Non-breeding)

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

Auskerry SPA

Conservation Objectives for Auskerry
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic tern (*Sterna paradisaea)*
- Storm petrel (*Hydrobates pelagicus)*

1

Benfleet and Southend Marshes SPA

NATURAL ENGLAND

European Site Conservation Objectives for
Benfleet and Southend Marshes Special Protection Area
Site Code: UK9009171

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
Waterbird assemblage

www.naturalengland.org.uk

Blackwater Estuary SPA

This is a European Marine Site

This site is a part of the Benfleet and Southend Marshes European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

NATURAL ENGLAND

European Site Conservation Objectives for Blackwater Estuary (Mid-Essex Coast Phase 4) Special Protection Area Site Code: UK9009245

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A059 *Aythya ferina*; Common pochard (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)

www.naturalengland.org.uk

Breydon Water SPA

This is a European Marine Site

This site is a part of the Essex Estuaries European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

NATURAL ENGLAND

European Site Conservation Objectives for
Breydon Water Special Protection Area
Site Code: UK9009181

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A142 *Vanellus vanellus*; Northern lapwing (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
Waterbird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Breydon Water European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Broadland SPA

NATURAL ENGLAND

European Site Conservation Objectives for Broadland Special Protection Area Site Code: UK9009253

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A021 *Botaurus stellaris*; Great bittern (Breeding)
A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
A038 *Cygnus cygnus*; Whooper swan (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A051 *Anas strepera*; Gadwall (Non-breeding)
A056 *Anas clypeata*; Northern shoveler (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A021 *Botaurus stellaris*; Great bittern (Non-breeding)
A040 *Anser brachyrhynchus*; Pink-footed goose (Non-breeding)
Waterbird assemblage

www.naturalengland.org.uk

Buchan Ness to Collieston Coast SPA

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Conservation Objectives for Buchan Ness to Collieston Coast Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Fulmar (*Fulmarus glacialis*)*
- Guillemot (*Uria aalge*)*
- Herring gull (*Larus argentatus*)*
- Kittiwake (*Rissa tridactyla*)*
- Shag (*Phalacrocorax aristotelis*)*

- Seabird assemblage

* indicates assemblage qualifier only

The site overlaps with Buchan Ness to Collieston Special Area of Conservation

1

Calf of Eday SPA

Conservation Objectives for Calf of Eday
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Cormorant (*Phalacrocorax carbo carbo*)*
- Fulmar (*Fulmarus glacialis*)*
- Great black-backed gull (*Larus marinus*)*
- Guillemot (*Uria aalge*)*
- Kittiwake (*Rissa tridactyla*)*

- Seabird assemblage

* indicates assemblage qualifier only

1

Colne Estuary SPA

NATURAL ENGLAND

European Site Conservation Objectives for
Colne Estuary (Mid-Essex Coast Phase 2) Special Protection Area
Site Code: UK9009243

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A059 *Aythya ferina*; Common pochard (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Essex Estuaries European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Copinsay SPA

Conservation Objectives for Copinsay
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Fulmar (*Fulmarus glacialis*)*
- Great black-backed gull (*Larus marinus*)*
- Guillemot (*Uria aalge*)*
- Kittiwake (*Rissa tridactyla*)*
- Seabird assemblage

* indicates assemblage qualifier only

1

Cromarty Firth SPA

Conservation Objectives for Cromarty Firth
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Bar-tailed godwit (*Limosa lapponica*)
- Common tern (*Sterna hirundo*)
- Curlew (*Numenius arquata*)*
- Dunlin (*Calidris alpina alpina*)*
- Greylag goose (*Anser anser*)
- Knot (*Calidris canutus*)*
- Osprey (*Pandion haliaetus*)
- Oystercatcher (*Haematopus ostralegus*)*
- Pintail (*Anas acuta*)*
- Red-breasted merganser (*Mergus serrator*)*
- Redshank (*Tringa totanus*)*
- Scaup (*Aythya marila*)*
- Whooper swan (*Cygnus cygnus*)
- Wigeon (*Anas penelope*)*

- Waterfowl assemblage

* indicates assemblage qualifier only

The site overlaps with the Moray Firth Special Area of Conservation

1

Coquet Islands SPA

NATURAL ENGLAND

European Site Conservation Objectives for
Coquet Island Special Protection Area
Site Code: UK9006031

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A192 *Sterna dougallii*; Roseate tern (Breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A194 *Sterna paradisaea*; Arctic tern (Breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A204 *Fratercula arctica*; Atlantic puffin (Breeding)
Seabird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Coquet Island European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features Identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Dengie Marshes SPA

NATURAL ENGLAND

European Site Conservation Objectives for
Dengie (Mid-Essex Coast Phase 1) Special Protection Area
Site Code: UK9009242

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Essex Estuaries European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Dornoch Firth and Loch Fleet SPA

Conservation Objectives for Dornoch Firth and Loch Fleet Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Bar-tailed godwit (*Limosa lapponica*)
- Curlew (*Numenius arquata*)*
- Dunlin (*Calidris alpina alpina*)*
- Greylag goose (*Anser anser*)
- Osprey (*Pandion haliaetus*)
- Oystercatcher (*Haematopus ostralegus*)*
- Teal (*Anas crecca*)*
- Wigeon (*Anas penelope*)
- Waterfowl assemblage

* Indicates assemblage qualifier only

The site overlaps with Dornoch Firth and Morrich More Special Area of Conservation, Moray Firth Special Area of Conservation and Mound Alderwoods Special Area of Conservation

1

East Caithness Cliffs SPA

Conservation Objectives for East Caithness Cliffs Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Cormorant (*Phalacrocorax carbo*)*
- Fulmar (*Fulmarus glacialis*)*
- Great black-backed gull (*Larus marinus*)*
- Guillemot (*Uria aalge*)
- Herring gull (*Larus argentatus*)
- Kittiwake (*Rissa tridactyla*)
- Peregrine (*Falco peregrinus*)
- Puffin (*Fratercula arctica*)*
- Razorbill (*Alca torda*)
- Shag (*Phalacrocorax aristotelis*)

- Seabird assemblage

* indicates assemblage qualifier only

The site overlaps with East Caithness Cliffs Special Area of Conservation

1

East Sanday Coast SPA

Conservation Objectives for East Sanday Coast Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Bar-tailed godwit (*Limosa lapponica*)
- Purple sandpiper (*Calidris maritima*)
- Turnstone (*Arenaria interpres*)

The site overlaps with Sanday Special Area of Conservation

1

Fair Isle SPA

FAIR ISLE MARINE ENVIRONMENT AND TOURISM INITIATIVE

Up
Management Issues

Managing the sea for birds – Fair Isle and adjacent waters

2 Conservation Objectives

2.1 General principles

The requirements of the EC Wild Birds Directive (79/409/EEC) and Habitats and Species Directive (92/43/EEC) can be summarised as the following overall objectives for the proposed protected area:

- To safeguard and enhance the seabird importance of Fair Isle and its surrounding waters, with particular emphasis on the requirements of birds when feeding, breeding, moulting, wintering and resting;
- To contribute to the coherence of the *Natura 2000* network and support the requirements of the Habitats Directive.

2.2 Site conservation objectives

For the purposes of this illustrative plan, three site-specific conservation objectives have been identified:

1. Ensure the maintenance and protection of Fair Isle's internationally and nationally important seabird populations;
2. Maintain and, where appropriate, restore a natural marine ecosystem on which the functions, distribution, abundance and long-term survival of these internationally and nationally important seabird populations depend;
3. Maintain and, where appropriate, restore the quality of the physical environment necessary to preserve the biodiversity and natural functioning of the marine ecosystem.

2.3 Broad policies

In common with RSPB (1997), the following broad policies are considered necessary to achieve the overall conservation objectives:

Safeguard food supplies;

Minimise disturbance;

Safeguard habitat (eg nesting sites, water quality);

Improve understanding of seabirds;

Ensure consistency with Habitats Directive.

2.4 Prescriptions

The five recommended areas for action have been adapted from RSPB (1997):

(Key words in the right-hand column show how the action relates to the overall conservation objectives. Underlined text indicates which broad policy is promoted by the proposed action.)

Influence the management of activities such as commercial fisheries. These may affect the availability and composition of prey that are an important part of the diet of the seabirds in the area, and on which successful rearing of chicks depends.	Particularly important in relation to *Feeding* *Breeding*
Minimise disturbance to seabirds in the proposed protected area, particularly during the breeding season, through management of access and activities on land, sea and air.	*Breeding* *Resting* *Moulting*
Influence the development of management plans and policies which affect the quality of the physical and chemical environment of the proposed protected area. For example, regarding water quality, plans and policies should raise standards, minimise (or where possible eliminate) inputs of substances which are toxic, persistent and liable to bioaccumulate, and include comprehensive emergency procedures for dealing with pollution incidents.	*Feeding* *Breeding* *Wintering* *Resting* *Moulting*
Carry out research and monitoring of seabirds which breed in the proposed protected area, with particular emphasis on learning more about their feeding ecology, factors influencing breeding success, and other impacts on the health and viability of the populations. Disseminate this information to managers, policy makers and the general public.	*Feeding* *Breeding* *Wintering* *Resting* *Moulting*
Identify and locate habitats and species listed in the Habitats Directive which occur in the proposed protected area. Where possible use management measures which would benefit these species and habitats as well as the seabirds which use the area.	*Natura 2000*

2.5 Targets

Species targets developed from the national targets, such as those included in *Biodiversity Challenge* (Wynne *et al*, 1995), can also be used to refine the overall objectives for a site and clarify what action needs to be taken. Where targets specify numbers, detailed analysis will be needed to determine the contribution which Fair Isle can make to that target, and should be part of the research required under Article 10 of the EC Wild Birds Directive to provide the basis for the protection and management of birds.

It would be possible to set site-specific targets for Fair Isle's breeding seabird populations (eg population size not to change between specified limits or below a certain proportion of the national or biogeographical population). However, most species were at their highest recorded levels in the mid 1980s, due to population increases partly attributed to unsustainable fisheries practices. Measures applied to ensure more ecologically sustainable fisheries management may lead to readjustment of seabird populations, within acceptable limits, below their peak levels. It is therefore preferable to have lower seabird populations feeding on natural food sources, than artificially high levels exploiting unsustainable fishing methods (eg discards). For these reasons, no attempt at defining species targets has been made in this report.

However, target-setting is an essential principle for the management of any protected area, even if the key factor may not be population size. More appropriate variables may include chick growth rates and breeding productivity levels. Targets would need to be set individually for each species and would define acceptable limits of change. Species of national and/or international importance (see Table 3, Appendix 1) should be considered the key species for conservation action. The high diversity of seabird species breeding on Fair Isle is, in itself, of conservation value; measures that are responsive to established targets may benefit seabird diversity as well as the species of highest conservation concern.

INTRODUCTION CONTENTS PAGE MANAGEMENT ISSUES

Farne Islands

NATURAL ENGLAND

European Site Conservation Objectives for Farne Islands Special Protection Area Site Code: UK9006021

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A194 *Sterna paradisaea*; Arctic tern (Breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A192 *Sterna dougallii*; Roseate tern (Breeding)
A199 *Uria aalge*; Common guillemot (Breeding)
A204 *Fratercula arctica*; Atlantic puffin (Breeding)
Seabird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Berwickshire & North Northumberland Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Fetlar SPA

Conservation Objectives for Fetlar
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic skua (*Stercorarius parasiticus*)*
- Arctic tern (*Sterna paradisea*)
- Dunlin (*Calidris alpina schinzii*)
- Fulmar (*Fulmarus glacialis*)*
- Great skua (*Stercorarius skua*)
- Red-necked phalarope (*Phalaropus lobatus*)
- Whimbrel (*Numenius phaeopus*)

- Seabird assemblage

* indicates assemblage qualifier only

The site overlaps with North Fetlar Special Area of Conservation

1

EC Directive 79/409 on the Conservation of Wild Birds:

CITATION FOR SPECIAL PROTECTION AREA (SPA)
FOR PUBLIC ISSUE

FIRTH OF FORTH,
STIRLING, CLACKMANNANSHIRE, FALKIRK, FIFE, WEST LOTHIAN, CITY OF EDINBURGH, EAST LOTHIAN (UK9004411)

Site description:
The **Firth of Forth SPA** is a complex of estuarine and coastal habitats in south east Scotland stretching east from Alloa to the coasts of Fife and East Lothian. The site includes extensive invertebrate-rich intertidal flats and rocky shores, areas of saltmarsh, lagoons and sand dune. The site is underpinned by the Firth of Forth SSSI.

Qualifying interest:
The Firth of Forth SPA qualifies under **Article 4.1** by regularly supporting wintering populations (1993/94-97/98 winter peak means) of European importance of the **Annex 1** species: **red-throated diver** *Gavia stellata* (90 individuals; 2% of GB), **Slavonian grebe** *Podiceps auritus* (84; 2% of NW Europe, 21% of GB), **golden plover** *Pluvialis apricaria* (2,949; 1% of GB) and **bar-tailed godwit** *Limosa lapponica* (1,974; 2% of Western Europe, 4% of GB).

The site further qualifies under **Article 4.1** by regularly supporting a post-breeding (passage) population of European importance of the **Annex 1** species **sandwich tern** *Sterna sandvicensis* (1,617, 6% of GB, 1% of East Atlantic).

The Firth of Forth SPA qualifies under **Article 4.2** by regularly supporting wintering populations (1993/94-97/98 winter peak means) of both European and international importance of the migratory species **pink-footed goose** *Anser brachyrhynchus* (10,852; 6% of Icelandic/Greenlandic), **shelduck** *Tadorna tadorna* (moulting flock of 4,509; 2% of NW European), **knot** *Calidris canutus* (9,258; 3% of western European/Canadian), **redshank** *Tringa totanus* (4,341; 3% of European/West African) and **turnstone** *Arenaria interpres* (860 individuals; 1% of European).

The Firth of Forth SPA further qualifies under **Article 4.2** by regularly supporting a wintering waterfowl assemblage of European importance: a 1992/93-96/97 winter peak mean of 95,000 waterfowl, comprising 45,000 wildfowl and 50,000 waders. This assemblage includes nationally important numbers of 15 migratory species: **great crested grebe** *Podiceps cristatus* (720; 7% of GB), **cormorant** *Phalacrocorax carbo* (682; 5% of GB), **scaup** *Aythya marila* (437; 4% of GB), **elder** *Somateria mollissima* (9,400; 13% of GB), **long-tailed duck** *Clangula hyemalis* (1,045; 4% of GB), **common scoter** *Melanitta nigra* (2,880; 8% of GB), **velvet scoter** *M. fusca* (635; 21% of GB), **goldeneye** *Bucephala clangula* (3,004; 18% of GB population), **red-breasted merganser** *Mergus serrator* (670; 7% of GB), **oystercatcher** *Haematopus ostralegus* (7,846; 2% of GB), **ringed plover** *Charadrius hiaticula* (328; 1% of GB), **grey plover** *Pluvialis squatarola* (724; 2% of GB), **dunlin** *Calidris alpina* (9,514; 2% of GB), and **curlew** *Numenius arquata* (1,928; 2% of GB). The assemblage also includes large numbers of the following species: **wigeon** *Anas penelope* (2,139 [1991/2-95/96]), **mallard** *A. platyrhnchos* (2,564 [1991/2-95/96]) and **lapwing** *Vanellus vanellus* (4,148 [1991/2-95/96]).

Area: 6,313.72 ha.
OS 1:50,000 sheets - 59, 65, 66 & 67
National Grid References: NS 865920 to NO 615075 and NT 678794

October 2001
Natura 2000
Scottish Natural Heritage

Firth of Tay & Eden Estuary SPA

Conservation Objectives for Firth of Forth Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Bar-tailed godwit (*Limosa lapponica*)
- Common scoter (*Melanitta nigra*)*
- Cormorant (*Phalacrocorax carbo*)*
- Curlew (*Numenius arquata*)*
- Dunlin (*Calidris alpina alpina*)*
- Eider (*Somateria mollissima*)*
- Golden plover (*Pluvialis apricaria*)
- Goldeneye (*Bucephala clangula*)*
- Great crested grebe (*Podiceps cristatus*)*
- Grey plover (*Pluvialis squatarola*)*
- Knot (*Calidris canutus*)
- Lapwing (*Vanellus vanellus*)*
- Long-tailed duck (*Clangula hyemalis*) *
- Mallard (*Anas platyrhnchos*)*
- Oystercatcher (*Haematopus ostralegus*)*
- Pink-footed goose (*Anser brachyrhynchus*)
- Red-breasted merganser (*Mergus serrator*)*
- Redshank (*Tringa totanus*)
- Red-throated diver (*Gavia stellata*)
- Ringed plover (*Charadrius hiaticula*) *
- Sandwich tern (*Sterna sandvicensis*)
- Scaup (*Aythya marila*) *
- Shelduck (*Tadorna tadorna*)
- Slavonian grebe (*Podiceps auritus*)
- Turnstone (*Arenaria interpres*)
- Velvet scoter (*Melanitta fusca*)*
- Wigeon (*Anas penelope*)*

- Waterfowl assemblage

* indicates assemblage qualifyer only

1

Conservation Objectives for Firth of Tay & Eden Estuary Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying species:

- Bar-tailed godwit (*Limosa lapponica*)
- Black-tailed godwit (*Limosa limosa islandica*)*
- Common scoter (*Melanitta nigra*)*
- Cormorant (*Phalacrocorax carbo*)*
- Dunlin (*Calidris alpina alpina*)*
- Eider (*Somateria mollissima*)*
- Goldeneye (*Bucephala clangula*)*
- Goosander (*Mergus merganser*)*
- Grey plover (*Pluvialis squatarola*)*
- Greylag goose (*Anser anser*)
- Little tern (*Sterna albifrons*)
- Long-tailed duck (*Clangula hyemalis*)*
- Marsh harrier (*Circus aeruginosus*)
- Oystercatcher (*Haematopus ostralegus*)*
- Pink-footed goose (*Anser brachyrhynchus*)
- Red-breasted merganser (*Mergus serrator*)*
- Redshank (*Tringa totanus*)
- Sanderling (*Calidris alba*)*
- Shelduck (*Tadorna tadorna*)*
- Velvet scoter (*Melanitta fusca*)*

- Waterfowl assemblage

*Indicates assemblage qualifier only

This site overlaps with Barry Links Special Area of Conservation and Firth of Tay & Eden Estuary Special Area of Conservation

1

Flamborough Head and Bempton Cliffs SPA

NATURAL ENGLAND

European Site Conservation Objectives for Flamborough Head and Bempton Cliffs Special Protection Area Site Code: UK9006101

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A188 *Rissa tridactyla*; Black-legged kittiwake (Breeding)

Additional Qualifying Features identified by the 2001 UK SPA Review:

Seabird assemblage

www.naturalengland.org.uk

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Forth Islands SPA

Conservation Objectives for Forth Islands
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Arctic tern (Sterna paradisaea)
- Common tern (*Sterna hirundo)*
- Cormorant (*Phalacrocorax carbo)**
- Fulmar (Fulmarus glacialis)*
- Gannet (*Morus bassanus)*
- Guillemot (*Uria aalge)**
- Herring gull (Larus argentatus)*
- Kittiwake (*Rissa tridactyla)**
- Lesser black-backed gull (*Larus fuscus)*
- Puffin (*Fratercula arctica)*
- Razorbill (*Alca torda)**
- Roseate tern (*Sterna dougallii)*
- Sandwich tern (*Sterna sandvicensis*)
- Shag (*Phalacrocorax aristotelis)*

- Seabird assemblage

* indicates assemblage qualifier only

The site overlaps with Isle of May Special Area of Conservation

1

Foulness SPA

NATURAL ENGLAND

European Site Conservation Objectives for
Foulness (Mid-Essex Coast Phase 5) Special Protection Area
Site Code: UK9009246

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A130 *Haematopus ostralegus*; Eurasian oystercatcher (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A137 *Charadrius hiaticula*; Ringed plover (Breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Essex Estuaries European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Fowlsheugh SPA

Conservation Objectives for Fowlsheugh
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Fulmar (*Fulmarus glacialis*)*
- Guillemot (*Uria aalge*)
- Herring gull (*Larus argentatus*)*
- Kittiwake (*Rissa tridactyla*)
- Razorbill (*Alca torda*)*

- Seabird assemblage

* Indicates assemblage qualifier only

1

NATURAL ENGLAND

European Site Conservation Objectives for Saltfleetby–Theddlethorpe Dunes and Gibraltar Point Special Area of Conservation
Site code: UK0030270

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H2110. Embryonic shifting dunes

H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram

H2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland*

H2160. Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn

H2190. Humid dune slacks

* denotes a priority natural habitat or species (supporting explanatory text on following page)

www.naturalengland.org.uk

*** Priority natural habitats or species**

Some of the natural habitats and species listed in the Habitats Directive and for which SACs have been selected are considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Directive and the Habitats Regulations. These priority natural habitats and species are denoted by an asterisk (*) in Annex I and II of the Directive. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Directive or the Habitats Regulations.

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Great Yarmouth and North Denes SPA

NATURAL ENGLAND

European Site Conservation Objectives for Great Yarmouth North Denes Special Protection Area Site Code: UK9009271

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A195 *Sterna albifrons*; Little tern (Breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Great Yarmouth North Denes European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Hamford Water SPA

European Site Conservation Objectives for
Hamford Water Special Protection Area
Site Code: UK9009131

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A052 *Anas crecca*; Eurasian teal (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
Waterbird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Hamford Water European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features Identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Hermaness, Saxa Vord and Valla Field SPA

Conservation Objectives for Hermaness, Saxa Vord & Valla Field Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Fulmar (*Fulmarus glacialis*)*
- Gannet (*Morus bassana*)
- Great skua (*Catharacta skua*)
- Guillemot (*Uria aalge*)*
- Kittiwake (*Rissa tridactyla*)*
- Puffin (*Fratercula arctica*)
- Red-throated diver (*Gavia stellata*)
- Shag (*Phalacrocorax aristotelis*)*

- Seabird assemblage

* indicates assemblage qualifier only

1

Hornsea Mere SPA

NATURAL ENGLAND

European Site Conservation Objectives for Hornsea Mere Special Protection Area Site Code: UK9006171

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A036 *Cygnus olor*; Mute swan (Breeding)
A051 *Anas strepera*; Gadwall (Non-breeding)

www.naturalengland.org.uk

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Hoy SPA

Conservation Objectives for Hoy Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Arctic skua (*Stercorarius parasiticus*)*
- Fulmar (*Fulmarus glacialis*)*
- Great black-backed gull (*Larus marinus*)*
- Great skua (*Catharacta skua*)
- Guillemot (*Uria aalge*)*
- Kittiwake (*Rissa tridactyla*)*
- Peregine (*Falco peregrinus*)
- Puffin (*Fratecula arctica*)*
- Red-throated diver (*Gavia stellata*)

- Seabird assemblage

* indicates assemblage qualifier only

The site overlaps with Hoy Special Area of Conservation

1

Humber Estuary SPA

NATURAL ENGLAND

European Site Conservation Objectives for Humber Estuary Special Protection Area Site Code: UK9006111

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A021 *Botaurus stellaris*; Great bittern (Non-breeding)
A021 *Botaurus stellaris*; Great bittern (Breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

This is a European Marine Site

This site is a part of the Humber Estuary European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Imperial Dock Lock, Leith SPA

Conservation Objectives for Imperial Dock Lock, Leith
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Common tern (*Sterna hirundo*)

1

Inner Moray Firth

Conservation Objectives for Inner Moray Firth
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Bar-tailed godwit (*Limosa lapponica)*
- Common tern (*Sterna hirundo)*
- Cormorant (*Phalacrocorax carbo)**
- Curlew (*Numenius arquata)**
- Goldeneye (*Bucephala clangula)**
- Goosander (*Mergus merganser)* *
- Greylag goose (*Anser anser)*
- Osprey (*Pandion haliaetus)*
- Oystercatcher *(Haematopus ostralegus)**
- Red-breasted merganser (*Mergus serrator)*
- Redshank (*Tringa totanus)*
- Scaup (*Aythya marila)*
- Teal (*Anas crecca*)*
- Wigeon (*Anas penelope*)*

- Waterfowl assemblage

* Indicates assemblage qualifier only

1

Lindisfarne SPA

European Site Conservation Objectives for Lindisfarne Special Protection Area
Site Code: UK9006011

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A038 *Cygnus cygnus*; Whooper swan (Non-breeding)
A043a *Anser anser*; Greylag goose (Non-breeding)
A046c *Branta bernicla hrota*; Light-bellied brent goose (Non-breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A063 *Somateria mollissima*; Common eider (Non-breeding)
A064 *Clangula hyemalis*; Long-tailed duck (Non-breeding)
A065 *Melanitta nigra*; Black (common) scoter (Non-breeding)
A069 *Mergus serrator*; Red-breasted merganser (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A144 *Calidris alba*; Sanderling (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A192 *Sterna dougallii*; Roseate tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A143 *Calidris canutus*; Red knot (Non-breeding)
Waterbird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Berwickshire & North Northumberland Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features Identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Loch of Strathbeg

Conservation Objectives for Loch of Strathbeg
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ➢ Population of the species as a viable component of the site ➢ Distribution of the species within site ➢ Distribution and extent of habitats supporting the species ➢ Structure, function and supporting processes of habitats supporting the species ➢ No significant disturbance of the species
Qualifying Species: • Barnacle goose (*Branta leucopsis*) • Greylag goose (*Anser anser*) • Pink-footed goose (*Anser brachyrhynchus*) • Sandwich tern (*Sterna sandvicensis*) • Teal (*Anas crecca*)* • Whooper swan (*Cygnus cygnus*) • Waterfowl assemblage

* Indicates assemblage qualifier only

1

Marwick Head SPA

Conservation Objectives for Marwick Head
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ➢ Population of the species as a viable component of the site ➢ Distribution of the species within site ➢ Distribution and extent of habitats supporting the species ➢ Structure, function and supporting processes of habitats supporting the species ➢ No significant disturbance of the species
Qualifying Species: • Guillemot (*Uria aalge*) • Kittiwake (*Rissa tridactyla*) * • Seabird assemblage

* indicates assemblage qualifier only

1

NATURAL ENGLAND

European Site Conservation Objectives for
Medway Estuary and Marshes Special Protection Area
Site Code: UK9012031

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A054 *Anas acuta*; Northern pintail (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage
Breeding bird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Swale & Medway European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features Identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Minsmere – Walberswick SPA

NATURAL ENGLAND

European Site Conservation Objectives for Minsmere to Walberswick Heaths and Marshes Special Area of Conservation Site code: UK0012809

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H1210. Annual vegetation of drift lines

H1220. Perennial vegetation of stony banks; Coastal shingle vegetation outside the reach of waves

H4030. European dry heaths

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Minsmere–Walberswick European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Montrose Basin SPA

Conservation Objectives for Montrose Basin Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Dunlin (*Calidris alpina alpina*)*
- Eider (*Somateria mollissima*)*
- Greylag goose (*Anser anser*)
- Knot (*Calidris canutus*)
- Oystercatcher (*Haematopus ostralegus*)*
- Pink-footed goose (*Anser brachyrhynchus*)
- Redshank (*Tringa totanus*)
- Shelduck (*Tadorna tadorna*)*
- Wigeon (*Anas penelope*)*

- Waterfowl assemblage

* indicates assemblage qualifier only

The site overlaps with River South Esk Special Area of Conservation

1

Moray and Nairn Coast SPA

Conservation Objectives for Moray and Nairn Coast Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Bar-tailed godwit (*Limosa lapponica*)
- Common scoter (*Melanitta nigra*)*
- Dunlin (*Calidris alpina alpina*)*
- Greylag goose (*Anser anser*)
- Long-tailed duck (*Clangula hyemalis*)*
- Osprey (*Pandion haliaetus*)
- Oystercatcher (*Haematopus ostralegus*)*
- Pink-footed goose (*Anser brachyrhynchus*)
- Red-breasted merganser (*Mergus serrator*)*
- Redshank (*Tringa totanus*)
- Velvet scoter (*Melanitta fusca*)*
- Wigeon (*Anas penelope*)*

- Waterfowl assemblage

* indicates assemblage qualifier only

The site overlaps with Lower River Spey – Spey Bay Special Area of Conservation and River Spey Special Area of Conservation

1

Mousa SPA

Conservation Objectives for Mousa Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ➢ Population of the species as a viable component of the site ➢ Distribution of the species within site ➢ Distribution and extent of habitats supporting the species ➢ Structure, function and supporting processes of habitats supporting the species ➢ No significant disturbance of the species
Qualifying Species: • Arctic tern (*Sterna paradisaea*) • Storm petrel (*Hydrobates pelagicus*)

This site overlaps with Mousa Special Area of Conservation

1

North Caithness Cliffs SPA

Conservation Objectives for North Caithness Cliffs Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ➢ Population of the species as a viable component of the site ➢ Distribution of the species within site ➢ Distribution and extent of habitats supporting the species ➢ Structure, function and supporting processes of habitats supporting the species ➢ No significant disturbance of the species
Qualifying Species: • Fulmar (*Fulmarus glacialis*)* • Guillemot (*Uria aalge*) • Kittiwake (*Rissa tridactyla*)* • Peregrine (*Falco peregrinus*) • Puffin (*Fratercula arctica*)* • Razorbill (*Alca torda*)* • Seabird assemblage

* indicates assemblage qualifier only

1

North Norfolk Coast SPA

NATURAL ENGLAND

European Site Conservation Objectives for North Norfolk Coast Special Protection Area Site Code: UK9009031

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A021 *Botaurus stellaris*; Great bittern (Breeding)
A040 *Anser brachyrhynchus*; Pink-footed goose (Non-breeding)
A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A084 *Circus pygargus*; Montagu's harrier (Breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A021 *Botaurus stellaris*; Great bittern (Non-breeding)
A054 *Anas acuta*; Northern pintail (Non-breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)

www.naturalengland.org.uk

A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A176 *Larus melanocephalus*; Mediterranean gull (Breeding)
A192 *Sterna dougallii*; Roseate tern (Breeding)
Waterbird assemblage

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the The Wash and North Norfolk Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Northumbria Coast SPA

NATURAL ENGLAND

European Site Conservation Objectives for Northumbria Coast Special Protection Area Site Code: UK9006131

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A148 *Calidris maritima*; Purple sandpiper (Non-breeding)

A169 *Arenaria interpres*; Ruddy turnstone (Non-breeding)

A195 *Sterna albifrons*; Little tern (Breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Northumbaria Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Noss SPA

Conservation Objectives for Noss
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Fulmar (*Fulmarus glacialis*)*
- Gannet (*Morus bassanus*)
- Great skua (*Catharacta skua*)
- Guillemot (*Uria aalge*)
- Kittiwake (*Rissa tridactyla*)*
- Puffin (*Fratercula arctica*)*

- Seabird assemblage

* indicates assemblage qualifier only

1

Orkney Mainland Moors SPA

Conservation Objectives for Orkney Mainland Moors
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Hen harrier (*Circus cyaneus)*
- Red-throated diver (*Gavia stellata)*
- Short-eared owl (*Asio flammeus)*

1

Papa Stour SPA

Conservation Objectives for Papa Stour
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic tern (*Sterna paradisaea)*
- Ringed plover (*Charadrius hiaticula*)

The site overlaps with Papa Stour Special Area of Conservation

1

Papa Westray (North Hill and Holm) SPA

Conservation Objectives for Papa Westray
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic skua (*Stercorarius parasiticus*)
- Arctic tern (*Sterna paradisaea*)

1

Pentland Firth Island SPA

Conservation Objectives for Pentland Firth Islands
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic tern (*Sterna paradisaea*)

1

Ronas Hill – North Roe and Tingon SPA

Conservation Objectives for Ronas Hill - North Roe and Tingon Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Great skua (*Catharacta skua*)
- Merlin (*Falco columbarius*)
- Red-throated diver (*Gavia stellata*)

The site overlaps with Ronas Hill – North Roe Special Area of Conservation and Tingon Special Area of Conservation

1

Rousay SPA

Conservation Objectives for Rousay Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Arctic skua (*Stercorarius parasiticus*)*
- Arctic tern (*Sterna paradisaea*)
- Fulmar (*Fulmarus glacialis*)*
- Guillemot (*Uria aalge*)*
- Kittiwake (*Rissa tridactyla*)*

- Seabird assemblage

* indicates assemblage qualifier only

1

St Abb's Head to Fast Castle SPA

Conservation Objectives for St Abb's Head to Fast Castle Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Guillemot (*Uria aalge*)*
- Herring gull (*Larus argentatus*)*
- Kittiwake (*Rissa tridactyla*)*
- Razorbill (*Alca torda*)*
- Shag (*Phalacrocorax aristotelis*)*

- Seabird assemblage

* indicates assemblage qualifier only

The site overlaps with Berwickshire and North Northumberland Coast Special Area of Conservation and St Abb's Head to Fast Castle Special Area of Conservation

1

Stour and Orwell Estuaries SPA

NATURAL ENGLAND

European Site Conservation Objectives for Stour and Orwell Estuaries Special Protection Area Site Code: UK9009121

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A054 *Anas acuta*; Northern pintail (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A169 *Arenaria interpres*; Ruddy turnstone (Non-breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Stour and Orwell Estuaries European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Sumburgh Head SPA

Conservation Objectives for Sumburgh Head
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic tern (*Sterna paradisaea*)
- Fulmar (*Fulmarus glacialis*)*
- Guillemot (*Uria aalge*)*
- Kittiwake (*Rissa tridactyla*)*

- Seabird assemblage

* indicates assemblage qualifier only

1

NATURAL ENGLAND

European Site Conservation Objectives for
Teesmouth and Cleveland Coast Special Protection Area
Site Code: UK9006061

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A143 *Calidris canutus*; Red knot (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A191 *Sterna sandvicensis*; Sandwich tern (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Teesmouth and Cleveland Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at:
http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features Identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Thames Estuary and Marshes SPA

7/1/13 Thames Estuary and Marshes Conservation Objectives > Environment

PORT OF LONDON AUTHORITY

Contact us | Sitemap | Help | Search the PLA

Home | About Us | Safety | Port Trade | Environment | News | Leisure | Travel | Events | History

You are here > Environment > Thames Estuary and Marshes Conservation Objectives   Print this page

Thames Estuary and Marshes Conservation Objectives

The conservation objectives for the site are detailed in the Regulation 33 advice for the Thames Estuary and Marshes Marine Site 2001. The conservation objectives for the nationally and internationally important populations of the regularly occurring migratory species are:

Subject to natural change, maintain in favourable condition the habitats for the internationally important population of the regularly occurring Annex 1 bird species, under the Birds Directive, in particular:

- Saltmarsh;
- Intertidal Mudflats; and
- Intertidal shingle.

And;

Subject to natural change, maintain in favourable condition the habitats for the internationally important assemblage of waterfowl, under the Birds Directive, in particular:

- Saltmarsh;
- Intertidal Mudflats; and
- Intertidal shingle.

Numbers of bird species using these habitats within the Benfleet and Southend Marshes SPA are shown below (average peak counts for the five year period 1986/87 to 1990/91).

Internationally important populations of regularly occurring Annex 1 species	
Species	Population (5yr Peak mean)
Avocet	283 birds (28.3% Great Britain)
Internationally important populations of regularly occurring migratory species	
Species	Population (5yr Peak mean)
Ringed Plover	1,324 birds (2.6% Europe/North Africa)
Grey Plover	2,593 birds (1.7% Eastern Atlantic)
Dunlin	29,646 birds (2.1% Northern Siberia;/Europe/West Africa)
Knot	4,848 birds (1.4% North West Europe)
Black-tailed Godwit	1,699 birds (2.4% Iceland)
Redshank	3,251 birds (2.2% Eastern Atlantic)
An internationally important assemblage of waterfowl	
Importance	Population (5yr Peak mean)
Thames Estuary supports large populations of wintering waterfowl	75,019 individual birds
Nationally important bird populations within internationally important assemblages of waterfowl	
Species	Shelduck (*Tadorna tadorna*), Teal (*Anas crecca*) and Pintail (*Anas acuta*).

The Regulation 33 advice provides favourable condition tables for the Thames Estuary and Marshes European Marine Sites. The relevant favourable condition targets for the Thames Estuary and Marshes SPA are presented below.

Favourable Condition Table for the Thames Estuary European Marine Site

Feature	Sub-Feature	Attribute	Measure	Target	Comments
Internationally important populations of	All sub-features	Disturbance in feeding and roosting areas	Reduction or displacement of wintering birds,	No significant reduction in numbers or	Significant disturbance attributable to human activities can result in

https://www.pla.co.uk/display_fixedpage.cfm/id/2508/site/environment 1/4

7/1/13 Thames Estuary and Marshes Conservation Objectives > Environment

regularly occurring Annex 1 bird species (Avocet)			measured periodically (frequency to be determined).	displacement of wintering birds attributable to disturbance, subject to natural change.	reduced food intake and/or increased energy expenditure. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstructions to view lines	Openness of terrain unrestricted by obstructions, measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines, subject to natural change.	Avocet ideally require unrestricted views >200 m to allow early detection of predators when feeding and roosting.
	Intertidal mudflats	Extent and distribution of habitat	Area (ha) measured once per reporting cycle.	No decrease in extent form an established baseline (established during first reporting cycle), subject to natural change.	Intertidal sediment and their communities provide both habitat and feeding area for the Annex 1 bird populations.
		Food availability	Diversity and abundance of fish and intertidal invertebrates including e.g. *Gammarus*, *Corophium*, flies, beetles, *Nereis*, *Hydrobia*, *Cardium*, gobies. Measured periodically. Frequency to be determined	Diversity and abundance of prey species should not deviate significantly from the established baseline (established during first reporting cycle), subject to natural change.	Marine insects, crustaceans, mollusc
Internationally important populations of regularly occurring Annex 1 bird species (Avocet)	Saltmarsh	Extent and distribution of habitat	Area (ha) measured once per reporting cycle.	No decrease in extent from an established baseline (established during first reporting cycle), subject to natural change.	Saltmarsh provides roosting areas, and shallow water within saltings may be used for feeding.
		Vegetation characters	Open, short vegetation or bare ground predominating (roosting), measured periodically (frequency to be determined).	Vegetation height throughout areas used for roosting should not deviate significantly from an established baseline (established during first reporting cycle), subject to natural change.	Vegetation of <10 cm is required throughout areas used by roosting avocet.
Internationally important assemblage including internationally and nationally important populations of migratory species	All sub-features	Disturbance in feeding and roosting areas	Reduction or displacement of wintering birds, measure periodically(frequency to be determined)	No significant reduction in numbers or displacement of wintering birds attributable to disturbance, subject to natural change.	Significant disturbance attributable to human activities can result in reduced food intake and/or increased energy expenditure. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstructions to	Openness of terrain unrestricted by	No increase in obstructions to	Some waders require unrestricted views >200

https://www.pla.co.uk/display_fixedpage.cfm/id/2508/site/environment 2/4

		view lines	obstructions, measured periodically (frequency to be determined	existing bird view lines, subject to natural change	m to allow early detection of predators when feeding and roosting.
Internationally important assemblage including internationally and nationally important populations of migratory species	Intertidal mudflats	Extent and distribution of habitat	Area (ha) measured once per reporting cycle	No decrease in extent form an established baseline (established during first reporting cycle), subject to natural change.	Intertidal mudflats and their communities provide both roosting and feeding areas for the migratory species of birds.
		Food availability	Diversity and abundance of intertidal invertebrates. Measured periodically (frequency to be determined)	Diversity and abundance of prey species should not deviate significantly from the established baseline (established during first reporting cycle), subject to natural change.	Marine insects, crustaceans, molluscs and worms are important food sources for the migratory species of birds: *Gammarus* and *Posidium* for ringed plover. *Nerais, Arinicola* and *Notomastus* for grey plover. *Nereis, Macoma, Hydrobia, Crangon* and *Carcinus* for dunlin. *Macoma, Mytilus/Cerastoderma* spat and *Hydrobia* for knot. *Macoma, Cardium* and *Nereis* for black-tailed godwit. *Hydrobia, Macoma, Corophium* and *Hydrobia* for shelduck. *Hydrobia* for teal and pintail.
	Saltmarsh	Extent and distribution of habitat	Area (ha) measured once per reporting cycle	No decrease in extent form an established baseline (established during first reporting cycle), subject to natural change.	Water fowl feed and roost within the saltmarsh areas of the Thames Estuary European marine site.
Internationally important assemblage including internationally and nationally important populations of migratory species	Saltmarsh	Food availability	Presence and abundance of soft leaved and seed bearing plants. Measured periodically (frequency to be determined.	Presence and abundance of food species should not deviate from an established baseline (established during first reporting cycle), subject to natural change.	*Salicornia* and Atriplex are important for teal.
		Vegetation characteristics	Open, short vegetation or bare ground predominating (roosting), measured periodically (frequency to be determined).	Vegetation height throughout areas used for roosting should not deviate significantly from an established baseline (established during first reporting cycle), subject to natural change.	Vegetation of <10 cm is required throughout areas used by roosting waders.
	Intertidal shingle/ cobble beach	Extent and distribution of habitat	Area (ha) measured once per reporting cycle	No decrease in extent form an established baseline (established during first reporting cycle), subject	Areas of intertidal shingle/cobble beach provide high tide roots for the migratory species of waterfowl which use the Thames Estuary European marine site.

				to natural change.	

Back to Thames Estuary and Marshes SPA and Ramsar site

NATURAL ENGLAND

European Site Conservation Objectives for Thanet Coast and Sandwich Bay Special Protection Area Site Code: UK9012071

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A140 *Pluvialis apricaria*; European golden plover (Non-breeding)

A169 *Arenaria interpres*; Ruddy turnstone (Non-breeding)

A195 *Sterna albifrons*; Little tern (Breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the North East Kent European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

The Swale SPA

NATURAL ENGLAND

European Site Conservation Objectives for The Swale Special Protection Area Site Code: UK9012011

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
Breeding bird assemblage
Waterbird assemblage

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A054 *Anas acuta;* Northern pintail (Non-breeding)
A056 *Anas clypeata*; Northern shoveler (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A176 *Larus melanocephalus*; Mediterranean gull (Breeding)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the Swale & Medway European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features Identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

The Wash SPA

NATURAL ENGLAND

European Site Conservation Objectives for The Wash Special Protection Area Site Code: UK9008021

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
A040 *Anser brachyrhynchus*; Pink-footed goose (Non-breeding)
A046a *Branta bernicla bernicla*; Dark-bellied brent goose (Non-breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A051 *Anas strepera*; Gadwall (Non-breeding)
A054 *Anas acuta*; Northern pintail (Non-breeding)
A065 *Melanitta nigra*; Black (common) scoter (Non-breeding)
A067 *Bucephala clangula*; Common goldeneye (Non-breeding)
A130 *Haematopus ostralegus*; Eurasian oystercatcher (Non-breeding)
A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A144 *Calidris alba*; Sanderling (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A160 *Numenius arquata*; Eurasian curlew (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A169 *Arenaria interpres*; Ruddy turnstone (Non-breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

www.naturalengland.org.uk

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A038 *Cygnus cygnus*; Whooper swan (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)

www.naturalengland.org.uk

West Westray SPA

This is a European Marine Site

This site is a part of the The Wash and North Norfolk Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Conservation Objectives for West Westray
Special Protection Area

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species:

- Arctic skua (*Stercorarius parasiticus*)*
- Arctic tern (*Sterna paradisaea*)
- Fulmar (*Fulmarus glacialis*) *
- Guillemot (*Uria aalge*)
- Kittiwake (*Rissa tridactyla*)*
- Razorbill (*Alca torda*)*

- Seabird assemblage

* indicates assemblage qualifier only

1

Moray Firth SAC

The conservation objectives for the Moray Firth marine SAC are as follows:

To avoid deterioration of the habitats of the qualifying species (**Bottlenose dolphin *Tursiops truncatus***) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.
To ensure for the qualifying species that the following are established then maintained in the long term:
• Population of the species as a viable component of the site
• Distribution of the species within the site
• Distribution and extent of habitats supporting the species
• Structure, function and supporting processes of habitats supporting the species
• No significant disturbance of the species

To avoid deterioration of the qualifying habitat (**Sandbanks which are slightly covered by sea water all the time**) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.
To ensure for the qualifying habitat that the following are maintained in the long term:
• Extent of the habitat on site
• Distribution of the habitat within site
• Structure and function of the habitat
• Processes supporting the habitat
• Distribution of typical species of the habitat
• Viability of typical species as components of the habitat
• No significant disturbance of typical species of the habitat

Firth of Tay and Eden Estuary SAC

Conservation Objectives for
Firth of Tay & Eden Estuary Special Area of Conservation

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- **Distribution of the species within site**
- **Distribution and extent of habitats supporting the species**
- **Structure, function and supporting processes of habitats supporting the species**
- **No significant disturbance of the species**

Qualifying Species:

- Common seal

The site overlaps with Firth of Tay & Eden Estuary Special Protection Area

Conservation Objectives for
Firth of Tay & Eden Estuary Special Area of Conservation

To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying habitats that the following are maintained in the long term:

- Extent of the habitat on site
- Distribution of the habitat within site
- Structure and function of the habitat
- Processes supporting the habitat
- Distribution of typical species of the habitat
- Viability of typical species as components of the habitat
- No significant disturbance of typical species of the habitat

Qualifying Habitats:

- Estuaries
- Intertidal mudflats and sandflats
- Subtidal sandbanks

NB The conservation objectives for the qualifying species are on the next page

1

Berwickshire and North Northumberland Coast SAC

NATURAL ENGLAND

European Site Conservation Objectives for
Berwickshire and North Northumberland Coast Special Area of Conservation
Site code: UK0017072

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats
H1160. Large shallow inlets and bays; Shallow inlets and bays
H1170. Reefs
H8330. Submerged or partially submerged sea caves; Sea caves
S1364. *Halichoerus grypus*; Grey seal

www.naturalengland.org.uk

This is a cross border site

This site crosses the border between England and Scotland. Some features may only occur in one Country.

This is a European Marine Site

This site is a part of the Berwickshire & North Northumberland Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Humber Estuary SAC

NATURAL ENGLAND

European Site Conservation Objectives for Humber Estuary Special Protection Area Site Code: UK9006111

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A021 *Botaurus stellaris*; Great bittern (Non-breeding)
A021 *Botaurus stellaris*; Great bittern (Breeding)
A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
A143 *Calidris canutus*; Red knot (Non-breeding)
A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)
A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
A162 *Tringa totanus*; Common redshank (Non-breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Waterbird assemblage

www.naturalengland.org.uk

Flamborough Head SAC

This is a European Marine Site

This site is a part of the Humber Estuary European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

NATURAL ENGLAND

European Site Conservation Objectives for Flamborough Head Special Area of Conservation
Site code: UK0013036

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H1170. Reefs

H1230. Vegetated sea cliffs of the Atlantic and Baltic coasts

H8330. Submerged or partially submerged sea caves

www.naturalengland.org.uk

Doggerbank SAC

This is a European Marine Site

This site is a part of the Flamborough Head European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

1.3. Dogger Bank SAC Conservation Objectives

The Conservation Objectives for the Dogger Bank SAC interest features are provided below. These are high-level objectives for site features, and JNCC may refine them in future as our understanding of the features improves. They should be read in the context of (and in conjunction with) other advice given, particularly the site Selection Assessment Document which provides more-detailed information about the site and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles.

Within the objectives below superscript letters refer to explanatory text provided subsequently in section 1.4.

The Conservation Objectives for the Dogger Bank Sandbanks which are slightly covered by seawater all the time are:

> Subject to natural change, restore[a] the sandbanks to favourable condition,
>
> such that: The natural environmental quality[b] is restored;
>
> The natural environmental processes[c] and the extent[d] are maintained;
>
> The physical structure[e], diversity[f], community structure[g] and typical species[h], representative of **sandbanks which are slightly covered by seawater all the time**, in the Southern North Sea, are restored.

Due to the activities of demersal fishing and the oil and gas infrastructure development in the area, and the known associated damage to the seabed, the Annex I feature may not be in favourable condition and might require restoration where possible.

The feature's vulnerability to human pressure is further documented in section 2.5. However there is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. As such, it is not possible to ascertain precisely the degree to which the feature has been damaged, and the extent to which restoration might be required. As outlined in section 1.5 below, further information will be required to assess and monitor favourable condition of the sandbank feature at this offshore SAC. The conservation objective for the site may be revised at a later date should new information become available.
information become available.

1.4. Explanation of terms used in the conservation objectives

a) Maintain or restore

Maintain implies that, based on our existing understanding, the feature is regarded as being in favourable condition and will, subject to natural change, remain in this condition at designation.

Restore implies that the feature is likely to have been degraded to some degree. In the absence of direct evidence of damage or deterioration, where activities associated with pressures to which the feature is sensitive overlap the feature, they may need to be managed to reduce or eliminate potential negative impact(s). The first step for a restore objective may be to seek new information on the current condition of the site feature and/or more-detailed information on the potential overlap of activities with the feature(s) at the site. Restoration in the marine environment generally refers to natural recovery to favourable condition through the reduction or removal of adverse impacts.

JNCC considers that maintenance or restoration of the following parameters (b - h) will take account of the maintenance or restoration of natural structures and functions and ecological processes.

b) **Natural environmental quality** e.g. chemical quality parameters of water, suspended sediment levels, radionuclide levels etc. should not deviate from baseline levels at designation (if data is available) or from reference conditions.

c) **Natural environmental processes** e.g. circulation, sediment deposition and erosion etc. should not deviate from baseline levels at designation (if data is available) or from reference conditions.

d) **Extent** - the area covered by the habitat and communities.

e) **Physical structure** - the shape, form and composition of the habitat and its substrata.

f) **Diversity** - the number of different biological communities or number of species within a given community.

g) **Community structure** - e.g. age classes, sex ratios, distribution of species, abundance, biomass, reproductive capacity, recruitment, range and mobility.

h) **Typical species** – see Appendix III for draft criteria for identifying typical species.

1.5. Favourable condition

The Conservation objectives for inshore English SACs have been provided in association with a 'Favourable Condition' table, which outlines how to recognise favourable condition for the interest features in question. However, understanding the functioning and condition of complex and dynamic offshore marine sites, which experience a variety of pressures resulting from historical and present-day activities, is difficult. For offshore sites, there is currently insufficiently detailed information on i) the existing condition of qualifying interest features and ii) the preferred or target condition of interest features. This limits the identification of measures and associated targets for condition monitoring. It is anticipated that further information on the condition of interest features will be obtained through baseline surveys and monitoring.
surveys and monitoring.

The Wash and North Norfolk Coast SAC

NATURAL ENGLAND

European Site Conservation Objectives for
The Wash and North Norfolk Coast Special Area of Conservation
Site code: UK0017075

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks

H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats

H1150. Coastal lagoons*

H1160. Large shallow inlets and bays

H1170. Reefs

H1310. *Salicornia* and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand

H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

H1420. Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*); Mediterranean saltmarsh scrub

S1355. *Lutra lutra*; Otter

S1365. *Phoca vitulina*; Common seal

* denotes a priority natural habitat or species (supporting explanatory text on following page)

www.naturalengland.org.uk

This is a European Marine Site

This site is a part of the The Wash and North Norfolk Coast European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at enquiries@naturalengland.org.uk, or by phone on 0845 600 3078, or visit the Natural England website at: http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx

*** Priority natural habitats or species**

Some of the natural habitats and species listed in the Habitats Directive and for which SACs have been selected are considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Directive and the Habitats Regulations. These priority natural habitats and species are denoted by an asterisk (*) in Annex I and II of the Directive. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Directive or the Habitats Regulations.

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

River Derwent SAC

NATURAL ENGLAND

European Site Conservation Objectives for River Derwent Special Area of Conservation Site code: UK0030253

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Rivers with floating vegetation often dominated by water-crowfoot

S1095. *Petromyzon marinus*; Sea lamprey

S1099. *Lampetra fluviatilis*; River lamprey

S1163. *Cottus gobio*; Bullhead

S1355. *Lutra lutra*; Otter

www.naturalengland.org.uk

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

www.naturalengland.org.uk

Haisborough, Hammond and Winterton SAC/SCI

I.1 This advice is based on information on the SAC presented in Natural England (NE)/Joint Nature Conservation Committee's (JNCC) Haisborough, Hammond and Winterton: SAC Selection Assessment" (v 6.0 August 2010). These Conservation Objectives and Advice on Operations are site- and feature-specific, and have been developed using best available scientific information and expert interpretation as at March 2013. The advice is generated through a broad grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure scores have been combined to give a measure of the vulnerability of an interest feature to operations that may cause damage or deterioration, and which may therefore require management action.

I.2 The Conservation Objective for the Haisborough, Hammond and Winterton cSAC is to maintain the Annex I Sandbanks which are slightly covered by seawater all the time in Favourable Condition, and maintain or restore the Annex I reefs in Favourable Condition.

The exact impact of any operation will be dependent upon the nature, scale, location and timing of events. This advice on operations for the Haisborough, Hammond and Winterton site will be kept under review and will be periodically updated to reflect new evidence that suggests changes in condition or changes in sensitivity and exposure.

I.3 Management actions should enable the submarine structures made by leaking gases to achieve favourable condition. This will require assessment and management of human activities likely to affect the feature adversely, and of activities likely to impact natural environmental quality and environmental processes upon which the features are dependent.

I.4 There is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. Further information will be required to assess and monitor favourable condition of Annex I habitat Sandbanks which are slightly covered by seawater all the time and Annex I habitat Reefs at this offshore SAC.

I.5 The Haisborough, Hammond and Winterton sandbank and reef features are currently vulnerable to:

- Physical loss by removal (aggregate dredging) and obstruction (oil, gas and wind farm infrastructure) (moderate level –sandbank; high level-reef); and
- Physical damage by surface and shallow abrasion (demersal fishing, aggregate dredging) (moderate level – sandbank, high level-reef).

I.6 Therefore to fulfil the conservation objectives for these Annex I features, the Competent Authorities for this area are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of the site's features from the pressures outlined above.

I.7 As demersal fishing is not subject to prior authorisation or licensing, this pressure is currently considered to pose a high risk of damage to the sandbank and reef habitats.

I.8 The formal conservation objectives for Annex 1 Sandbanks which are slightly covered by seawater all the time:

- Subject to natural change maintain the sandbanks in favourable condition, in particular the sub-features:
  - Low diversity dynamic sand communities; and
  - Gravelly muddy sand communities.

I.9 The formal conservation objectives for Annex 1 Sabellaria spinulosa reefs:

- Subject to natural change maintain or restore the reefs in favourable condition.

North Norfolk Sandbanks and Saturn Reef SAC/SCI

I.10 This advice is based on information on the SAC presented in JNCC's 'North Norfolk Sandbanks and Saturn Reef: SAC Selection Assessment' (v5.0 August 2010). JNCC's Conservation Objectives and Advice on Operations is site- and feature-specific, and has been developed using best available scientific information and expert interpretation as at September 2012. The advice is generated through a broad grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure ratings have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which may therefore require management action.

I.11 The Conservation Objective for the North Norfolk Sandbanks and Saturn Reef Sandbank SAC is to restore the Annex I Sandbanks which are slightly covered by seawater all the time and Annex I Reef to Favourable Condition.

I.12 The exact impact of any operation will be dependent upon the nature, scale, location and timing of events. This Advice on Operations for the North Norfolk Sandbanks and Saturn Reef site will be kept under review and will be periodically updated to reflect new evidence that suggests changes in sensitivity and exposure and feature condition directly.

I.13 Management actions should enable the biological communities associated with the North Norfolk Sandbanks and Saturn Reef to achieve Favourable Condition. This will require assessment and management of human activities likely to affect the feature adversely, and of activities likely to impact natural environmental quality and environmental processes upon which the features are dependent.

I.14 There is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. JNCC are currently developing knowledge on pressures and their effects on features. This information will be used to assess and monitor favourable condition of Annex 1 Sandbanks which are slightly covered by seawater all the time and Annex I Reefs at this offshore SAC.

I.15 The North Norfolk Sandbanks and Saturn Reef are currently highly or moderately vulnerable to the following pressures (i.e. it is both sensitive to and exposed to the pressure). Therefore, to fulfil the conservation objectives for the Annex I sandbanks which are slightly covered by seawater all the time, and the Annex I reef the Competent Authorities for this area are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of this feature through any of the following:

- Physical Loss through obstruction (oil and gas industry infrastructure) at a high level, for the sandbanks feature and at an unknown level for the reef feature.

I.16 Within the North Norfolk Sandbanks and Saturn Reef SAC, the following offshore activities may result in damage to the interest feature. It is, therefore, currently considered to pose a moderate risk of damage to the interest feature:

- Oil and gas infrastructure.

I.17 Competent Authorities are advised to consider introducing management actions to further assess and, if necessary, to reduce the risk of damage to the feature from this activity.

I.18 Therefore to fulfil the conservation objectives for these Annex I features, the Competent Authorities for this area are advised to manage human activities within their remit such that they do not result in increased exposure to these pressures.

I.19 The Conservation Objectives for North Norfolk Sandbanks and Saturn Reef SAC sandbanks which are slightly covered by seawater all the time, and reef, are:

- Subject to natural change, restore the sandbanks which are slightly covered by seawater all the time and reefs to favourable condition, such that the:
  - The natural environmental quality, natural environmental processes and extent are maintained
  - The physical structure, diversity, community structure and typical species, representative of sandbanks which are slightly covered by seawater all the time and reefs in the Southern North Sea are restored.

Inner Dowsing, Race Bank and North Ridges SAC/SCI

I.20 This advice is based on information on the SAC presented in Natural England (NE)/Joint Nature Conservation Committee's (JNCC) Inner Dowsing, Race Bank and North Ridge: SAC Selection Assessment (v5.0 August 2010). These Conservation Objectives and Advice on Operations are site- and feature-specific, and have been developed using best available scientific information and expert interpretation as at October 2012. The advice is generated through a broad grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure ratings have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which may therefore require management action.

I.21 The Conservation Objective for the Inner Dowsing, Race Bank and North Ridge SAC is to maintain or restore the habitat Annex 1 Sandbanks which are slightly covered by seawater all the time in Favourable Condition, and the habitat Annex I reef in Favourable Condition.

I.22 The exact impact of any operation will be dependent upon the nature, scale, location and timing of events. This advice on operations for the Inner Dowsing, Race Bank and North Ridge site will be kept under review and will be periodically updated to reflect new evidence that suggests changes in condition or improves information on sensitivity and exposure.

I.23 Management actions should enable the biological communities associated with the Inner Dowsing, Race Bank and North Ridge to achieve Favourable Condition. This will require assessment and management of human activities likely to affect the feature adversely, and of activities likely to impact natural environmental quality and environmental processes upon which the features are dependent.

I.24 There is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. JNCC are currently developing knowledge on pressures and their effects on features. This information will be used to assess and monitor favourable condition of Annex 1 features at this offshore SAC.

I.25 The Inner Dowsing, Race Bank and North Ridge sandbank and reef features are currently vulnerable to:

- Physical loss by removal (aggregate dredging) and obstruction (oil, gas and wind farm infrastructure) (moderate level –sandbank; high level-reef); and
- Physical damage by surface and shallow abrasion (demersal fishing, aggregate dredging) (moderate level – sandbank, high level-reef).

I.26 Therefore to fulfil the conservation objectives for these Annex I features, the Competent Authorities for this area are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of the site's features from the pressures outlined above.

I.27 As demersal fishing is not subject to prior authorisation or licensing, this pressure is currently considered to pose a high risk of damage to the sandbank and reef habitats.

I.28 The formal conservation objectives for Annex 1 Sandbanks slightly covered by seawater all the time are:

- Subject to natural change, maintain or restore the sandbanks in favourable condition, in particular the sub-features:
  - Gravelly muddy sand communities; and
  - Dynamic sand communities.

I.29 The formal conservation objectives for Annex 1 Sabellaria spinulosa reefs area:

- Subject to natural change, maintain or restore the reefs in favourable condition.

Liability

This report has been prepared by Niras, with all reasonable skill, care and diligence within the terms of their contracts with SMart Wind Ltd or their subcontractor to Niras placed under Niras' contract with SMart Wind Ltd as the case may be.

Document release and authorisation record					
Version	**Date**	**Description**	**Prepared**	**Checked**	**Approved**
V1	20/06/13	Draft	Robin Ward Ian Ellis	Robin Ward	Robin Ward
V2	10/07/13	Final	Robin Ward	Robin Ward	Robin Ward

Table of Contents

Table of Tables

Collision risk and displacement mortality for gannet and kittiwake populations within foraging range as a proportion of Potential Biological Removal (PBR)

Introduction

Background

J.1 The assessment of the significance of predicted mortality rates from collision and displacement has been made in light of the Potential Biological Removal (PBR) approach proposed by Watts (2010). This note provides clarification on the Hornsea Project One offshore wind farm ("the Project") ornithological impact assessment, particularly with respect to information used to determine whether impacts arising from predicted mortality rates from collision and displacement were significant for affected populations.

J.2 This note summarises determination of PBR for gannet and kittiwake populations at an SPA and regional level for which the study area of the Project lies within foraging range. The outcome is used to describe the predicted mortality rates from collisions and displacement that can be apportioned to a colony or regional population, as a proportion of the PBR.

Methods: Potential Biological Removal

J.3 PBR provides a means of estimating the number of additional mortalities that a given population can sustain. Wade (1998) and others have defined a simple formula for PBR:

$$PBR = \frac{1}{2} r_{max} N_{min} f$$

Where:

r_{max} is the maximum annual recruitment rate

N_{min} is a conservative estimate of the population size

f is a “recovery factor” applied to depleted populations where the management goal may be to facilitate growth back to a target population size

J.4 Wade (1998) showed that PBR can be used to identify sustainable harvest rates that would maintain populations at, or above, maximum net productivity level (MNPL or maximum sustained yield). Based on a generalised logistic model of population growth and assuming that the density dependency in the population growth is linear (θ = 1.0) then MNPL is equivalent to 0.5K (where K is the notional carrying capacity) and the net recruitment rate at MNPL (RMNPL) is 0.5 r_{max}.

J.5 Wade (1998) also showed that PBR is conservative for populations with θ > 1.0 (i.e. a convex density-dependent growth curve) where RMNPL will be > 0.5 r_{max} (see Figure 1 in Wade 1998).

J.6 Estimating r_{max}The maximum annual recruitment rate (r_{max}) is equivalent to λ_{max} – 1, therefore:

$$r_{max} = \lambda_{max} - 1$$

Where:

λ_{max} is the maximum discrete rate of population growth.

J.7 Niel & Lebreton (2005) show two methods for calculating λ_{max}:

A quadratic solution (equation 15 of Niel & Lebreton 2005) also used by Watts (2010):

$$\lambda_{max} \approx \frac{(s\alpha - s + \alpha + 1) + \sqrt{(s - s\alpha - \alpha - 1)^2 - 4s\alpha^2}}{2a}$$

And a relationship based on mean optimal generation length (equation 17 of Niel & Lebreton 2005):

$$\lambda_{max} = exp\left[\left(\alpha + \frac{s}{\lambda_{max} - s}\right)^{-1}\right]$$

Where:

s is annual adult survival

α is age of first breeding

J.8 Niel & Lebreton (2005) suggest that the second method is most suitable for short-lived species. A comparison of the results of both methods indicated that the first generated slightly more precautionary PBRs for the relatively long-lived species considered in this note. Consequently λ_{max} has been estimated using the first method for all species below.

Estimating N_{min}

J.9 N_{min} is a conservative estimate of the population size. Where the population is not known or there are different estimates of its size Wade (1998) suggests using the lower bound of a 60% confidence interval. Dillingham & Fletcher (2008) provide further methods for approximating N_{min} in circumstances where there is uncertainty about the population size.

J.10 The N_{min} value used should recognise uncertainty around the population estimates used, including colony counts where there will be "measurement error" i.e. error in accurately counting birds present. This concurs with SNCB's advice that, in the absence of specific data, applying a reduction due to error to the population count is appropriate (NE & JNCC *in litt*.). Therefore the PBR has been calculated with a conservative estimate of the population size (N_{min}) rather than a site count (N), whether it be a single count or latest 4 year mean. Following the guidance of Wade (1998) to which SNCB advice concurs (NE & JNCC *in litt*.); the lower bound of a 60% confidence interval is used for N_{min}. This is calculated as following Dillingham & Fletcher (2008) using the equation:

$$N_{min} = \hat{N}e^{(Z_p CV_{\hat{N}})}$$

Where:

$\hat{N}$ is the population estimate e.g. single count or mean count for several years

$CV_{\hat{N}}$ is the estimated coefficient of variation for $\hat{N}$

Z_p is the *p*th standard normal variate, in this case

J.11 For the percentile $N_{0.2}$, the lower bound of a 60% confidence interval, p = 0.2, and Z_p~-0.842. In practice, percentile estimates (N_p) are based on an estimated coefficient of variation ($CV_{\hat{N}}$) which following SNCB guidance (from JNCC seabird experts, Natural England *in litt.*) is set at 10% as a suitable estimate of CV (i.e. $CV_{\hat{N}}$ = 0.1). Given these assumptions the revised equation for calculating N_{min} for the purposes of current analysis is*:*

$$N_{0.2} = \hat{N}e^{(-0.842 \text{ x } 0.1)}$$

<u>Selecting *f*</u>

J.12 The recovery factor *f* is an arbitrary value set between 0.1 and 1.0 and its purpose is to increase conservatism in the calculation of PBR or to identify a value for PBR that is intended to achieve a specific outcome for nature conservation (e.g. population recovery).

J.13 Dillingham & Fletcher (2008) link the value of *f* to conservation status and (following IUCN status criteria) suggest that *f* = 0.1 is adopted for 'threatened' species; *f* = 0.3 for 'near threatened' species and *f* = 0.5 for species of 'least concern'. They further argue that a value of *f* = 1.0 may be suitable for species of 'least concern' that are known to be increasing or stable.

J.14 A similar scheme could be used for individual populations and their status in relation to specific conservation objectives.

<u>Sensitivity of the PBR estimate</u>

J.15 Dillingham & Fletcher (2008) discuss the sensitivity of the PBR estimate in relation to variability in survival rates and age of first breeding. It is generally the case that survival estimates are derived in non-optimal conditions or estimates have not been adjusted for possible emigration from the study area. When so, consideration of the impact of changes in different survival estimates on the PBR by Dillingham & Fletcher (2008) has led to the recommendation that conservative (i.e. high) survival estimates should be used to avoid over-estimation of λ_{max} and PBR. As such, it is not considered inappropriate to use the survival estimates as published by Robinson (2005) in the current analysis. For kittiwake however, the annual adult survival rate derived by Trinder (2013) for this Project when conducting a Population Variability Analysis on the Flamborough Head and Bempton Cliffs SPA population, is used.

J.16 For seabirds with delayed fecundity and high survival, Dillingham & Fletcher (2008) stated changes in α lead to only small changes in λ_{max}. Fecundity and age-specific breeding success of seabirds increases in the initial two or three years of breeding. Mid-point values for α are usually appropriate, while high values lead to conservative estimates of λ_{max} and PBR (Dillingham & Fletcher 2008). The current analysis uses the typical age of first breeding (α) as published by Robinson (2005).

Predicted Mortality Rates from Collisions and Displacement

J.17 The Environmental Statement (Volume 2, Chapter 5: Ornithology contains the predicted annual collision risks for the Project and apportioned to colonies. Likewise, the predicted annual mortality rates arising from displacement by the Project and apportioned to colonies are also contained within the Environmental Statement (Volume 2, Chapter 5) alongside further information on the approach to displacement modelling, collision risk modelling and the apportioning of the mortalities to individual colonies.

Population data and trends

Population data used

J.18 For gannet and kittiwake, Flamborough Head and Bempton Cliffs is the only the SPA where the species qualify as breeding features and the site is within foraging range of the Project. This is based on the maximum foraging range (Thaxter *et al.,* 2012) for kittiwake. For gannet, the evidence suggests that breeding birds from other colonies are unlikely to reach the Project (Wakefield *et al.,* 2013). Mean maximum foraging range is used for gannet (229.4 km, Thaxter *et al.,* 2012). The estimated sizes of the species breeding population at this SPA used in the analysis were taken from revised citations as recommended by Natural England (Table J.1). Flamborough Head and Bempton Cliffs SPA includes for both species all breeding colonies within foraging range of the Project. The population estimates used for Flamborough Head and Bempton Cliffs SPA were derived for kittiwake from four-years of count data (2008-2011) and for gannet, a single count in 2011 (Natural England *in litt.*).

J.19 The UK breeding population estimate for gannet used in the analysis was taken from the latest national census carried out in 2004/05. For kittiwake, the UK breeding population estimate was from Seabird 2000, a census of the entire breeding seabird population of Britain and Ireland carried out between 1998-2002 (Mitchell *et al.,* 2004).

Population trends

J.20 The following section provides a brief narrative of recent population trends for the two species nationally and for the Flamborough Head and Bempton Cliffs SPA predicted to interact with the Project. This appraisal is later used as a guide in the selection of the recovery factor *f* for the individual species to be used in the PBR analysis.

Table J.1 Populations of SPA designate breeding species within foraging range of the Project (foraging range is calculated based on the distance between the site boundary and project boundary).

Species	Flamborough Head and Bempton Cliffs SPA		Regional population		UK population	
	Mean no. of individuals	Year(s) of count	Mean no. of individuals	Year(s) of count	No. of individuals	Years of census
Gannet	19,894	2011	19,894	2011	437,092	2004-2005
Kittiwake	89,040	2008-2011	89,040	2008-2011	757,694	1998-2002

J.21 The UK gannet population has steadily been increasing in the long–term with 113,000 pairs in 1969/70 and by the latest census in 2004/5, 218,000 apparently occupied nests (JNCC 2012). Those colonies monitored in the Britain and Ireland since the last census have continued to increase and this is true of the gannetry at Flamborough Head and Bempton Cliffs SPA. The SPA colony has been increasing steadily since its formation in the 1960s although in recent years the growth rate appears to have escalated. The gannetry almost trebled in size (281%) over the period 2004 to 2012 from 3,940 pairs (JNCC 2012) to 11,061 pairs (RSPB 2013).

J.22 The UK index of kittiwake abundance has declined rapidly since the early 1990s, such that by 2011 the index was just 44% of that in 1986, the lowest value in the 26 years of monitoring (JNCC 2012). Considering England alone however, the Seabird Monitoring Programme’s abundance index of kittiwake for this country has over the last decade shown relative stability although with some fluctuation (JNCC 2012). This latter stability has not been reflected in the Kittiwake breeding population of Flamborough Head and Bempton Cliffs SPA where a 47% decline has occurred between the last national census of 1998-2002 (Mitchell *et al.,* 2004) and revision of the SPA citation (counts from 2008-2011; Natural England *in litt.*). Information provided by Natural England is referred to in Volume 2, Chapter 5: Ornithology of the Environmental Statement and the Consultation Report.

Results

Selecting the recovery factor *f*

J.23 For Gannet, long term increases in population sizes at Flamborough Head and Bempton Cliffs SPA, regionally and nationally, would suggest that a high recovery factor is appropriate (see Section:

J.24 Population data and trends below). Indeed, population trends in gannet (Section:

J.25 Population data and trends) imply that a recovery factor of 1.0 may be biologically appropriate. However, SNCB advice for other projects analysing gannet PBR have comprised of recommendations for a more precautionary recovery factor. Considering the evidence underpinning the selection of recovery factors in this report, it is deemed appropriate that the analysis considers the implications of 0.5.

J.26 For kittiwake where the local and national population are in decline, a recovery factor of 0.2 has been considered appropriate for the PBR analysis. None of the SPA populations for this species are considered at this time to be threatened from extinction, which would be necessary to assign a value of 0.1.

Potential Biological Removal

J.27 Table J.2 presents the PBR results for the two species predicted to interact in terms of collisions, with the Project for a range of recovery factors. Highlighted is the recovery factor with its resultant value, considered in paragraphs J.23 and J.26 as most appropriate for a given species based upon recent population trends.

J.28 For gannet using the data for the Flamborough Head and Bempton Cliffs SPA from the revised citation at a recovery rate of 0.5, PBR was calculated as 452 birds. No other gannetry is within mean-maximum foraging range of the Project site. The calculated PBR value for the species regional population is therefore identical to that for the SPA alone.

J.29 For kittiwake using the data for the Flamborough Head and Bempton Cliffs SPA from the revised citation at a recovery rate of 0.2, PBR was calculated as 1,023 birds. No other colony is within maximum foraging range of the Project site. The calculated PBR value for the species regional population is therefore identical to that for the SPA alone.

Table J.2 PBR values for populations of gannet and kittiwake predicted to interact with the Project with respect to collision risks, when using an estimated population sizes (N_{min}) at the lower bound of the 60% confidence interval and with a 10% coefficient of variation.

Species	Reference population	Age of first breeding (α)[1]	Annual adult survival (s)[2]	Growth rate (λ_{max})	Pop^n count (N)	N_{min}[3]	f	PBR	Population size: 1. source of estimate used 2. trends since mid-1980s
Gannet (SPA-NE recommendation)	Flamborough Head and Bempton Cliffs SPA	5	0.919	1.09	19,894	18,288	0.1	90.5	Natural England recommendations. Steadily increasing size of breeding population at SPA and nationally.
							0.2	180.9	
							0.3	271.4	
							0.4	361.9	
							0.5	452.3	
							1.0	904.7	
Kittiwake (SPA-NE recommendation)	Flamborough Head and Bempton Cliffs SPA	4	0.9	1.125	89,040	81,850	0.1	511.6	Revised citation provided by Natural England (year of counts: 2008-2011). Size of breeding population declining at SPA[4] and nationally.
							0.2	1023.1	
							0.3	1534.7	
							0.4	2046.2	
							0.5	2557.8	
							1.0	5115.6	

[1] Taken from Robinson (2005)

[2] Taken from Robinson (2005) with the exception of kittiwake that is taken from Trinder (2013)

[3] The lower bound of a 60% confidence interval of N with a 10% Coefficient of Variation (see section J.43).

[4] Difference between Seabird 2000 and revised citation of SPA

Predicted mortality rates from collisions in terms of PBR

J.30 Table J.3 presents for the two species anticipated to interact with the Project, the predicted mortality rates from collisions that can be apportioned to a colony or regional population, as a proportion of the corresponding PBR. When a recovery factor appropriate to the population status of the species has been selected, providing the predicted mortality does not exceed 100% of the corresponding PBR, a sustainable harvest rate is predicted that would maintain the population at, or above, maximum net productivity level.

J.31 The population and collision risk data used in the current analysis have originated from earlier steps in the EIA process where the reasoning behind its use and calculation is explained. The presumption has been that the correct assumptions were made whilst following a precautionary approach. A precautionary approach has been taken in calculating PBR and as such the analytical steps and variables used additively provide an overly precautionary assessment of collision risk in terms of PBR. However, for gannet and kittiwake, neither are predicted to suffer mortality from collisions at the Project that is greater than 1.3% of the sustainable harvest rate for local and regional populations.

Predicted mortality rates from displacement in terms of PBR

J.32 Table J.4 presents for the two species anticipated to interact with the Project, the predicted mortality rates from displacement that can be apportioned to a colony or regional population, as a proportion of the corresponding PBR. When a recovery factor appropriate to the population status of the species has been selected, providing the predicted mortality does not exceed 100% of the corresponding PBR, a sustainable harvest rate is predicted that would maintain the population at, or above, maximum net productivity level.

J.33 The population and mortality data used in the current analysis have originated from earlier steps in the EIA process where the reasoning behind its use and calculation is explained. The presumption has been that the correct assumptions were made whilst following a precautionary approach. A precautionary approach has been taken in calculating PBR and as such the analytical steps and variables used additively provide an overly precautionary assessment of displacement in terms of PBR. However, for gannet and kittiwake, neither are predicted to suffer mortality from displacement at the Project that is greater than 0.8% of the sustainable harvest rate for local and regional populations.

Table J.3 Predicted breeding and non-breeding season collision mortality (adults per annum) and changes in background mortality for the proportion of the populations of gannet and kittiwake predicted to interact with Hornsea Offshore Wind Farm.

Species	Component population	No. of collisions at specified avoidance rate (%)		Effect on populations (%)				Data source: Collision rates 2. Population sizes
		Avoidance rate	No. of Collisions	Change in background mortality (UK population[5])[6]	Change in background mortality (population affected)[7]	*f*	% of PBR[8]	
Gannet	Flamborough Head and Bempton Cliffs SPA (breeding season collisions only)	99%	4	0.01%	0.25%	0.5	0.9%	1. Volume 2, Chapter 5: Ornithology 2. Natural England recommendations.
	Flamborough Head and Bempton Cliffs SPA (non-breeding season collisions only)	99%	**2**	<0.01%	0.12%	0.5	0. 4%	
Kittiwake	Flamborough Head and Bempton Cliffs SPA (breeding season collisions only)	98%	**13**	0.02%	0.15%	0.2	1.3%	1. Volume 2, Chapter 5: Ornithology 2. Revised citation provided by Natural England (year of counts: 2008-2011).
	Flamborough Head and Bempton Cliffs SPA (non-breeding season collisions only)	98%	**2**	<0.01%	0.02%	0.2	0.2%	

5 UK population (JNCC, 2012)

6 [(No. of collisions/annual mortality) x UK population] x 100, where annual mortality = 1 – annual adult survival (s)

7 [(No. of collisions/annual mortality) x population of affected population] x 100, where annual mortality = 1 – annual adult survival (s)

8 No. of mortalities/PBR x 100

Table J.4 Predicted annual displacement mortality (adults per annum) and changes in background mortality for populations of gannet and kittiwake predicted to interact with Hornsea Offshore Wind Farm.

Species	Component population	No. of mortalities of a specified no. displaced		Effect on populations (%)				Data source: 1. Mortality rates 2. Population sizes
		No. subject to displacement	No. of mortalities	Change in background mortality (UK population)[9]	Change in background mortality (population affected)[10]	*f*	% of PBR[11]	
Gannet	Flamborough Head and Bempton Cliffs SPA (breeding season mortality only)	341	**3**	0.01%	0.19%	0.5	0.7%	1. Volume 2, Chapter 5: Ornithology 2. Natural England recommendations (year of count: 2011).
	Flamborough Head and Bempton Cliffs SPA (non- breeding season mortality only)	338	**0**	0	0	0.5	0%	
Kittiwake	Flamborough Head and Bempton Cliffs SPA (breeding season mortality only)	1,897	**8**	0.01%	0.09%	0.2	0.8%	1. Volume 2, Chapter 5: Ornithology 2. Revised citation provided by Natural England (year of counts : 2008-2011).
	Flamborough Head and Bempton Cliffs SPA (non- breeding season mortality only)	20,272	**7**	0.01%	0.08%	0.2	0.7%	

9 [(No. of mortalities/annual mortality) x UK population] x 100, where annual mortality = 1 – annual adult survival (s)

10 [(No. of mortalities/annual mortality) x population of affected population] x 100, where annual mortality = 1 – annual adult survival (s)

11 No. of mortalities/PBR x 100

Displacement mortality for populations of three auk species within foraging range as a proportion of Potential Biological Removal (PBR)

Introduction

Background

J.34 The assessment of the significance of predicted mortality rates from displacement has been made in light of the Potential Biological Removal (PBR) approach proposed by Watts (2010). This note provides clarification on the Hornsea Project One offshore wind farm ("the Project") ornithological impact assessment, particularly with respect to information used to determine whether impacts arising from predicted mortality rates from displacement were significant for affected populations.

J.35 This note summarises determination of PBR for guillemot, razorbill and puffin populations at an SPA and regional level for which the study area of the Project lies within foraging range. The outcome is used to describe the predicted mortality rates from displacement that can be apportioned to a colony or regional population, as a proportion of the PBR.

Methods: Potential Biological Removal

J.36 PBR provides a means of estimating the number of additional mortalities that a given population can sustain. Wade (1998) and others have defined a simple formula for PBR:

$$PBR = \frac{1}{2} r_{max} N_{min} f$$

Where:

r_{max} is the maximum annual recruitment rate

N_{min} is a conservative estimate of the population size

f is a "recovery factor" applied to depleted populations where the management goal may be to facilitate growth back to a target population size

J.37 Wade (1998) showed that PBR can be used to identify sustainable harvest rates that would maintain populations at, or above, maximum net productivity level (MNPL or maximum sustained yield). Based on a generalised logistic model of population growth and assuming that the density dependency in the population growth is linear (θ = 1.0) then MNPL is equivalent to 0.5K (where K is the notional carrying capacity) and the net recruitment rate at MNPL (RMNPL) is 0.5 r_{max}.

J.38 Wade (1998) also showed that PBR is conservative for populations with $\theta > 1.0$ (i.e. a convex density-dependent growth curve) where RMNPL will be > 0.5 r_{max} (see Figure 1 in Wade 1998).

Estimating r_{max}

J.39 The maximum annual recruitment rate (r_{max}) is equivalent to $\lambda_{max} - 1$, therefore:

$$r_{max} = \lambda_{max} - 1$$

Where: λ_{max} is the maximum discrete rate of population growth.

J.40 Niel & Lebreton (2005) show two methods for calculating λ_{max}:

A quadratic solution (equation 15 of Niel & Lebreton 2005) also used by Watts (2010):

$$\lambda_{max} \approx \frac{(s\alpha - s + \alpha + 1) + \sqrt{(s - s\alpha - \alpha - 1)^2 - 4s\alpha^2}}{2a}$$

And a relationship based on mean optimal generation length (equation 17 of Niel & Lebreton 2005):

$$\lambda_{max} = exp\left[\left(\alpha + \frac{s}{\lambda_{max} - s}\right)^{-1}\right]$$

Where:

s is annual adult survival

α is age of first breeding

J.41 Niel & Lebreton (2005) suggest that the second method is most suitable for short-lived species. A comparison of the results of both methods indicated that the first generated slightly more precautionary PBRs for the relatively long-lived species considered in this note. Consequently λ_{max} has been estimated using the first method for all species below.

Estimating N_{min}.

J.42 N_{min} is a conservative estimate of the population size. Where the population is not known or there are different estimates of its size Wade (1998) suggests using the lower bound of a 60% confidence interval. Dillingham & Fletcher (2008) provide further methods for approximating N_{min} in circumstances where there is uncertainty about the population size.

J.43 The N_{min} value used should recognise uncertainty around the population estimates used, including colony counts where there will be "measurement error" i.e. error in accurately counting birds present. This concurs with SNCB's advice that, in the absence of specific data, applying a reduction due to error to the population count is appropriate (NE & JNCC *in litt.*). Therefore the PBR has been calculated with a conservative estimate of the population size (N_{min}) rather than a site count (N), whether it be a single count or latest 4 year mean. Following the guidance of Wade (1998) to which SNCB advice concurs (NE & JNCC *in litt.*), the lower bound of a 60% confidence interval is used for N_{min}. This is calculated as following Dillingham & Fletcher (2008) using the equation:

$$N_{min} = \hat{N}e^{(Z_p CV_{\hat{N}})}$$

Where:

$\hat{N}$ is the population estimate e.g. single count or mean count for several years

$CV_{\hat{N}}$ is the estimated coefficient of variation for $\hat{N}$

Z_p is the *p*th standard normal variate, in this case

J.44 For the percentile $N_{0.2}$, the lower bound of a 60% confidence interval, p = 0.2, and $Z_p \sim -0.842$. In practice, percentile estimates (N_p) are based on an estimated coefficient of variation ($CV_{\hat{N}}$) which following SNCB guidance (from JNCC seabird experts, Natural England *in litt.*) is set at 10% as a suitable estimate of CV (i.e. $CV_{\hat{N}}$ = 0.1). Given these assumptions the revised equation for calculating N_{min} for the purposes of current analysis is:

$$N_{0.2} = \hat{N}e^{(-0.842 \text{ x } 0.1)}$$

Selecting *f*

J.45 The recovery factor *f* is an arbitrary value set between 0.1 and 1.0 and its purpose is to increase conservatism in the calculation of PBR or to identify a value for PBR that is intended to achieve a specific outcome for nature conservation (e.g. population recovery).

J.46 Dillingham & Fletcher (2008) link the value of *f* to conservation status and (following IUCN status criteria) suggest that *f* = 0.1 is adopted for 'threatened' species; *f* = 0.3 for 'near threatened' species and *f* = 0.5 for species of 'least concern'. They further argue that a value of *f* = 1.0 may be suitable for species of 'least concern' that are known to be increasing or stable.

J.47 A similar scheme could be used for individual populations and their status in relation to specific conservation objectives.

<u>Sensitivity of the PBR Estimate</u>

J.48 Dillingham & Fletcher (2008) discuss the sensitivity of the PBR estimate in relation to variability in survival rates and age of first breeding. It is generally the case that survival estimates are derived in non-optimal conditions or estimates have not been adjusted for possible emigration from the study area. When so, consideration of the impact of changes in different survival estimates on the PBR by Dillingham & Fletcher (2008) has led to the recommendation that conservative (i.e. high) survival estimates should be used to avoid over-estimation of λ_{max} and PBR. As such, it is not considered inappropriate to use the survival estimates as published by Robinson (2005) in the current analysis.

J.49 For seabirds with delayed fecundity and high survival, Dillingham & Fletcher (2008) stated changes in α lead to only small changes in λ_{max}. Fecundity and age-specific breeding success of seabirds increases in the initial two or three years of breeding. Mid-point values for α are usually appropriate, while high values lead to conservative estimates of λ_{max} and PBR (Dillingham & Fletcher 2008). The current analysis uses the typical age of first breeding (α) as published by Robinson (2005).

Predicted mortality rates from displacement

J.50 The Environmental Statement (Volume 2, Chapter 5: Ornithology) provided the predicted mortality rates arising from displacement by the Project and apportioned to colonies. Further information on the approach to displacement modelling and the apportioning of the mortalities to individual colonies are described in the Environmental Statement (Volume 2, Chapter 5: Ornithology).

Population data and trends

<u>Population data used</u>

J.51 For all three species (guillemot, razorbill and puffin), Flamborough Head and Bempton Cliffs is the only the SPA where the species qualify as breeding features and the site is within foraging range of the Project. This is based on the maximum foraging range (Thaxter *et al.,* 2012) for each species. The estimated sizes of the species breeding population at this SPA used in the analysis were taken from revised citations as recommended by Natural England (Table J.5). Flamborough Head and Bempton Cliffs SPA includes for all three species all breeding colonies within foraging range of the Project. The population estimates used for Flamborough Head and Bempton Cliffs SPA were derived from four-years of count data (2008-2011, Natural England *in litt.*).

J.52 For all three species, the UK breeding population estimate was from Seabird 2000, a census of the entire breeding seabird population of Britain and Ireland carried out between 1998-2002 (Mitchell *et al.,* 2004).

Population trends

J.53 The following section provides a brief narrative of recent population trends for the three auk species nationally and for the Flamborough Head and Bempton Cliffs SPA predicted to interact with the Project. This appraisal is later used as a guide in the selection of the recovery factor f for the individual species to be used in the PBR analysis.

Table J.5 Populations of SPA designate breeding species of auk within foraging range of the Project (foraging range is calculated based on the distance between the site boundary and project boundary)

Species	Flamborough Head and Bempton Cliffs SPA		Regional population		UK population	
	Mean no. of individuals	Year(s) of count	Mean no. of individuals	Year(s) of count	No. of individuals	Years of census
Guillemot	83,214	2008-2011	83,214	2008-2011	1,897,888	1998-2002
Razorbill	21,140	2008-2011	21,140	2008-2011	250,650	1998-2002
Puffin	980	2008-2011	980	2008-2011	1,161,428	1998-2002

J.54 The numbers of guillemots counted in attendance at the colonies of Bempton Cliffs (including Flamborough Head) increased by 43% between the two national censuses of 1985-86 and 1998-2002 (Mitchell *et al.,* 2004). This trend has continued with the colonies of Flamborough Head and Bempton Cliffs SPA having since increased by 40% up until 2008-2011. Following a period of stability in the UK breeding population of guillemot in the years immediately after 1986, a marked increase occurred between 1990-2001; a 83% increase in the UK population index (JNCC 2012). Thereafter there has been apparent stabilisation that may be a result of so-called 'density-dependent' effects (JNCC 2012).

J.55 Like guillemot, the UK abundance index for razorbill has increased over the period 1986 – 2011 (JNCC 2012). This included a decline in the index since 2005 followed by an apparent substantial recovery in 2011, although this should be treated with caution given the observed low productivity of recent years. Over the same time period, 1986-2011, the numbers of razorbills counted in attendance at the colonies of Flamborough Head and Bempton Cliffs SPA has increased, and had done so by 84% between 2000 (Mitchell *et al.,* 2004) and the censuses of 2008-2011, to a mean count of 21,140 individuals (Natural England *in litt.*).

J.56 The breeding population of puffins on Flamborough Head and Bempton Cliffs SPA since at least 1986 has shown a trend of decrease, there having been an approximate 80% change between 2000 (Mitchell *et al.,* 2004) and the estimate for 2008-2011 (Natural England *in litt.*). Over the same time period up until at least 2000, the UK breeding population of puffin had increased and possibly has continued to do so as suggested from the limited counts available (JNCC 2012).

Results

Selecting the recovery factor *f*

J.57 For one species (Razorbill), a long term increase in population size at Flamborough Head and Bempton Cliffs SPA, regionally and nationally, would suggest a recovery factor of 0.5 (or higher) is appropriate (see Section: Population data and trends). Where the local population trend is increasing though nationally numbers may be stable (Guillemot), a recovery factor of 0.4 has been considered appropriate for the PBR analysis. For one species (Puffin), a long term decrease in the local population and uncertainty as to the recent national trend, would suggest a recovery factor of 0.2 is appropriate for the PBR analysis. None of the SPA populations are considered at this time to be threatened from extinction, which would be necessary to assign a value of 0.1.

Potential Biological Removal

J.58 Table J.6 presents the PBR results for the three species of auk predicted to interact with the Project for a range of recovery factors. Highlighted is the recovery factor with its resultant value, considered in paragraph J.57 as most appropriate for a given species based upon recent population trends.

J.59 For guillemot using the data for the Flamborough Head and Bempton Cliffs SPA from the revised citation at a recovery rate of 0.4, PBR was calculated as 1,293 birds. No other colony is within maximum foraging range of the Project site. The calculated PBR value for the species regional population is therefore identical to that for the SPA alone.

J.60 For razorbill using the data for the Flamborough Head and Bempton Cliffs SPA from the revised citation at a recovery rate of 0.5, PBR was calculated as 607 birds. No other colony is within maximum foraging range of the Project site. The calculated PBR value for the species regional population is therefore identical to that for the SPA alone.

J.61 For puffin using the data for the Flamborough Head and Bempton Cliffs SPA from the revised citation at a recovery rate of 0.2, PBR was calculated as 7.6 birds. No other colonies are within maximum foraging range of the Project site. The calculated PBR value for the species regional population is therefore identical to that for the SPA alone.

Predicted mortality rates from displacement in terms of PBR

J.62 Table J.7 presents for the three auk species anticipated to interact with the Project, the predicted mortality rates from displacement that can be apportioned to a colony or regional population, as a proportion of the corresponding PBR. When a recovery factor appropriate to the population status of the species has been selected, providing the predicted mortality does not exceed 100% of the corresponding PBR, a sustainable harvest rate is predicted that would maintain the population at, or above, maximum net productivity level.

J.63 The population and mortality data used in the current analysis have originated from earlier steps in the EIA process where the reasoning behind its use and calculation is explained. The presumption has been that the correct assumptions were made whilst following a precautionary approach. A precautionary approach has been taken in calculating PBR and as such the analytical steps and variables used additively provide an overly precautionary assessment of displacement in terms of PBR. However, for the three auk species anticipated to interact with Project, none is predicted to suffer mortality from displacement exceeding a sustainable harvest rate for the regional and national populations.

Table J.6 PBR values for populations of guillemot, razorbill and puffin predicted to interact with the Project when using an estimated population sizes (N_{min}) at the lower bound of the 60% confidence interval and with a 10% coefficient of variation.

Species	Reference population	Age of first breeding (α)[12]	Annual adult survival (s)[13]	Growth rate (λ_{max})	Pop^n count (N)	N_{min}[14]	f	PBR	Population size: 1. source of estimate used 2. trends since mid-1980s
Guillemot (SPA –NE recommendations)	Flamborough Head and Bempton Cliffs SPA	5	0.946	1.09	83,214	76,494	0.1	323.4	Revised citation provided by Natural England (year of counts: 2008-2011). Overall increase in size of breeding populations with in recent years an apparent stabilisation nationally[15].
							0.2	646.7	
							0.3	970.1	
							0.4	1293.4	
							0.5	1616.8	
							1.0	3233.6	
Razorbill (SPA –NE recommendations)	Flamborough Head and Bempton Cliffs SPA	4	0.9	1.13	21,140	19,433	0.1	121.5	Revised citation provided by Natural England (year of counts: 2008-2011). Overall increase in size of breeding populations at SPA[4] and nationally.
							0.2	242.9	
							0.3	364.4	
							0.4	485.8	
							0.5	607.3	
							1.0	1214.6	
Puffin (SPA –NE recommendations)	Flamborough Head and Bempton Cliffs SPA	5	0.924	1.10	980	901	0.1	3.8	Revised citation provided by Natural England (year of counts: 2008-2011). Marked decrease in size of breeding populations at SPA[4] and since late 1980s, an increase nationally.
							0.2	7.6	
							0.3	11.4	
							0.4	15.2	
							0.5	19.0	
							1.0	38.1	

[12] Taken from Robinson (2005)

[13] Taken from Robinson (2005)

[14] The lower bound of a 60% confidence interval of N with a 10% Coefficient of Variation (see section J.43).

15 Difference between Seabird 2000 and revised citation of SPA

Table J.7 Predicted annual displacement mortality (adults per annum) and changes in background mortality for populations of guillemot, razorbill and puffin predicted to interact with Hornsea Offshore Wind Farm.

Species	Component population	No. of mortalities of a specified no. displaced		Effect on populations (%)				Data source: 1. Mortality rates 2. Population sizes
		No. subject to displacement	No. of mortalities	Change in background mortality (UK population)[16]	Change in background mortality (population affected)[17]	*f*	% of PBR[18]	
Guillemot	Flamborough Head and Bempton Cliffs SPA (breeding season mortality only)	3,458	**74**	0.1%	1.65%	0.4	5.7%	1. Volume 2, Chapter 5: Ornithology 2. Revised citation provided by Natural England (years of count: 2008-2011).
	Flamborough Head and Bempton Cliffs SPA (non- breeding season mortality only)	15,364	**3**	<0.01%	0.07%	0.4	0.2%	
	Flamborough Head and Bempton Cliffs SPA (post- breeding season mortality only)	19,016	**50**	0.05%	1.11%	0.4	3.9%	
Razorbill	Flamborough Head and Bempton Cliffs SPA (breeding season mortality only)	915	**30**	0.12%	1. 42%	0.5	4.9%	1. Volume 2, Chapter 5: Ornithology 2. Revised citation provided by Natural England (years of count: 2008-2011).
	Flamborough Head and Bempton Cliffs SPA (non- breeding season mortality only)	6,570	**5**	0.02%	0.24%	0.5	0.8%	
	Flamborough Head and Bempton Cliffs SPA (post- breeding season mortality only)	7,314	**44**	0.18%	2.08%	0.5	7.3%	
Puffin	Flamborough Head and Bempton Cliffs SPA (breeding season mortality only)	1,070	**3**	<0.01%	4.03%	0.2	39.5%	1. Volume 2, Chapter 5: Ornithology 2. Revised citation provided by Natural England (years of count: 2008-2011).
	Flamborough Head and Bempton Cliffs SPA (non- breeding season mortality only)	1,275	**0**	0%	0%	0.2	0%	

[16] [(*No. of mortalities/annual mortality*) x *UK population*] x 100, where annual mortality = 1 – annual adult survival (s)

[17] [(*No. of mortalities/annual mortality*) x *population of affected population*] x 100, where annual mortality = 1 – annual adult survival (s)

[18] *No. of mortalities/PBR* x 100

REFERENCES

Dillingham, P.W. and Fletcher, D. (2008). Estimating the ability of birds to sustain additional human-caused mortalities using a simple decision rule and allometric relation-ships. *Biological Conservation*, 141, pp. 1783-1792.

JNCC (2012). *Seabird Population Trends and Causes of Change: 2012 Report*. [Online]. Available at: http://jncc.defra.gov.uk/page-3201 (Accessed 24th March 2013).

Mitchell, P I, Newton, S, Ratcliffe, N. and Dunn, T E. (2004). *Seabird populations of Britain and Ireland*. T. & A.D. Poyser, London, UK: 511pp.

Niel, C. and Lebreton, J-D. (2005). Using Demographic Invariants to Detect Overharvested Bird Populations from Incomplete Data. *Conservation Biology*, 19 (3), pp. 826-835.

Robinson, R.A. (2005). BirdFacts: profiles of birds occurring in Britain & Ireland (BTO Research Report 407). BTO, Thetford (http://www.bto.org/birdfacts, accessed on 04/02/2013)

RSPB (2013). Shining a light on gannet numbers at RSPB Bempton Cliffs. RSPB, Sandy (http://www.rspb.org.uk/news/326575-shining-a-light-on-gannet-numbers-at-rspb-bempton-cliffs, accessed on 13/06/2013).

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W. and Burton, N.H.K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation* 156, pp. 53-61.

Trinder, M. (2013). *Hornsea Offshore Wind Farm Kittiwake PVA Report No. 2. Population based on proposed extension to Flamborough Head and Bempton Cliffs SPA.* MacArthur Green Ltd., Glasgow.

Wade, P.R. (1998). Calculating Limits to the Allowable Human-Caused Mortality of Cetaceans and Pinnipeds. *Marine Mammal Science*, 14 (1), pp. 1-37.

Wakefield, E.D., Bodey, T.W., Bearhop, S., Blackburn, J., Colhoun, K., Davies, R., Dwyer, R.G., Green, J., Grémillet, D., Jackson, A.L., Jessopp, M.J., Kane, A., Langston, R.H.W., Lescroël, A., Murray, S., Le Nuz, M., Patrick,S.C., Péron, C., Soanes, L., Wanless, S., Votier, S.C. and Hamer, K.C. (2013). Space Partitioning Without Territoriality in Gannets. Science doi: 10.1126/science.1236077

Watts, B. D. (2010). *Wind and waterbirds: establishing sustainable mortality limits within the Atlantic Flyway.* Center for Conservation Biology Technical Report Series, CCBTR-10-05. College of William and Mary / Virginia Commonwealth University, Williamsburg, VA. 43pp.

MacArthur Green Ltd

Kittiwake PVA Report No. 2

Population based on proposed extension to Flamborough Head and Bempton Cliffs SPA

Prepared by: Mark Trinder
Reviewed by: Bob Furness

Date: 12th July 2013

Tel: 0141 342 5404
Email: mark.trinder@macarthurgreen.com
Web: www.macarthurgreen.com
Address: 95 South Woodside Road | Glasgow | G20 6NT

Document Quality Record

Version	Status	Authorised by	Date
1.0	Draft	Mark Trinder	11/12/2012
1.1	Draft	Mark Trinder	12/12/2012
1.2	Draft	Mark Trinder	17/03/2013
1.3	Final	Mark Trinder	12/07/2013

Table of Contents

Table of Tables

Table of Figures

Introduction

K.1 This report is the second of two which describe the structure, parameterisation and outputs from a population model of the Flamborough Head and Bempton Cliffs SPA kittiwake population (hereafter referred to as the Flamborough Head population) and the predictions generated by the model for the potential impacts resulting from additional mortality. This work has been commissioned by Smart Wind with reference to the proposed Hornsea Project One Offshore Wind Farm. This second report is based on the slightly larger population present within the original SPA plus a proposed terrestrial extension.

Methods

Demographic rates

K.2 Kittiwake populations have been comparatively well studied among seabirds, with survival and productivity rates published for several colonies across different periods (see Frederiksen *et al.,* 2005 for a review). In their assessment of the availability of published seabird demographic data, Maclean *et al.,* (2007) gave kittiwake the highest score (for demographic data availability) of the 25 species considered. One consequence of the availability of studies from several locations is that it has become apparent that different breeding colonies have experienced different population trends over the last 25 years. Much effort has been spent attempting to identify the causes of change in colony sizes, for example looking for links between local population trends and adjacent sandeel stocks (Frederiksen *et al.,* 2004a). Much of this work has been undertaken on the kittiwake population of the Isle of May, in relation to the sandeel fishery in the outer Firths of Forth and Tay. However, comparatively little study has been undertaken on the Flamborough Head population, presumably due to the inaccessibility of this colony. The only annual dataset available for this population is an estimate of breeding success collected for a sample of the site, collected between 1986 and 2011 (http://jncc.defra.gov.uk/smp/; NB. there are no estimates for 2000 and 2010 in this dataset, but these are provided in an unpublished RSPB report (Aitken *et al.,* 2012)). Over this period there have been three colony counts (1987, 2000 and 2008) which have recorded declines from 85,395 AON (apparently occupied nests) to 42,692 to 37,617 respectively. The breeding success estimates were averaged across two periods (1986-1999 and 2000-2011) corresponding to the two transitional periods between counts and also across all years (Table K.1)

Table K.1 Average breeding success for the Flamborough Head kittiwake population.

Years	Period definition	Average productivity (young fledged per breeding pair)	SD
1986 – 1999	'early'	1.05	0.32
2000 – 2011	'late'	0.81	0.32
1986 – 2011	'all'	0.94	0.35

K.3 It is not possible to state which of these three productivity estimates is most appropriate for the purposes of predictive modelling, therefore model outputs using all three options in Table K.1 ('early', 'late' and 'all') will be provided. The key additional parameters required for population modelling are survival rates. There are no site specific survival estimates for this population; however estimates are available for several other populations (Frederiksen *et al.,* 2005). The nearest colony for which survival estimates are available is in North Shields (c. 130km away), however these data were collected between the 1950s and 1980s at a small colony using artificial nest sites (Coulson & Thomas 1985). Consequently these survival estimates are not considered to be the most appropriate for the current purposes. The nearest colony for which comprehensive and contemporary estimates are available is the Isle of May (Frederiksen *et al.,* 2004a, Frederiksen *et al.,* 2004b). However, as noted above there have been differences in colony trends and thus there is a need to check if survival rates estimated from the Isle of May population are suitable for modelling the Flamborough Head population. In order to do this, the demographic rates and population counts for the two sites were compared.

K.4 There is also no evidence for a correlation in the annual productivity at the two sites within each year (r=0.089). Nonetheless, the two populations appear to have experienced similar declines in breeding numbers across this period, with approximately half as many pairs in 2011 at both sites as there were in 1987. Thus, while productivity at the two colonies has been markedly different, the population trends have been similar.

K.5 Adult survival rates estimated for different populations have ranged between 0.8 and 0.93 (Frederiksen *et al.,* 2005). To determine an appropriate adult survival rate for the Flamborough Head population we calculated the average rate which gave the best match to the population counts, assuming a closed population or at least no net immigration/emigration. To achieve this, the following demographic rates were used in year specific matrix models:

- The annual productivity estimates for the population (Appendix 1, Table K.4);
- First year survival was fixed at 0.4 (Frederiksen *et al.,* 2004a);
- Pre-breeder survival was fixed at 0.64 (this is a three year composite rate, for survival from 1 to 4; derived from data in Frederiksen *et al.,* 2004a);
- Age at first breeding was set as 4 (Wooller and Coulson 2008; Frederiksen *et al.,* 2004a); and
- The proportion of adults which breed was fixed at 0.93 (Cam *et al.,* 1998).

K.6 Because the trend in the population size was different during 1986 - 1999 and 2000 - 2008 (annual population growth rate, λ, was 0.948 and 0.984 respectively), estimation of the best-fit adult survival was conducted separately for the two time intervals. The adult survival rates which produced the closest fit to the estimated number of apparently occupied nests (AONs) were 0.835 and 0.9 (Figure K.1).

K.7 The most recent estimate of 0.9 is considered likely to be the most appropriate for predictive modelling of the population. It should be noted that there have been variations in the survey methods used for each of the three census counts used in the above survival rate estimation, although the areas surveyed have remained consistent. This will have introduced some potential additional sources of error in the counts, and hence the survival rate estimated from them. However, there are no other sources of count data available and no means to estimate the magnitude of potential errors. However, as can be seen from the lines representing survival +/-2% of the best-fit (Figure K.2), a comparatively large change in AON would be needed to modify the estimated survival rate by this amount (e.g. for estimated survival to be 2% higher, the AON count in 2008 would need to be nearly 20,000 higher than the 37,000 reported.

K.8 The suite of demographic rates which will be used in the population modelling are provided in Table K.2.

Table K.2 Kittiwake demographic rates to be used in population model for the Flamborough Head population.

Parameter		Average rate	Standard Deviation (SD)	Source
Adult survival		0.9	0.035	Average rate estimated using local productivity and population counts. Standard deviation taken from Frederiksen *et al.,* (2004b).
Age at first breeding		4	NA	Wooller and Coulson (2008).
Sub-adult survival (composite three year rate)		0.636	0.035	Composite average rate for survival from age 1 to 4 from Frederiksen *et al.,* (2004b). Standard deviation as above.
Juvenile survival		0.4	0.035	Rate estimated for first year survival by Frederiksen *et al.,* (2004b). No variance estimate available so same value as adult used.
Proportion of breeders		0.93	0.012	Cam *et al.,* (1998).
Productivity (chicks fledged per pair)	'early'	1.05	0.32	1986 – 1999 Flamborough Head productivity data (JNCC; Table 1).
	'late'	0.81	0.32	2000 – 2011 Flamborough Head productivity data (JNCC; Table 1).
	'all years'	0.94	0.35	1986 – 2011 Flamborough Head productivity data (JNCC; Table 1).

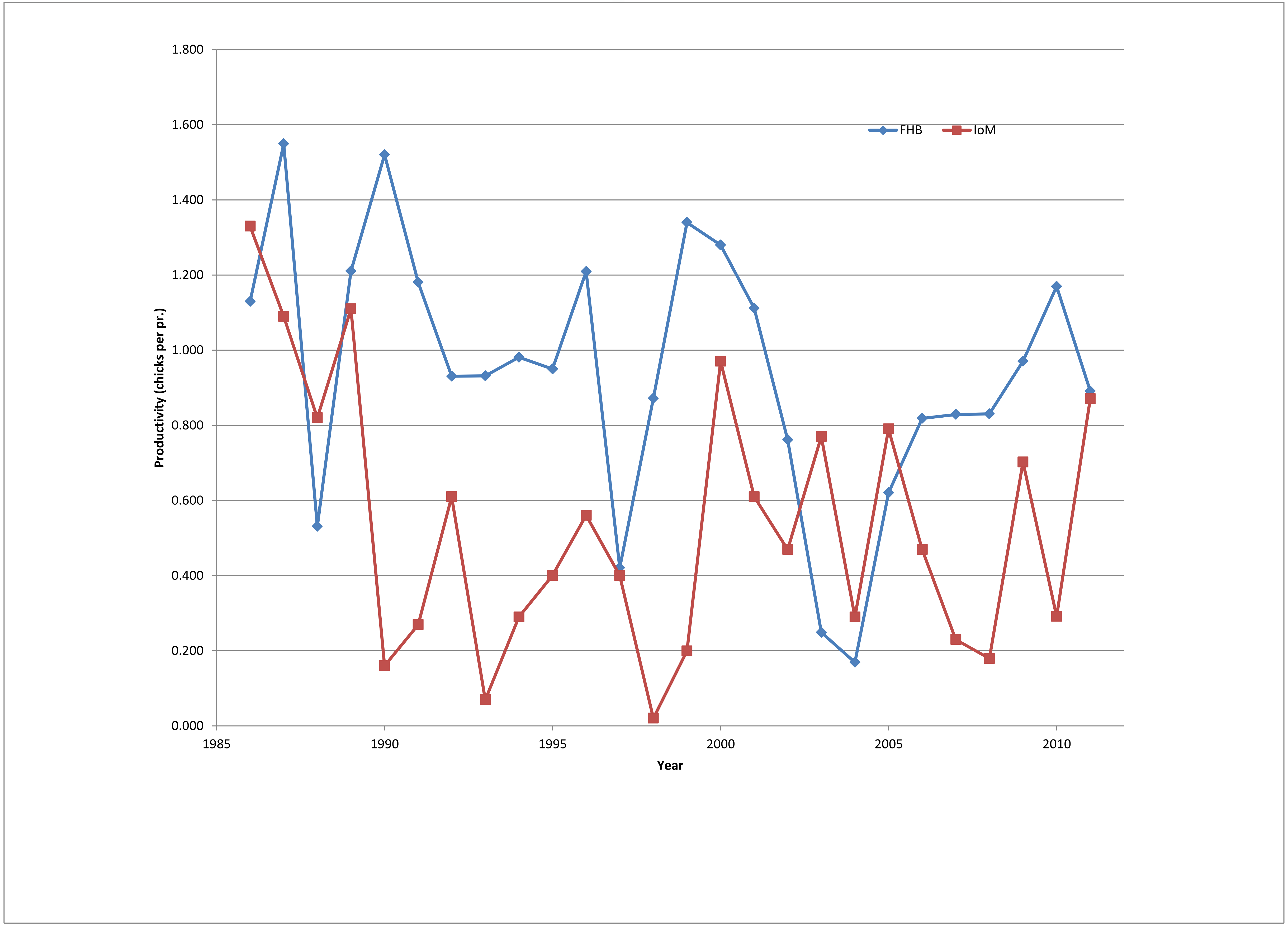


Figure K.1 Productivity at Flamborough Head (FHB) and Isle of May (IoM) between 1986 and 2011.

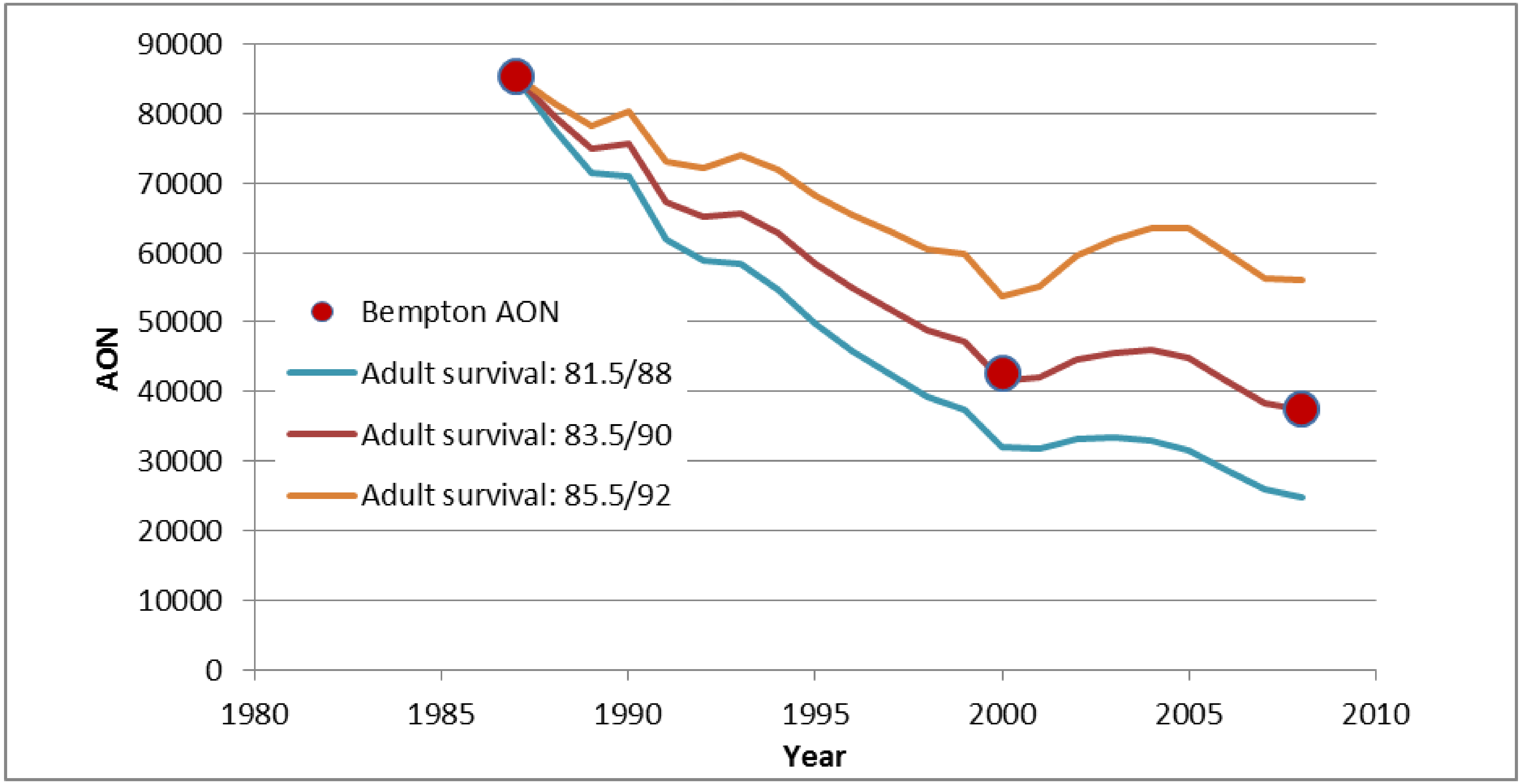


Figure K.2 **Best-fit adult survival rates for the Flamborough Head kittiwake population. Rates of 83.5% and 90% for the periods 1987-1999 and 2000-2008 respectively gave the closest match to the estimated number of breeding pairs. Survival rates +/- 2% are provided for illustration.**

Population Model

K.9 A bespoke stochastic model was developed for the SPA population, and follows best practice methods (e.g. selection of appropriate probability distributions for survival and reproduction; Morris & Doak 2002; WWT 2012). The model used the demographic rates provided in Table K.2.

K.10 The kittiwake population was modelled on an annual time step, using a three age class model: 0-1, 1-4 and 4+ (note that the second age class is a composite one for individuals aged between 1 and 4). The model has a post-breeding census structure and only the final age class breeds.

K.11 Productivity rates were modelled using averaged values either from all years, early years or late years. Using alternative productivity rates estimated from different time periods for projecting the population was not undertaken in order to attempt to replicate the population within those time periods. Instead, this was in acknowledgement of the fact that future productivity levels are obviously unknown and therefore using a range of values ensures the generation of predictions which reflect different possible scenarios.

K.12 Environmental stochasticity was incorporated using published estimates (Table K.2). Survival rates were drawn at random from beta distributions, and the number fledged per pair from a stretched beta distribution (Morris and Doak 2002). These probability distributions permit the generation of random numbers with appropriate characteristics (e.g. survival between 0 and 1, and numbers fledged per pair greater than zero and capped at a biologically realistic level, in this case 3; Coulson and Thomas 1985).

K.13 Demographic stochasticity on survival was modelled using a binomial process; the number of individuals surviving from one time step to the next was estimated using a binomial function which takes as inputs the number of individuals available at the first time step and the survival rate, from which a randomly generated number of surviving individuals is outputted.

K.14 For clarity, the difference between environmental and demographic stochasticity can be thought of as follows. Environmental stochasticity generates random values for the probability of survival from one time step to the next. Demographic stochasticity generates random numbers of individuals which survive from one time step to the next for any given survival probability. Thus environmental stochasticity models variable environments (e.g. weather effects) while demographic stochasticity models chance effects due to the population size (i.e. demographic stochasticity plays a more important role in small populations where chance effects are likely to be more pronounced).

K.15 Coulson and Wooller (1976) found evidence for decreases in adult survival with increasing breeding density, however this study was conducted at a man-made site (a warehouse) at which breeding sites became limited as the colony grew. It seems unlikely that the current Flamborough Head population, at less than half the size recorded in 1986, would be experiencing such competition. Indeed, even at larger population sizes (such as that recorded in 1986), determining that breeding sites are limiting at a site as extensive and inaccessible as Flamborough Head would be extremely difficult. Therefore, all demographic rates were modelled as density independent. Density dependent models have an inherent mechanism by which negative impacts such as elevated mortality are buffered, thereby reducing the predicted population impacts. By contrast, density independent models lack this buffering effect and therefore equivalent impacts can have more pronounced effects. Thus, projecting the population using a density independent model represents a more precautionary approach.

K.16 The proportion of breeders used in the model (0.93; Cam *et al.,* 1998), was derived from a population in north-west France. During the period of study this population experienced more or less stable growth. No estimates for this rate were found for other populations. Therefore, in the absence of alternatives, and on the grounds that the study population had not undergone dramatically different growth from that observed at FHB over the last decade, using this value to simulate the Flamborough Head population was considered to be reasonable. To illustrate the influence of the value for the proportion of breeders on model predictions, two alternative values were tested using the model; 1 (i.e. all adults breed) and 0.8 (i.e. 80% of adults breed). Since the proportion of breeders is used to estimate survival, increasing this to 1 means that the adult survival rate since 2000 needed to be reduced to 0.895 in order to balance the model. Using this survival rate and a proportion of breeders of 1, the baseline model predicted population growth if 1.03. This is approximately 1% higher than using a proportion of breeders of 0.93. If the proportion is reduced to 0.88, adult survival needed to be adjusted to 0.91. Using this survival rate and a proportion of 0.8 the baseline model predicted population growth of 1.02, which was very similar to that obtained using the proportion of 0.93. Thus, overall it can be seen that model predictions are relatively insensitive to this rate. Since nest sites are not considered to be limiting at the current population size, it is more likely that the proportion of adults which breed is higher than 0.93 rather than lower; if all adults breed (i.e. a proportion of 1) the predicted population growth rate is slightly improved, thereby making the model less precautionary, lending further support to the use of 0.93 in the modelling.

K.17 The at sea surveys conducted for the proposed wind farm generated estimates of the ratio of adult to juvenile kittiwakes. The overall adult proportion reported was 78%, although this is considered likely to include immature age classes (i.e. pre-breeders) since the plumage characteristics of ‘adult and 2nd year immature are often puzzling.’ (Snow and Perrins 1998). The model-predicted average adult proportion obtained from preliminary model simulations varied between 60% and 68% (Table K.3), however including the composite pre-breeder age class increased this to between 71% and 77%. Since these figures were only a little lower than the at sea estimate, it was concluded that applying additional mortality to all age classes in proportion to their presence in the population was more appropriate than applying a fixed rate based on only two years of potentially imprecise estimates (due to plumage variations).

K.18 Simulations were conducted across a range of additional annual mortalities, from 0 to 1,000, at intervals of 50, representing the additional annual mortality which could affect the population. The simulated value for additional mortality defined at the outset of each simulation was used to calculate the proportional mortality for each age class. For example, if the additional mortality for a given simulation was set at 100 individuals, at each time step in the simulation this value was multiplied by the proportion of the total population in each age class. In order for the additional mortality to remain in overall proportion to the total population size, prior to dividing the mortality among the age classes, the total mortality was multiplied by the ratio of the current simulated population size to the initial population size (e.g. if the mortality for a particular simulation was 100, the initial population size was 80,000 and the modelled population size at a given time step was 100,000, the total mortality for that time step would be 100 * (100,000/80,000) = 125). In this manner, the additional mortality experienced by the population remains in proportion to the modelled population size throughout the simulated period.

K.19 The effect on the population of adults killed during the breeding season may be twofold; loss of the adult and their future contribution to the population and also failure of the current breeding attempt since the remaining partner will be very unlikely to be able to successfully raise a nestling alone. Preliminary simulations were conducted to check the potential for this secondary impact to further contribute to both reduced population growth and increased risk of decline. Up to the maximum annual mortality modelled here (1,000) inclusion of this secondary effect produced an undetectable difference to the results. Since the inclusion of this effect required additional assumptions regarding the seasonality of mortality it was excluded on the grounds of parsimony.

K.20 The model assumes a closed population. This was a necessary assumption as there are no data regarding rates of exchange between Flamborough Head and other populations. The implications of this assumption for both the Flamborough Head population and the wider kittiwake population will be dependent on the relative rates of growth experienced elsewhere and the relative roles of different colonies as either sources or sinks of individuals. However, it seems plausible to assume that colonies within the region, of which Flamborough Head is the largest, are likely to have experienced similar trends over the period of data collection and therefore the assumption of a closed population is probably reasonable.

K.21 The initial population size used in the second version of the model reported here was based on that estimated within the existing SPA and a proposed extension (figure provided by JNCC). This population was 44,520 AON, estimated as the average size recorded between 2008 and 2011. This is larger than the most recent estimated size of the population within the current SPA of 37,617, dating from 2008 (for model predictions based on this population refer to the accompanying report no. 1).

K.22 To calculate the total adult total population size associated with the SPA, the number of AONs was multiplied by 2 (= breeding adults) and divided by 0.93 (to account for non-breeding adults). Preliminary simulations were then performed using this number and approximate values for the other age classes in order to derive appropriate stable age distributions. In this manner the model predicted number of individuals in each age class, based on the observed AONs could be estimated (Table K.3). These ratios are a function of the different productivity rates in the model; hence each version had a different ratio.

Table K.3 Initial age ratios derived from preliminary model runs and the 2008 AON estimate.

Productivity period	0-1 age class	1-4 age class	Adult age class
Early	0.29	0.11	0.60
Late	0.23	0.09	0.68
All years	0.26	0.10	0.64

K.23 For each level of mortality, 10,000 simulations of 25 years were run. The following outputs were generated and plotted against additional mortality:

- The average population growth rate and upper and lower 95% confidence intervals. These estimates excluded the data from the first five time steps (the predictions from the first few (c. 5) time-steps from a matrix based population models are potentially unreliable, Caswell 2001); and,
- The probability of population decline below specific thresholds (quasi-extinction), defined as percentages of the initial population size. These were calculated as the proportion of simulations which declined below each threshold size, at any point during the simulation (NB: as for calculation of the population growth rate, the first five time steps were excluded from these estimates).

K.24 Example population projections against time for selected additional mortalities (0; 200; 400; 600; 800; 1,000) were also plotted to provide illustrations of the median population prediction and upper and lower 95% confidence intervals associated with these mortality levels.

K.25 To provide a measure of the potential difference in population size after 25 years of additional mortality relative to that predicted to occur in the absence of additional mortality, the following outputs were plotted against additional mortality:

- The absolute probability of the population size being smaller at the end of the 25 year simulation period than the median predicted population size in the absence of additional mortality (tables of the same outputs measured at intermediate intervals of 5, 10, 15 and 20 years and the 25 year estimate as plotted are also provided in Table K.5 to Table K.19 in Appendix 2); and

- The change in the probability of the population size being smaller at the end of the 25 year simulation period than the median predicted population size in the absence of additional mortality. This was calculated using the probability values predicted with zero additional mortality.

K.26 It is informative to attempt some form of model validation prior to its use for generating predictions. Typically this is reliant on independent datasets for model parameterisation and validation. In this instance since the colony data have been used to parameter the model there are no obvious counts to use for validation. While the model could be tested for its ability to simulate the trend at another colony, this would make the assumption that the test colony had experienced the same influences. There is evidence to indicate that this is not the case for kittiwake populations (Frederiksen *et al.,* 2005). Under such circumstances validation necessarily becomes more qualitative, through consideration of the likely range of baseline model predictions compared with recent trends. Viewed this way, the baseline predictions were considered to provide reasonable estimates. It is also worth stressing that the model results should be considered in a relative sense, rather than an absolute one; the key metrics for assessment should be the difference in rates of growth or probability of decline between baseline (no impact) and scenario simulations. Thus the importance of the absolute reliability of the model is reduced when comparing results.

Results

Early productivity scenario (1986-1999) - additional mortality predictions

K.27 In the absence of additional mortality, using productivity data collected between 1986 and 1999, the population model predicted that the population will grow at an average of 1.6% per year (Figure K.3 and Figure K.4). The growth rate declines to 0.09% per year with an additional annual mortality of 1,000 individuals (Figure K.3 and Figure K.4).

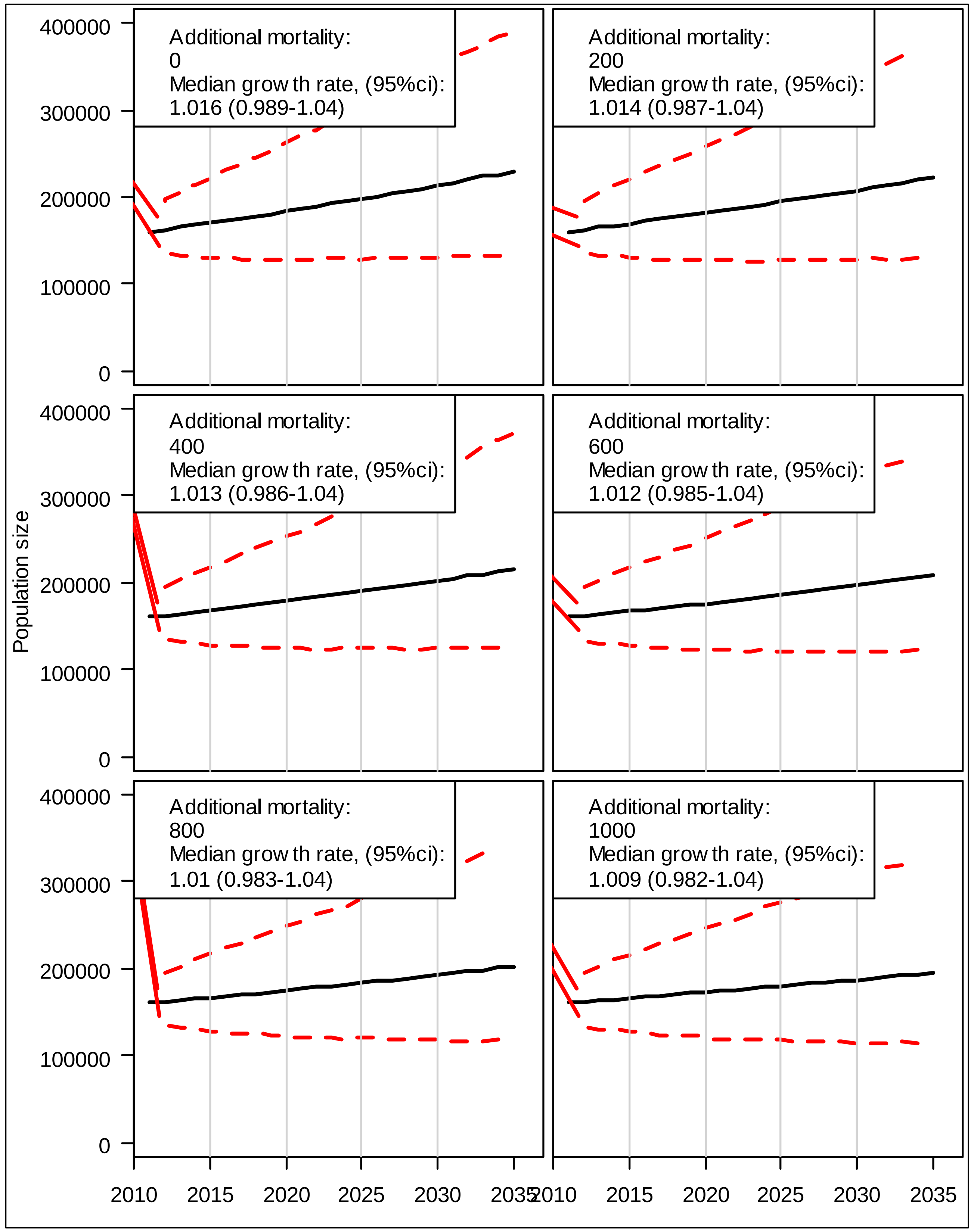


Figure K.3 **Early productivity (1986-1999) scenario: population projections for additional mortality between 0 and 1,000. Black lines are the average population trend, red dashed lines contain 95% of the simulations. Average population growth rate and 95% confidence intervals included on each panel.**

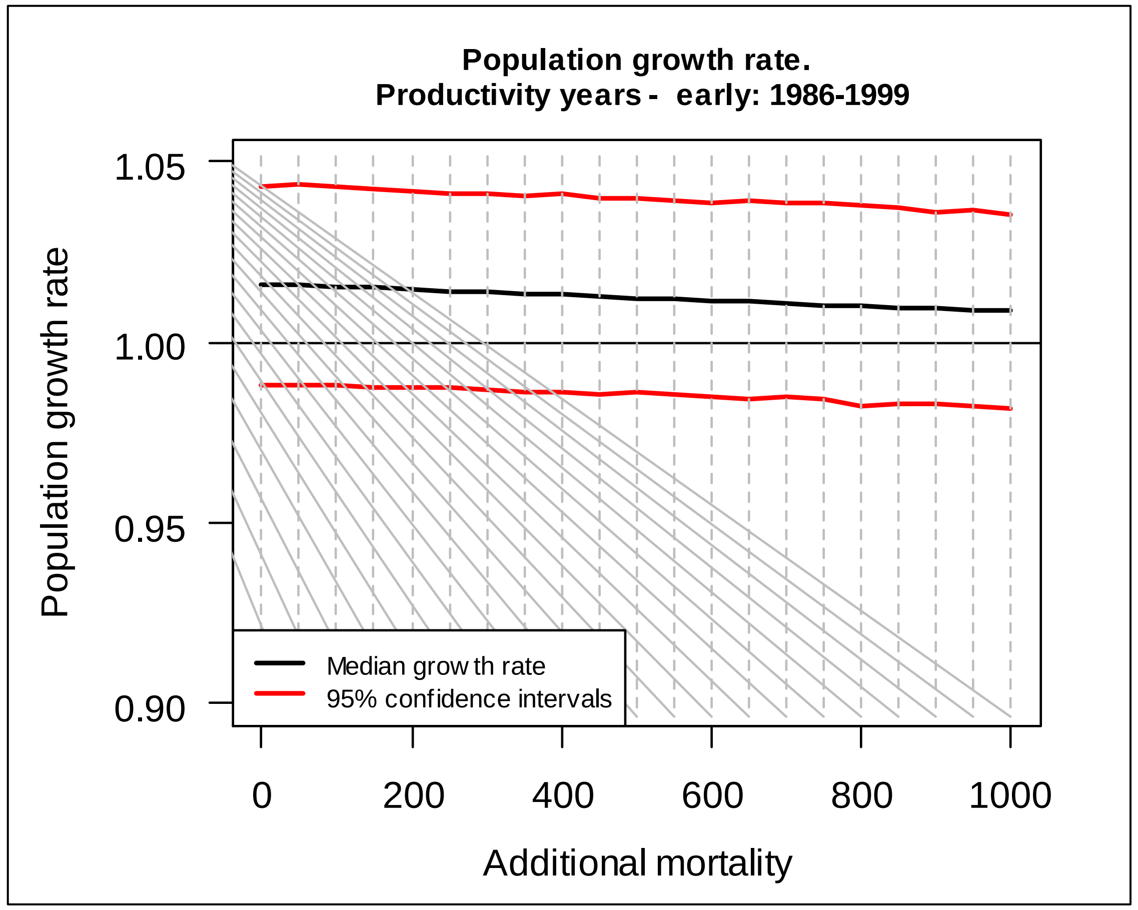


Figure K.4 **Early productivity (1986-1999) scenario: change in population growth rate with increasing additional mortality.**

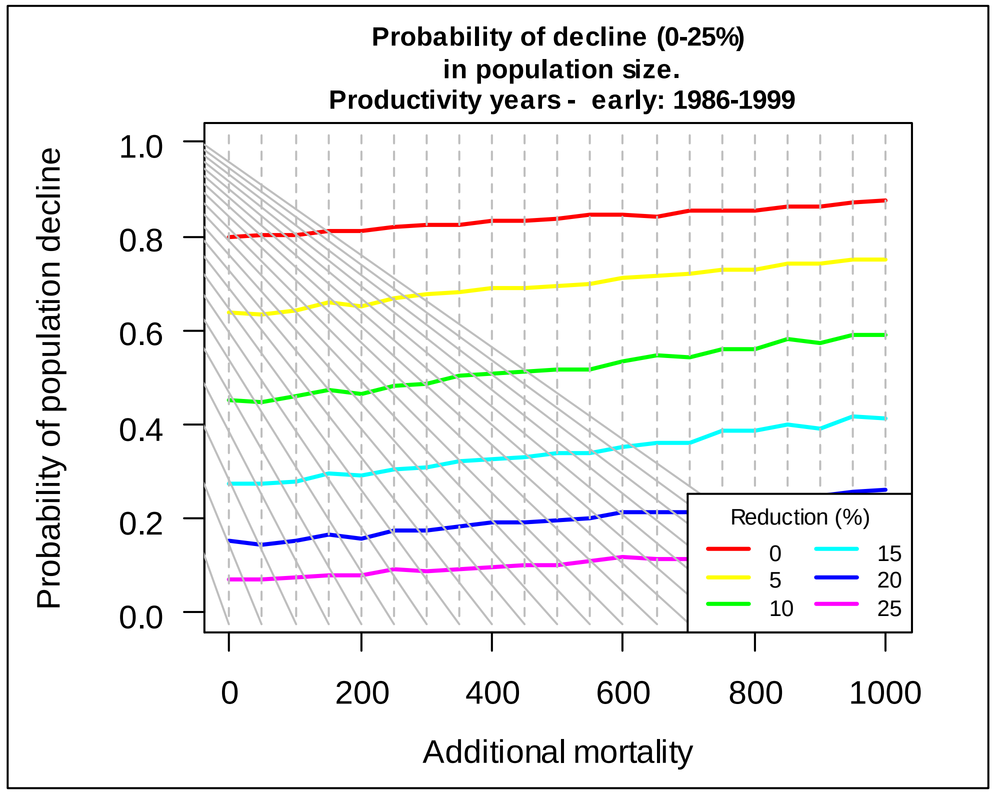


Figure K.5 **Early productivity (1986-1999) scenario: probability of population decline with increasing additional mortality.**

K.28 The probability of any population decline over 25 years increases from 80% to 87% as additional mortality increases from zero to 1,000 (Figure K.5, red line). Similar magnitudes of increase in the probability of population decline were recorded for the risk of decline below lower population thresholds (Figure K.5).

K.29 The probability that the median population size will be smaller after 25 years than the initial size increased from 50% with no mortality (i.e. half of all simulations increase and half decrease), to 73% with an additional annual mortality of 1,000 (Figure K.6, red line), an increase in risk of 23% (Figure K.7). Similar rates of increase in this risk were recorded for the lower population thresholds, although the increase in risk of a decline to a population size 75% of the initial one was slightly lower at 18% (Figure K.6 and Figure K.7).

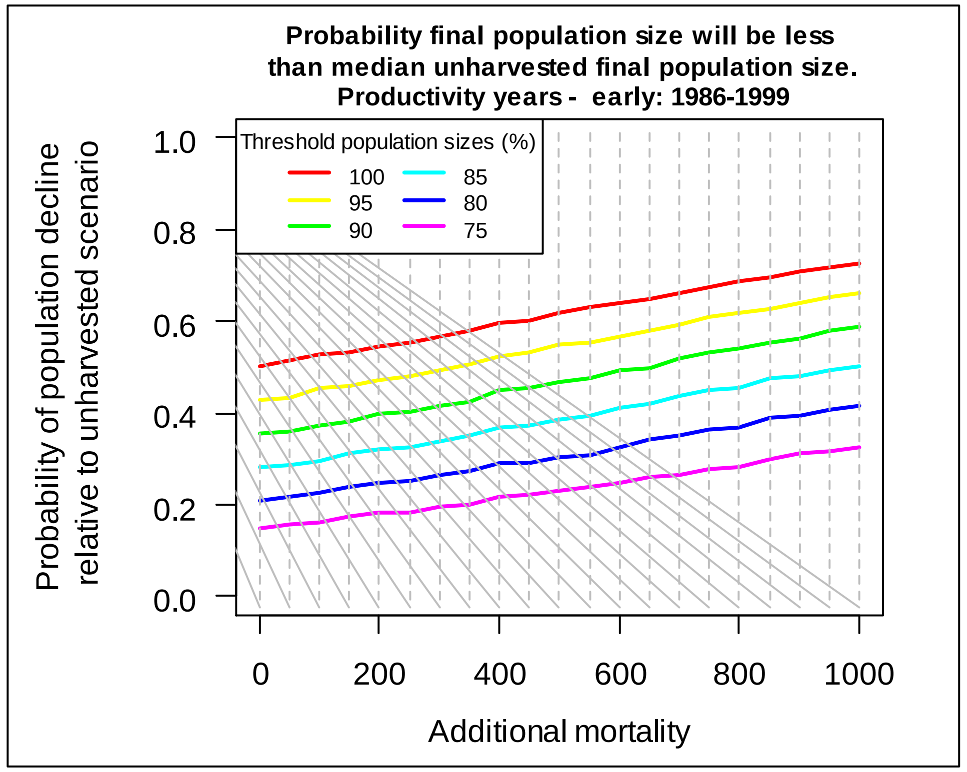


Figure K.6 **Early productivity (1986-1999) scenario: probability population in final year of simulation will be less than that achieved in absence of additional mortality.**

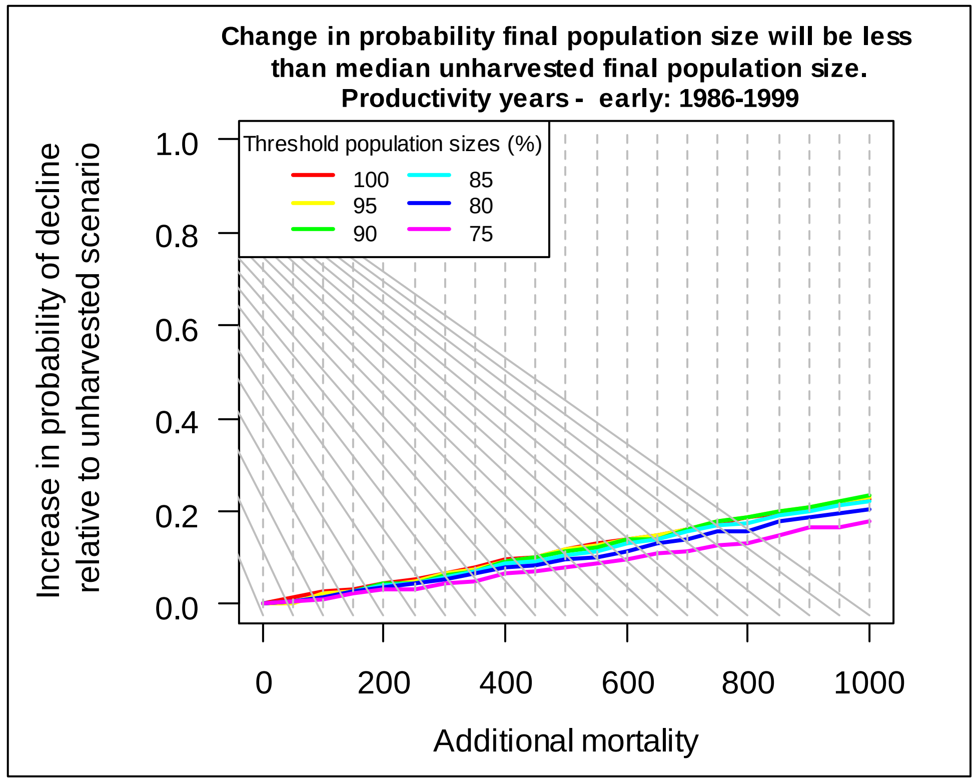


Figure K.7 **Early productivity (1986-1999) scenario: increase in probability population in final year of simulation will be less than that achieved in absence of additional mortality.**

Late productivity scenario (2000-2011) - additional mortality predictions

K.30 In the absence of additional mortality, using productivity data collected between 2000 and 2011, the population model predicted that the population will decline at an average of 1.1% per year (Figure K.8 and Figure K.9). The growth rate falls further to an average decrease of around 1.9% per year with an additional annual mortality of 1,000 individuals (Figure K.8 and Figure K.9).

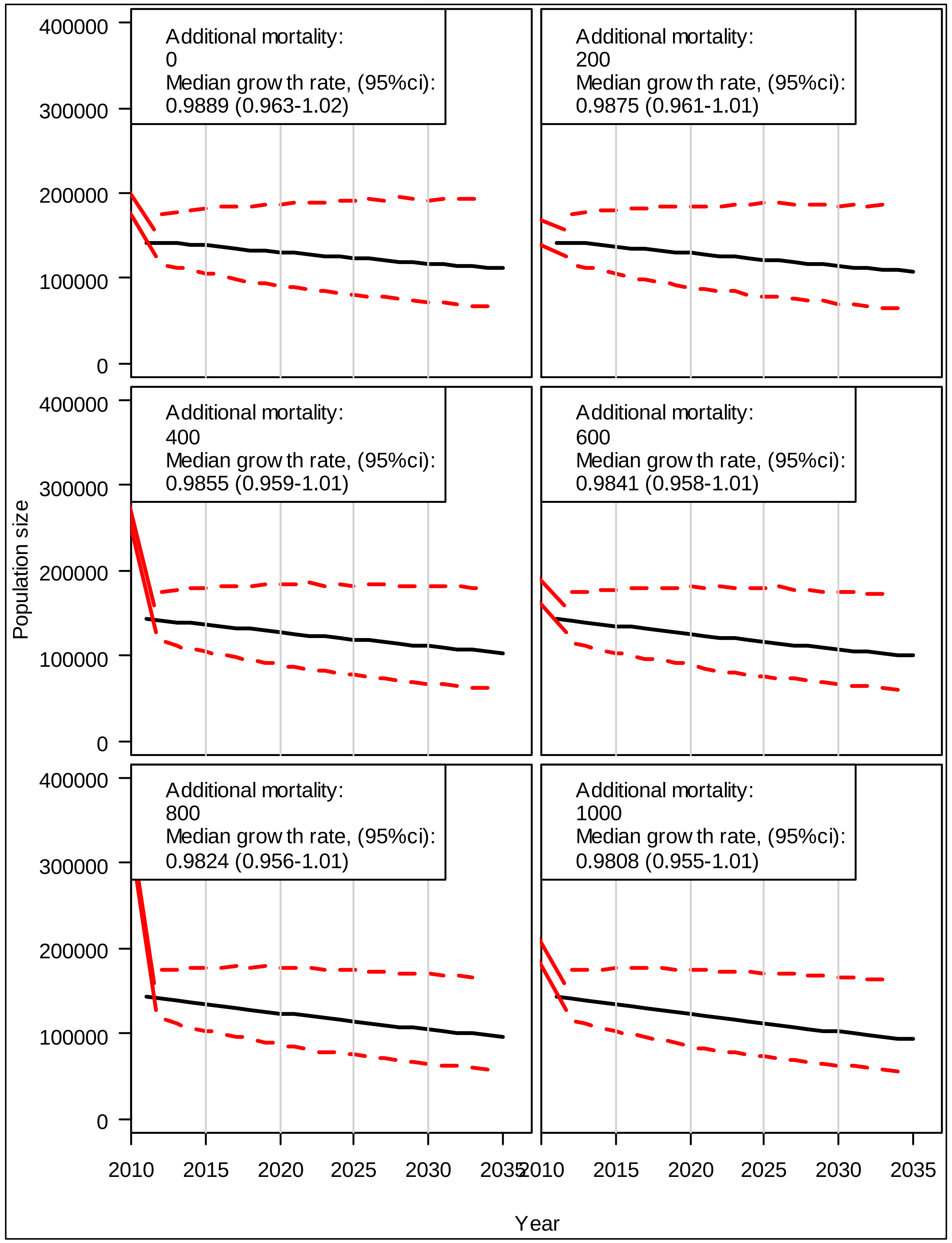


Figure K.8 **Late productivity (2000-2011) scenario: population projections for additional mortality between 0 and 1,000. Black lines are the average population trend, red dashed lines contain 95% of the simulations. Average population growth rate and 95% confidence intervals included on each panel.**

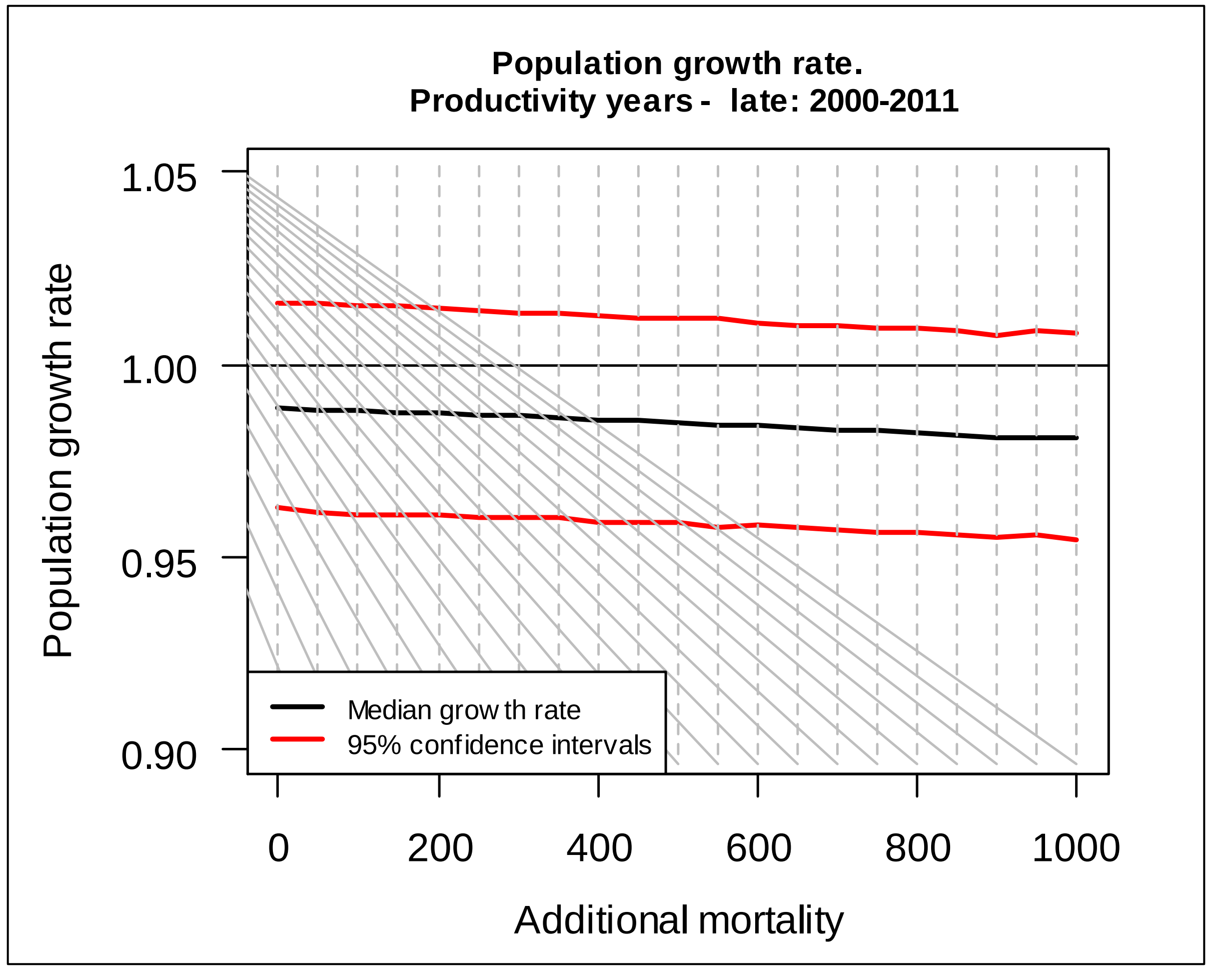


Figure K.9 Late productivity (2000-2011) scenario: change in population growth rate with increasing additional mortality.

K.31 Since even with no additional mortality this version of the model predicted population decline, the risk of decline remained at 100% irrespective of the level of additional mortality (Figure K.10, red line). The risk of a decline of 25% increased from 65% to 84% with an increase in mortality from zero to 1,000 individuals per year (Figure K.10, purple line).

K.32 The probability that the median population size will be smaller after 25 years than the initial size increased from 50% with no mortality (i.e. half of all simulations increase and half decrease), to 75% with an additional annual mortality of 1,000 (Figure K.11, red line), an increase in risk of 25% (Figure K.12). Similar rates of increase in this risk were recorded for the lower population thresholds, although the increase in risk of a decline to a population size 75% of the initial one was slightly lower at 21% (Figure K.11 and Figure K.12).

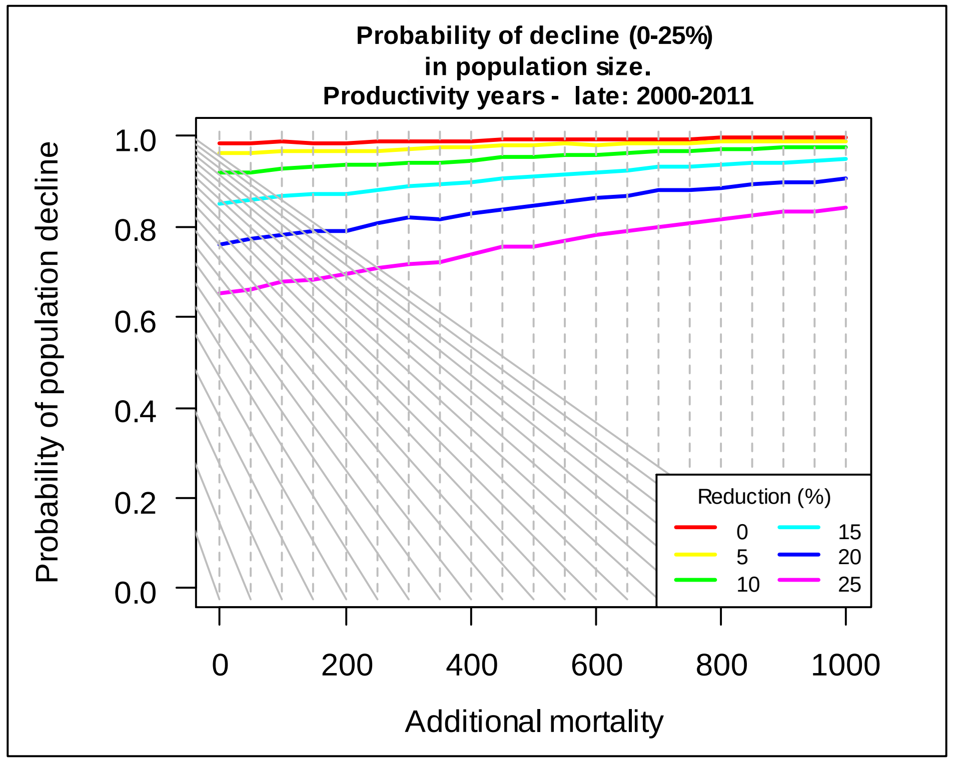


Figure K.10 Late productivity (2000-2011) scenario: probability of population decline with increasing additional mortality.

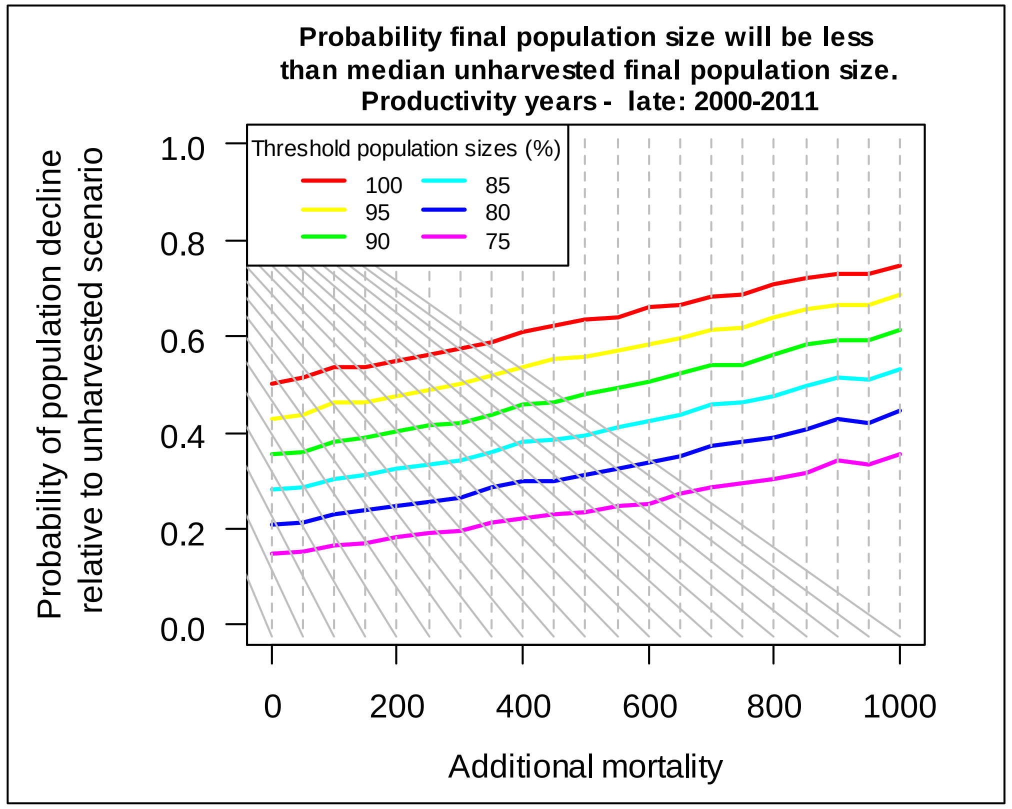


Figure K.11 Late productivity (2000-2011) scenario: probability population in final year of simulation will be less than that achieved in absence of additional mortality.

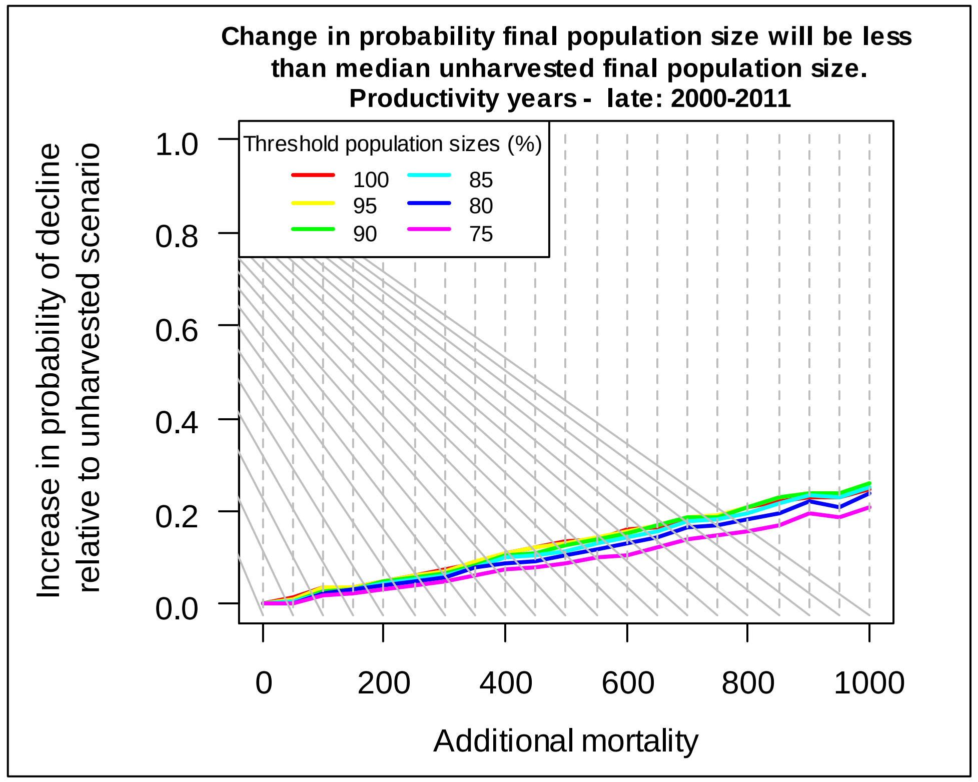


Figure K.12 **Late productivity (2000-2011) scenario: increase in probability population in final year of simulation will be less than that achieved in absence of additional mortality.**

All years productivity scenario (1986-2011) - additional mortality predictions

K.33 In the absence of additional mortality, using all the productivity data collected between 1986 and 2011, the population model predicted that the population will increase at a very slow rate of 0.3% per year (Figure K.13 and Figure K.14). The average growth rate falls to an average decrease of around 0.4% per year with an additional annual mortality of 1,000 individuals (Figure K.13 and Figure K.14)

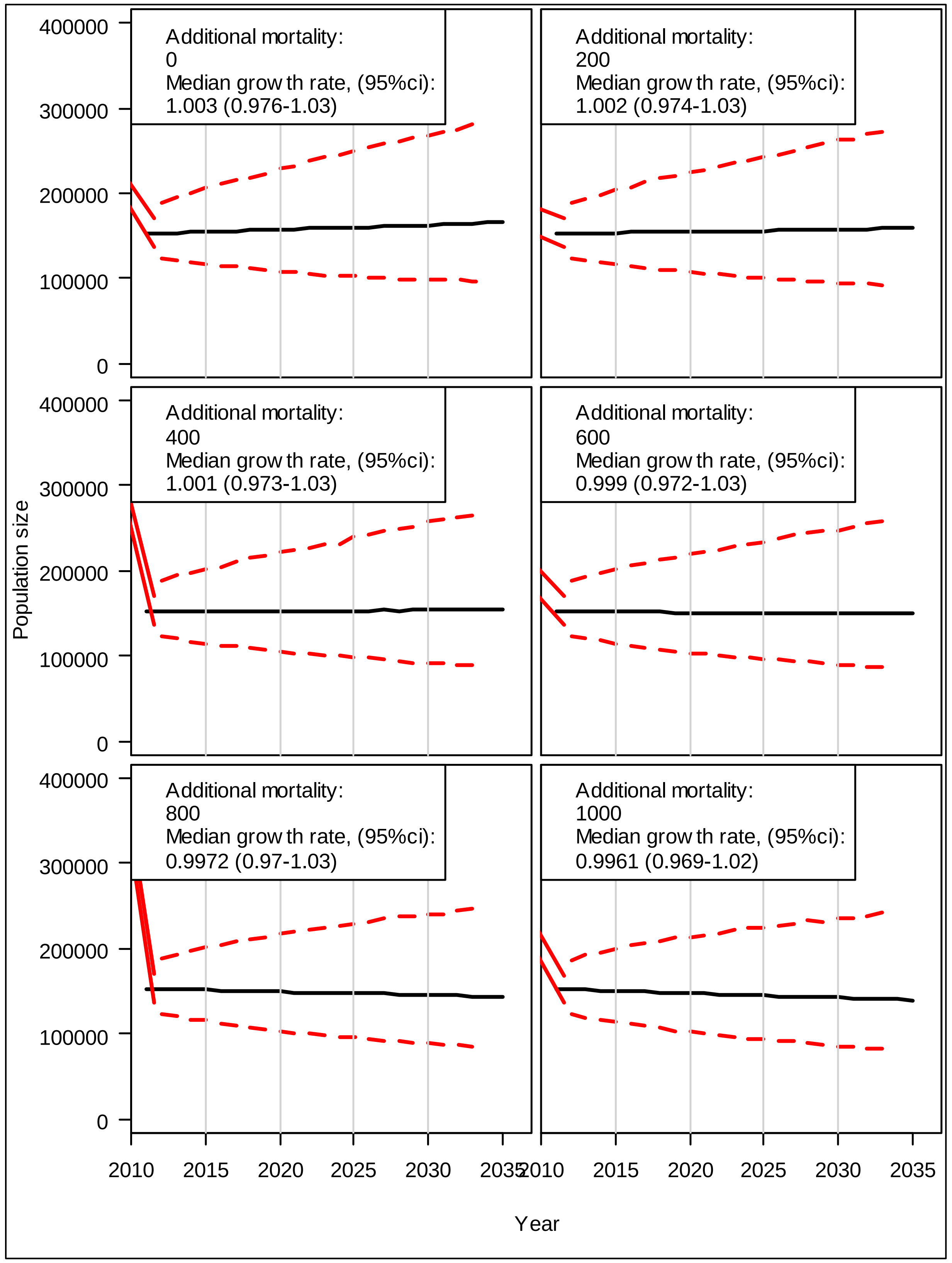


Figure K.13 **All years productivity (1986-2011) scenario: population projections for additional mortality between 0 and 1,000. Black lines are the average population trend, red dashed lines contain 95% of the simulations. Average population growth rate and 95% confidence intervals included on each panel.**

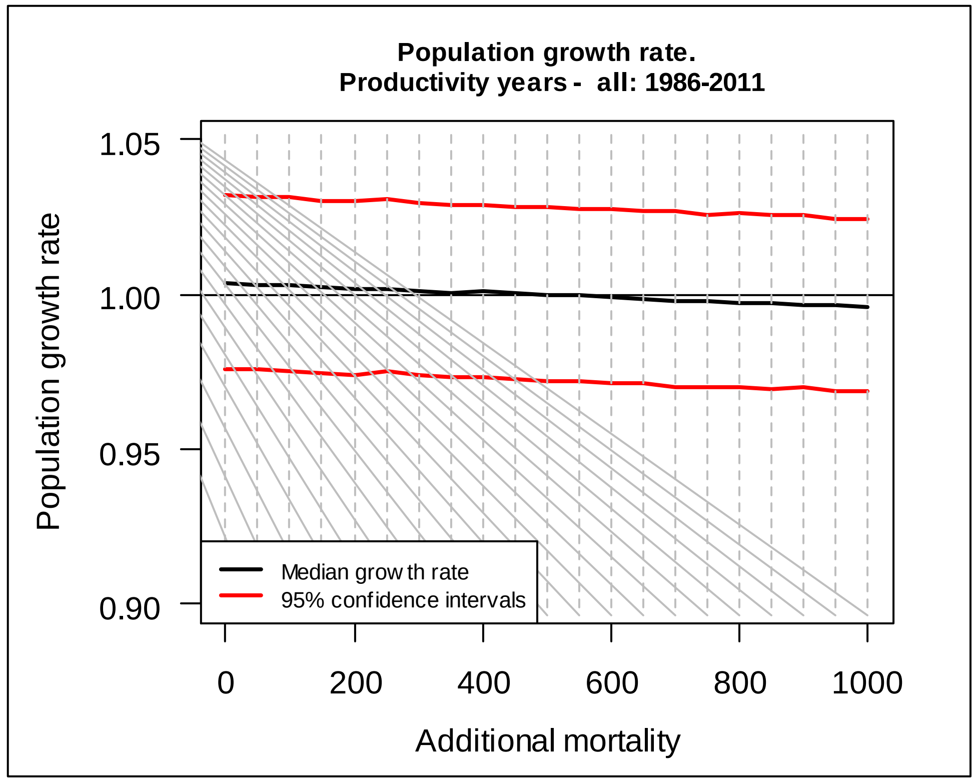


Figure K.14 All years productivity (1986-2011) scenario: change in population growth rate with increasing additional mortality.

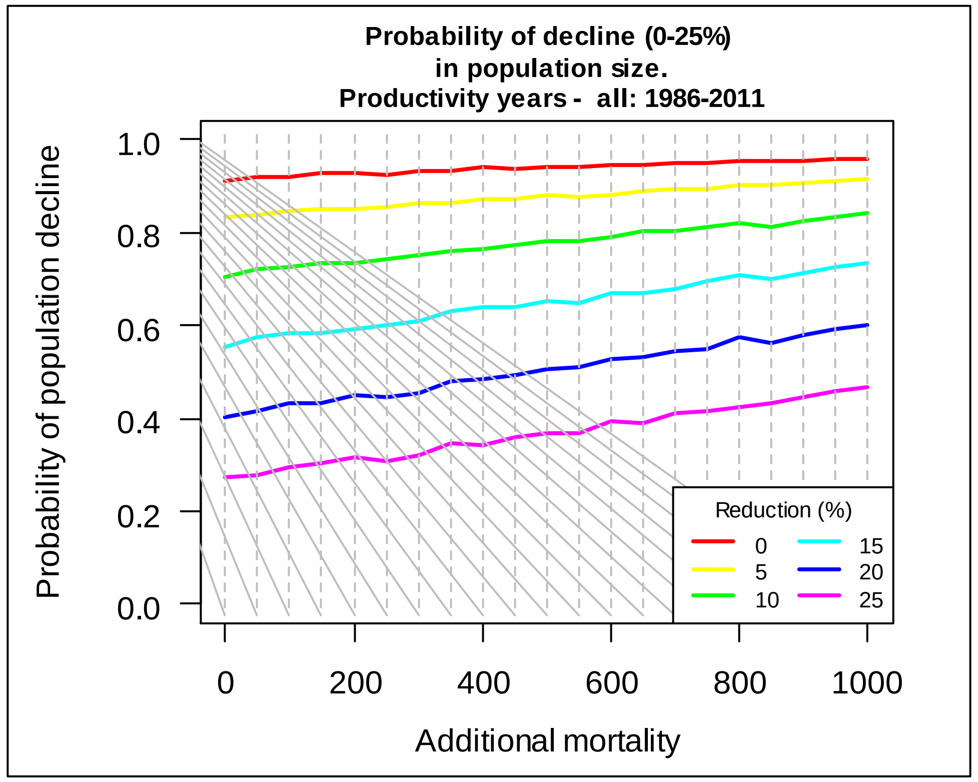


Figure K.15 All years productivity (1986-2011) scenario: probability of population decline with increasing additional mortality.

K.34 With no additional mortality this version of the model predicted a more or less stable population, therefore the risk of population decline is already high (91%) even with no additional mortality. This increased to 96% with additional mortality of 1,000 per year (Figure K.15, red line). The risk of a decline of 25% increased from 27% to 47 % with the same increase in mortality (Figure K.15, purple line).

K.35 The probability that the median population size will be smaller after 25 years than that predicted in the absence of harvest increased from 50% with no mortality (i.e. half of all simulations increase and half decrease), to 73% with an additional annual mortality of 1,000 (Figure K.16, red line), an increase in risk of 23% (Figure K.17). Similar rates of increase in this risk were recorded for the lower population thresholds, although the increase in risk that the population will be 75% of the size of that achieved in the absence of harvest after 25 years was slightly lower at 18% (Figure K.16 and Figure K.17).

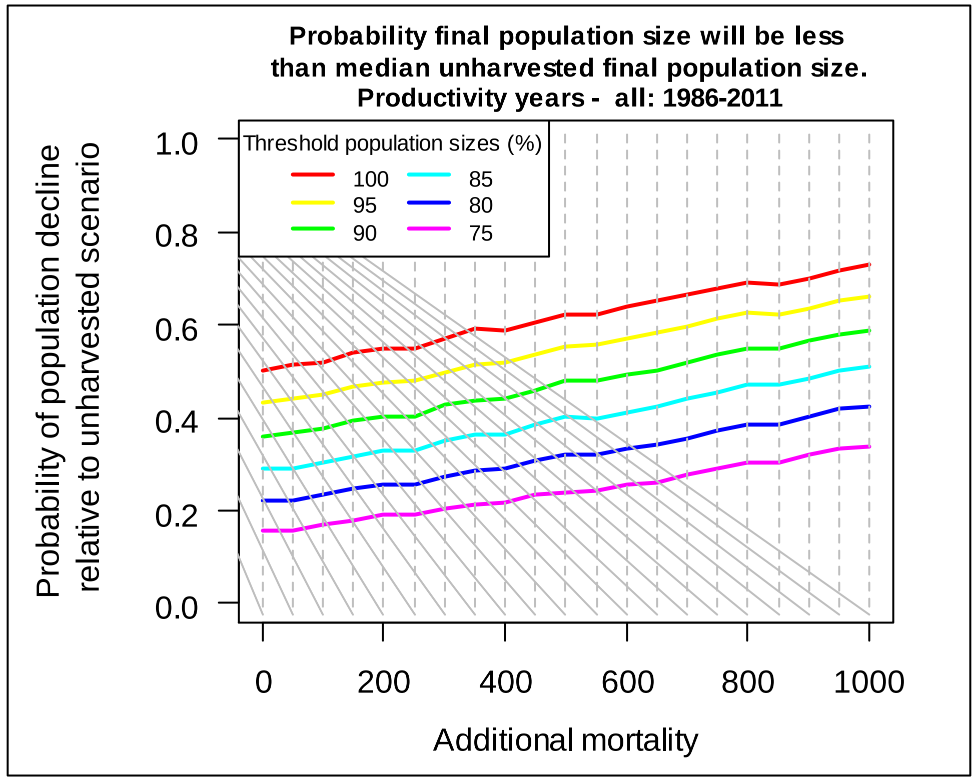


Figure K.16 All years productivity (1986-2011) scenario: probability population in final year of simulation will be less than that achieved in absence of additional mortality.

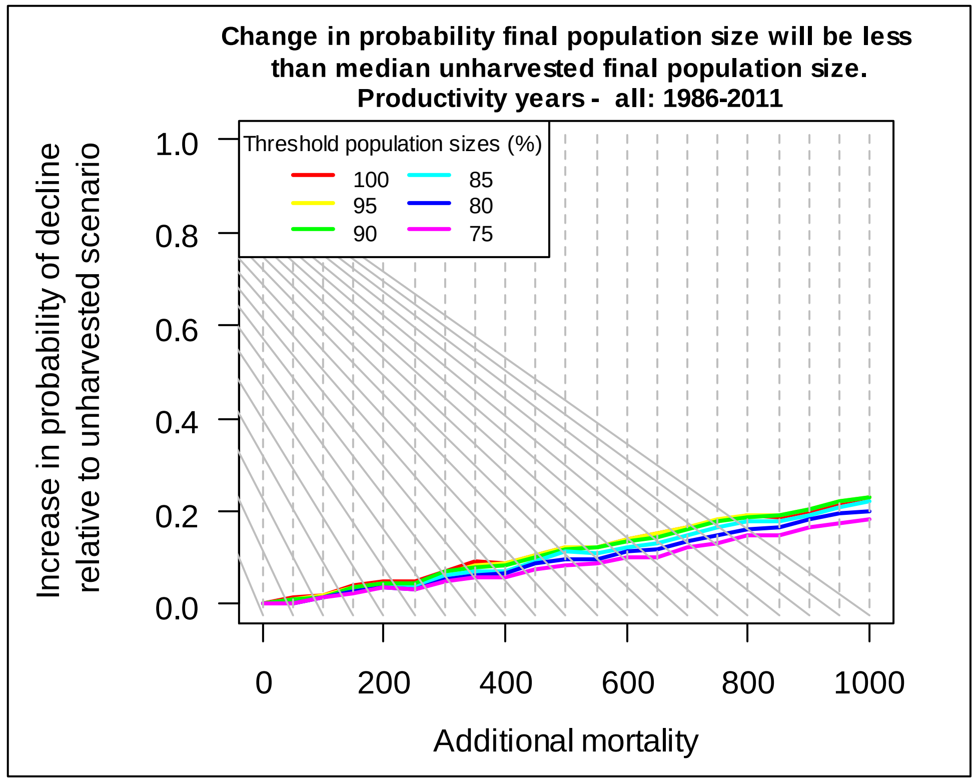


Figure K.17 All years productivity (1986-2011) scenario: increase in probability population in final year of simulation will be less than that achieved in absence of additional mortality.

Discussion

K.36 The population model presented here has used the most suitable data that could be found for the Flamborough Head and Bempton Cliffs SPA population. The only data recorded at the site itself comprise estimates of the number of fledged young per nesting pair, derived from a sample of the breeding colony, and population counts from three years (1987, 2000 and 2008). Kittiwake survival rates have been estimated at several other locations during different periods. The nearest location is South Shields, approximately 130 km to the north. However, these rates came from a study of a new colony which grew to only around 100 pairs, was located in an urban setting and was conducted during the around 40 years ago. Thus the suitability of these data for present purposes was considered to be low. A more recent set of survival rates has been estimated for the Isle of May population in the Firth of Forth, however the conditions experienced by this population during the period of study also potentially restrict their suitability for the focal population. Consequently, to generate survival estimates which were considered most likely to be compatible with the FHB population, the productivity estimates and population counts were used to estimate the constant rates of survival which satisfied the apparent population trends since 1987. In this manner, survival rates which matched the population were derived. It is encouraging that the rates obtained by this method (0.835 and 0.9 for the periods 1987-1999 and 2000-2008, respectively) lie within the range reported from other locations (0.8 – 0.93; Frederiksen *et al.,* 2005). Thus, this approach is considered to have generated reasonable rates for predictive modelling. Likewise, with only limited local data, an estimate for the proportion of adults which breed was taken from another location (Cam *et al.,* 1998). While this may seem potentially unsuitable for use with a different population, within quite a wide range of possible values the model outputs are comparatively insensitive to the rate used, and thus the impact of the value on predictions obtained is small.

K.37 The purpose of modelling was to better understand the likely response of the population to additional mortality. However, absolute predictions provided by population models are not themselves reliable; (WWT 2012) the most appropriate manner for considering the outputs from population modelling is in terms of the differences in predictions between impacted and baseline (no impact) scenarios. Furthermore, in acknowledgement of the uncertainty about which of the three estimated productivity rates was more appropriate, outputs obtained for all three were presented. The changes in population growth rate and the risk of decline predicted by each version of the model in response to the same level of additional mortality were, however, very similar, although the absolute predictions for future population growth (e.g. increasing stable and decreasing) do differ. . Thus, the question of which productivity rate is most suitable becomes of secondary importance and attention can be focussed on the relative magnitude of the predicted impacts, irrespective of model version. Similarly, the value used for the proportion of breeding birds does not have a large influence on the results obtained, and since the focus of comparisons should be on impacted vs. baseline (no impact), whilst keeping this, and other, rates the same, its influence on model predictions is negligible.

K.38 Given the paucity of demographic data for this population, identifying the operation of density dependent regulation was not possible and hence the model was density independent. This does not mean there is no density dependence operating, however without knowing which rates are affected, by what mechanism and the strength of regulation experienced, any attempt to include such a relationship would rely on guesswork and would produce unreliable conclusions. It is also worth noting that using a density independent model introduces an additional precautionary element to the predictions. This is because density dependent models have a means to 'buffer' themselves against negative impacts; if the population size decreases there is a consequent increase in whichever rate has been modelled as density dependent, thereby offsetting the population decline. The model used here has no such means of compensation.

K.39 A further assumption made in the models, which is almost certainly unrealistic, is that the population is closed (or equivalently immigration and emigration are balanced), thus any imbalance in these movement rates will influence the population trajectory. However, we currently have no means to estimate rates of movement in and out of the population. If movement rates become available in the future these can be used to generate estimates of ‘net’ mortality (i.e. the balance of gains and losses due to immigration, emigration and additional mortality) which can then be read off the figures presented in this report to predict the population consequences.

K.40 The reduction in the population growth rate predicted to occur with an additional annual mortality of 1,000 individuals was around 0.8% irrespective of which of the three models was used. Similarly, the predicted increase in the risk of population decline with increasing mortality remained consistent across models. Thus, with an additional mortality of 1,000 birds per year the increase in the risk that the population would be smaller in the final year of the simulation than that achieved in the absence of additional mortality was between 23% and 25%.

REFERENCES

Aitken *et al.,* (2012). Flamborough Head and Bempton Cliffs SPA Seabird Monitoring Programme, 2012 Report. Unpublished RSPB Report, Bempton.

Cam, E., Hines, J.E., Monnat, J., Nichols, J.D. and Danchin, E. (1998). Are adult nonbreeders prudent parents? The kittiwake model. *Ecology*, **79**, 2917-2930.

Caswell, H. (2001). Matrix Population Models: Construction, Analysis, and Interpretation, Second Edition. Sinauer Associates.

Coulson, J.C. and Thomas, C.S. (1985). Changes in the biology of the kittiwake *Rissa tridactyla*: A 31-year study of a breeding colony. *Journal of Animal Ecology*, **54**, 9-26.

Frederiksen, M., Wanless, S., Harris, M.P., Rothery, P. and Wilson, L.J. (2004a). The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. *Journal of Applied Ecology*, **41**, 1129–1139.

Frederiksen, M., Wanless, S. & Harris, M.P. (2004b). Estimating true age–dependence in survival when only adults can be observed: an example with Black–legged Kittiwakes. *Animal Biodiversity and Conservation*, **27.1**, 541-548.

Frederiksen, M., Harris, M. P. and Wanless, S. (2005). Inter-population variation in demographic parameters: a neglected subject? *Oikos*, **111**, 209-214.

Maclean, I.M.D., Frederikson, M. and Rehfisch, M.M. (2007). Potential use of population viability analysis to assess the impact of offshore windfarms on bird populations. BTO Research Report No. 480 to COWRIE. BTO, Thetford.

Morris, W.F. and Doak, D.F. (2002). Quantitative Conservation Biology: the Theory and Practice of Population Viability Analysis. 480pp Sinauer Associates.

Snow, D.W. & Perrins, C.M. (1998). The birds of the western Palearctic. Oxford University Press.

Wooller, R.D. & Coulson, J.C. (1976). Differential survival rates among breeding kittiwake gulls *Rissa tridactyla* (L.). *Journal of Animal Ecology*, **45,** 205-213.

Wooller, R.D. and Coulson, J.C. (2008). Factors affecting the age of first breeding of the kittiwake *Rissa tridactyla*. *Ibis,* **119**, 339-349.

WWT (2012). Developing guidelines on the use of Population Viability Analysis for investigating bird impacts due to offshore wind farms. Report delivered as part of SOSS-04 to The Crown Estate. http://www.bto.org/science/wetland-and-marine/soss/projects

Table K.4 Kittiwake productivity for Flamborough Head and Bempton Cliffs SPA, estimated as fledged young per breeding pair (source: http://jncc.defra.gov.uk/page-2889; except 2000 and 2010, from Aitken *et al.,* 2012).

Year	Productivity (fledged young per breeding pair)
1986	1.130
1987	1.549
1988	0.531
1989	1.211
1990	1.520
1991	1.181
1992	0.931
1993	0.932
1994	0.981
1995	0.950
1996	1.209
1997	0.421
1998	0.872
1999	1.340
2000	1.28
2001	1.112
2002	0.762
2003	0.249
2004	0.169
2005	0.620
2006	0.819
2007	0.829
2008	0.831
2009	0.971
2010	1.17
2011	0.891

Model scenario outputs. Tables of the probability of the simulated population being below the baseline (unharvested) level after 5, 10, 15, 20 and 25 years. Population thresholds set at 100% to 50% (at intervals of 5%).

Table K.5 Probability of population being below unharvested size after 5 years. Productivity derived from early years (1986-1999).

5 years Productivity: 1986-1999	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.357	0.224	0.115	0.051	0.018	0.004	0.001	0.000	0.000	0.000
50	0.502	0.359	0.221	0.119	0.049	0.018	0.004	0.001	0.000	0.000	0.000
100	0.511	0.365	0.228	0.125	0.055	0.021	0.005	0.001	0.000	0.000	0.000
150	0.518	0.371	0.235	0.125	0.057	0.021	0.007	0.001	0.000	0.000	0.000
200	0.521	0.368	0.229	0.121	0.053	0.019	0.005	0.001	0.000	0.000	0.000
250	0.528	0.383	0.247	0.136	0.061	0.021	0.006	0.001	0.000	0.000	0.000
300	0.534	0.381	0.244	0.130	0.059	0.019	0.005	0.001	0.000	0.000	0.000
350	0.538	0.388	0.248	0.137	0.062	0.020	0.005	0.001	0.000	0.000	0.000
400	0.540	0.392	0.256	0.137	0.062	0.023	0.006	0.001	0.000	0.000	0.000
450	0.552	0.399	0.257	0.139	0.063	0.022	0.006	0.001	0.000	0.000	0.000
500	0.551	0.398	0.253	0.142	0.064	0.024	0.007	0.002	0.000	0.000	0.000
550	0.544	0.394	0.255	0.146	0.064	0.023	0.006	0.001	0.000	0.000	0.000
600	0.554	0.406	0.269	0.150	0.073	0.025	0.006	0.002	0.000	0.000	0.000
650	0.561	0.415	0.273	0.149	0.071	0.023	0.006	0.001	0.000	0.000	0.000
700	0.558	0.414	0.270	0.146	0.065	0.025	0.007	0.001	0.000	0.000	0.000
750	0.571	0.426	0.285	0.162	0.075	0.027	0.007	0.001	0.000	0.000	0.000
800	0.573	0.428	0.283	0.159	0.074	0.027	0.007	0.002	0.000	0.000	0.000
850	0.576	0.422	0.284	0.163	0.077	0.027	0.008	0.002	0.000	0.000	0.000
900	0.574	0.424	0.279	0.152	0.076	0.028	0.007	0.002	0.000	0.000	0.000
950	0.590	0.432	0.295	0.172	0.079	0.028	0.007	0.002	0.000	0.000	0.000
1000	0.578	0.430	0.289	0.164	0.077	0.027	0.008	0.001	0.000	0.000	0.000

Table K.6 Probability of population being below unharvested size after 10 years. Productivity based on early years (1986-1999).

10 years Productivity: 1986-1999	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.390	0.282	0.188	0.113	0.055	0.025	0.009	0.003	0.001	0.000
50	0.485	0.376	0.275	0.185	0.109	0.058	0.025	0.008	0.003	0.001	0.000
100	0.504	0.391	0.283	0.186	0.112	0.058	0.028	0.011	0.003	0.000	0.000
150	0.525	0.410	0.302	0.203	0.121	0.066	0.032	0.010	0.004	0.001	0.000
200	0.518	0.403	0.291	0.196	0.118	0.064	0.029	0.010	0.003	0.001	0.000
250	0.528	0.417	0.311	0.213	0.131	0.071	0.035	0.013	0.004	0.001	0.000
300	0.537	0.422	0.311	0.209	0.131	0.071	0.033	0.012	0.004	0.001	0.000
350	0.545	0.433	0.322	0.216	0.136	0.074	0.031	0.012	0.003	0.001	0.000
400	0.546	0.435	0.322	0.220	0.139	0.074	0.035	0.013	0.004	0.001	0.000
450	0.566	0.452	0.336	0.229	0.137	0.073	0.034	0.014	0.005	0.001	0.000
500	0.557	0.451	0.334	0.226	0.137	0.073	0.033	0.012	0.004	0.001	0.000
550	0.572	0.466	0.346	0.233	0.145	0.079	0.038	0.015	0.005	0.001	0.000
600	0.589	0.477	0.356	0.245	0.151	0.081	0.039	0.017	0.006	0.001	0.000
650	0.580	0.468	0.349	0.242	0.153	0.082	0.041	0.015	0.004	0.001	0.000
700	0.589	0.474	0.363	0.258	0.161	0.087	0.041	0.015	0.005	0.001	0.000
750	0.602	0.491	0.373	0.261	0.168	0.098	0.047	0.017	0.006	0.002	0.000
800	0.602	0.485	0.376	0.264	0.166	0.093	0.045	0.016	0.004	0.001	0.000
850	0.608	0.500	0.382	0.268	0.168	0.099	0.046	0.018	0.006	0.001	0.000
900	0.616	0.506	0.386	0.270	0.174	0.095	0.047	0.020	0.006	0.001	0.000
950	0.632	0.515	0.395	0.283	0.180	0.103	0.051	0.020	0.006	0.001	0.000
1000	0.627	0.517	0.403	0.282	0.184	0.105	0.051	0.020	0.007	0.002	0.000

Table K.7 Probability of population being below unharvested size after 15 years. Productivity based on early years (1986-1999).

15 years Productivity: 1986-1999	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.409	0.315	0.230	0.155	0.099	0.052	0.025	0.010	0.003	0.001
50	0.505	0.412	0.321	0.231	0.154	0.094	0.052	0.026	0.011	0.003	0.001
100	0.509	0.417	0.325	0.237	0.163	0.098	0.055	0.027	0.011	0.004	0.001
150	0.520	0.427	0.335	0.250	0.168	0.107	0.062	0.031	0.013	0.004	0.001
200	0.522	0.434	0.338	0.247	0.171	0.107	0.059	0.029	0.011	0.003	0.001
250	0.540	0.452	0.355	0.257	0.180	0.114	0.064	0.031	0.014	0.004	0.001
300	0.543	0.450	0.354	0.268	0.185	0.120	0.068	0.033	0.013	0.004	0.002
350	0.555	0.463	0.369	0.276	0.191	0.122	0.070	0.033	0.013	0.004	0.001
400	0.571	0.476	0.380	0.287	0.199	0.127	0.071	0.035	0.015	0.005	0.002
450	0.581	0.488	0.397	0.298	0.210	0.131	0.077	0.038	0.017	0.006	0.002
500	0.582	0.492	0.391	0.298	0.211	0.135	0.075	0.037	0.016	0.005	0.001
550	0.593	0.501	0.402	0.308	0.215	0.139	0.080	0.044	0.021	0.006	0.001
600	0.602	0.513	0.414	0.311	0.221	0.142	0.083	0.043	0.019	0.007	0.002
650	0.611	0.519	0.422	0.319	0.226	0.142	0.082	0.041	0.019	0.007	0.002
700	0.622	0.526	0.423	0.325	0.229	0.150	0.086	0.046	0.019	0.007	0.002
750	0.634	0.543	0.442	0.343	0.247	0.166	0.098	0.050	0.023	0.010	0.002
800	0.636	0.545	0.448	0.346	0.247	0.165	0.097	0.052	0.023	0.007	0.002
850	0.650	0.556	0.457	0.354	0.260	0.170	0.103	0.051	0.025	0.010	0.003
900	0.657	0.567	0.464	0.359	0.257	0.173	0.102	0.054	0.024	0.011	0.003
950	0.664	0.574	0.474	0.368	0.268	0.180	0.111	0.061	0.029	0.011	0.002
1000	0.671	0.583	0.480	0.381	0.278	0.183	0.113	0.058	0.027	0.009	0.003

Table K.8 Probability of population being below unharvested size after 20 years. Productivity based on early years (1986-1999).

20 years Productivity: 1986-1999	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.420	0.338	0.259	0.186	0.123	0.077	0.044	0.021	0.009	0.003
50	0.512	0.432	0.344	0.260	0.186	0.126	0.081	0.044	0.022	0.010	0.003
100	0.516	0.432	0.347	0.268	0.199	0.134	0.083	0.048	0.023	0.009	0.004
150	0.533	0.449	0.366	0.285	0.208	0.145	0.096	0.054	0.026	0.012	0.004
200	0.541	0.459	0.370	0.286	0.210	0.146	0.092	0.051	0.027	0.011	0.004
250	0.554	0.472	0.389	0.299	0.226	0.158	0.095	0.055	0.027	0.013	0.005
300	0.555	0.473	0.389	0.311	0.231	0.160	0.101	0.058	0.028	0.012	0.005
350	0.569	0.485	0.401	0.315	0.233	0.162	0.104	0.059	0.031	0.013	0.005
400	0.589	0.505	0.420	0.328	0.247	0.176	0.108	0.063	0.032	0.016	0.006
450	0.590	0.507	0.419	0.335	0.252	0.176	0.113	0.068	0.038	0.016	0.007
500	0.605	0.525	0.435	0.347	0.263	0.180	0.117	0.066	0.034	0.015	0.005
550	0.613	0.533	0.445	0.354	0.269	0.188	0.119	0.069	0.038	0.017	0.006
600	0.622	0.544	0.462	0.371	0.285	0.200	0.131	0.079	0.041	0.020	0.007
650	0.628	0.548	0.464	0.378	0.290	0.207	0.137	0.084	0.045	0.020	0.008
700	0.642	0.559	0.476	0.386	0.293	0.215	0.139	0.077	0.040	0.018	0.006
750	0.656	0.580	0.496	0.402	0.309	0.220	0.147	0.089	0.049	0.023	0.009
800	0.665	0.583	0.495	0.398	0.311	0.227	0.158	0.095	0.050	0.022	0.009
850	0.674	0.595	0.511	0.419	0.323	0.237	0.161	0.100	0.052	0.024	0.010
900	0.687	0.606	0.517	0.428	0.335	0.247	0.168	0.105	0.059	0.029	0.011
950	0.695	0.620	0.534	0.441	0.343	0.254	0.175	0.107	0.059	0.029	0.011
1000	0.704	0.625	0.542	0.451	0.358	0.262	0.182	0.110	0.064	0.030	0.012

Table K.9 Probability of population being below unharvested size after 25 years. Productivity based on early years (1986-1999).

25 years Productivity: 1986-1999	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.430	0.355	0.281	0.210	0.150	0.099	0.061	0.033	0.016	0.006
50	0.514	0.433	0.360	0.287	0.216	0.155	0.106	0.065	0.034	0.017	0.007
100	0.528	0.452	0.371	0.295	0.225	0.160	0.107	0.068	0.035	0.019	0.008
150	0.531	0.459	0.382	0.311	0.238	0.173	0.119	0.073	0.042	0.021	0.009
200	0.543	0.471	0.399	0.320	0.248	0.183	0.121	0.075	0.040	0.021	0.010
250	0.553	0.480	0.401	0.326	0.254	0.182	0.126	0.079	0.046	0.023	0.010
300	0.566	0.495	0.415	0.338	0.264	0.195	0.133	0.081	0.048	0.023	0.010
350	0.578	0.505	0.426	0.350	0.274	0.199	0.132	0.085	0.049	0.025	0.012
400	0.596	0.522	0.449	0.369	0.291	0.215	0.148	0.093	0.054	0.028	0.011
450	0.603	0.531	0.455	0.372	0.293	0.220	0.153	0.099	0.060	0.031	0.012
500	0.620	0.548	0.468	0.385	0.306	0.230	0.160	0.101	0.060	0.029	0.012
550	0.630	0.555	0.475	0.393	0.310	0.237	0.166	0.106	0.061	0.030	0.015
600	0.638	0.569	0.494	0.412	0.325	0.246	0.175	0.115	0.067	0.035	0.016
650	0.650	0.578	0.497	0.419	0.341	0.259	0.188	0.123	0.074	0.036	0.016
700	0.663	0.593	0.518	0.436	0.350	0.264	0.188	0.123	0.072	0.038	0.017
750	0.676	0.609	0.532	0.451	0.365	0.278	0.200	0.129	0.080	0.043	0.020
800	0.686	0.617	0.540	0.455	0.369	0.281	0.206	0.143	0.088	0.046	0.022
850	0.696	0.628	0.554	0.474	0.389	0.298	0.215	0.146	0.088	0.048	0.023
900	0.708	0.640	0.564	0.481	0.395	0.314	0.226	0.154	0.095	0.052	0.024
950	0.719	0.653	0.578	0.494	0.407	0.317	0.235	0.159	0.101	0.055	0.026
1000	0.727	0.662	0.588	0.502	0.414	0.327	0.242	0.164	0.103	0.059	0.027

Table K.10 Probability of population being below unharvested size after 5 years. Productivity based on late years (2000-2011).

5 years Productivity: 2000-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.354	0.223	0.120	0.057	0.019	0.006	0.001	0.000	0.000	0.000
50	0.506	0.362	0.232	0.126	0.058	0.020	0.005	0.001	0.000	0.000	0.000
100	0.512	0.375	0.238	0.128	0.057	0.018	0.006	0.001	0.000	0.000	0.000
150	0.521	0.376	0.240	0.130	0.059	0.022	0.005	0.001	0.000	0.000	0.000
200	0.520	0.375	0.236	0.129	0.055	0.020	0.005	0.001	0.000	0.000	0.000
250	0.528	0.389	0.251	0.138	0.061	0.021	0.006	0.000	0.000	0.000	0.000
300	0.529	0.382	0.246	0.138	0.062	0.022	0.005	0.001	0.000	0.000	0.000
350	0.533	0.385	0.254	0.141	0.063	0.024	0.007	0.001	0.000	0.000	0.000
400	0.534	0.389	0.253	0.140	0.063	0.023	0.005	0.001	0.000	0.000	0.000
450	0.553	0.410	0.264	0.145	0.068	0.025	0.008	0.002	0.000	0.000	0.000
500	0.554	0.407	0.267	0.149	0.068	0.024	0.007	0.001	0.000	0.000	0.000
550	0.551	0.406	0.267	0.153	0.071	0.028	0.007	0.001	0.000	0.000	0.000
600	0.558	0.415	0.273	0.158	0.075	0.028	0.006	0.001	0.000	0.000	0.000
650	0.565	0.418	0.275	0.150	0.071	0.026	0.008	0.002	0.000	0.000	0.000
700	0.570	0.422	0.281	0.160	0.078	0.029	0.007	0.002	0.000	0.000	0.000
750	0.579	0.434	0.292	0.164	0.078	0.027	0.006	0.002	0.000	0.000	0.000
800	0.576	0.429	0.279	0.164	0.075	0.027	0.007	0.001	0.000	0.000	0.000
850	0.578	0.431	0.290	0.170	0.077	0.030	0.008	0.001	0.000	0.000	0.000
900	0.583	0.439	0.297	0.167	0.082	0.032	0.008	0.002	0.000	0.000	0.000
950	0.575	0.431	0.289	0.167	0.078	0.029	0.008	0.002	0.000	0.000	0.000
1000	0.590	0.442	0.297	0.172	0.081	0.034	0.008	0.001	0.000	0.000	0.000

Table K.11 Probability of population being below unharvested size after 10 years. Productivity based on late years (2000-2011).

10 years Productivity: 2000-2011	Threshold percentage population size									
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.392	0.286	0.191	0.115	0.061	0.025	0.009	0.003	0.000	0.000
50	0.504	0.393	0.287	0.196	0.117	0.061	0.023	0.008	0.002	0.000	0.000
100	0.517	0.408	0.300	0.204	0.119	0.062	0.029	0.012	0.003	0.001	0.000
150	0.519	0.407	0.300	0.201	0.118	0.060	0.025	0.009	0.003	0.001	0.000
200	0.519	0.411	0.302	0.201	0.121	0.063	0.030	0.012	0.003	0.000	0.000
250	0.536	0.427	0.311	0.208	0.127	0.066	0.029	0.011	0.003	0.000	0.000
300	0.538	0.433	0.318	0.214	0.127	0.069	0.033	0.014	0.004	0.001	0.000
350	0.544	0.434	0.322	0.222	0.133	0.073	0.033	0.012	0.004	0.001	0.000
400	0.548	0.444	0.331	0.220	0.135	0.071	0.032	0.013	0.005	0.001	0.000
450	0.568	0.458	0.347	0.239	0.150	0.082	0.037	0.014	0.005	0.001	0.000
500	0.569	0.459	0.343	0.237	0.149	0.081	0.036	0.015	0.005	0.001	0.000
550	0.574	0.462	0.346	0.240	0.151	0.083	0.038	0.013	0.005	0.001	0.000
600	0.582	0.476	0.361	0.248	0.150	0.083	0.039	0.014	0.004	0.001	0.000
650	0.593	0.486	0.369	0.258	0.162	0.090	0.043	0.018	0.005	0.001	0.000
700	0.607	0.497	0.382	0.269	0.173	0.095	0.047	0.016	0.005	0.001	0.000
750	0.602	0.496	0.380	0.267	0.173	0.099	0.048	0.018	0.006	0.001	0.000
800	0.614	0.503	0.381	0.267	0.171	0.101	0.050	0.020	0.006	0.001	0.000
850	0.628	0.519	0.403	0.285	0.181	0.105	0.056	0.022	0.008	0.002	0.000
900	0.632	0.526	0.408	0.293	0.191	0.112	0.055	0.021	0.005	0.001	0.000
950	0.625	0.515	0.399	0.287	0.188	0.108	0.054	0.022	0.006	0.001	0.000
1000	0.646	0.535	0.419	0.307	0.198	0.116	0.057	0.025	0.008	0.002	0.000

Table K.12 Probability of population being below unharvested size after 15 years. Productivity based on late years (2000-2011).

15 years Productivity: 2000-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.405	0.315	0.229	0.152	0.095	0.050	0.025	0.009	0.003	0.000
50	0.504	0.410	0.319	0.233	0.158	0.097	0.051	0.027	0.011	0.003	0.001
100	0.525	0.432	0.337	0.245	0.168	0.105	0.058	0.028	0.012	0.003	0.001
150	0.523	0.428	0.336	0.246	0.167	0.102	0.059	0.030	0.012	0.004	0.001
200	0.535	0.445	0.349	0.249	0.167	0.105	0.058	0.028	0.012	0.005	0.001
250	0.551	0.455	0.360	0.266	0.181	0.115	0.062	0.028	0.010	0.003	0.001
300	0.561	0.467	0.369	0.271	0.185	0.115	0.066	0.033	0.013	0.005	0.002
350	0.561	0.463	0.371	0.272	0.189	0.124	0.070	0.033	0.013	0.005	0.001
400	0.572	0.477	0.381	0.281	0.194	0.124	0.069	0.034	0.015	0.006	0.002
450	0.594	0.495	0.395	0.297	0.216	0.137	0.079	0.038	0.015	0.005	0.001
500	0.597	0.500	0.400	0.305	0.215	0.138	0.078	0.040	0.016	0.005	0.001
550	0.602	0.509	0.415	0.321	0.229	0.150	0.087	0.047	0.020	0.007	0.003
600	0.611	0.521	0.418	0.317	0.225	0.145	0.086	0.042	0.018	0.006	0.002
650	0.624	0.535	0.439	0.337	0.242	0.160	0.093	0.047	0.020	0.007	0.002
700	0.635	0.545	0.455	0.355	0.255	0.168	0.099	0.050	0.020	0.007	0.003
750	0.640	0.545	0.443	0.345	0.252	0.170	0.101	0.055	0.021	0.009	0.003
800	0.651	0.557	0.462	0.360	0.262	0.170	0.103	0.052	0.023	0.010	0.003
850	0.662	0.575	0.479	0.377	0.273	0.181	0.114	0.063	0.028	0.011	0.003
900	0.680	0.596	0.500	0.394	0.286	0.196	0.119	0.062	0.027	0.010	0.003
950	0.662	0.579	0.485	0.380	0.282	0.193	0.117	0.063	0.028	0.010	0.003
1000	0.688	0.599	0.505	0.400	0.298	0.208	0.126	0.067	0.028	0.011	0.003

Table K.13 Probability of population being below unharvested size after 20 years. Productivity based on late years (2000-2011).

20 years Productivity: 2000-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.415	0.334	0.254	0.186	0.122	0.074	0.042	0.018	0.009	0.003
50	0.503	0.417	0.336	0.256	0.183	0.124	0.073	0.040	0.022	0.009	0.003
100	0.518	0.441	0.356	0.274	0.202	0.135	0.083	0.046	0.019	0.007	0.003
150	0.526	0.446	0.361	0.282	0.206	0.142	0.086	0.049	0.024	0.010	0.004
200	0.538	0.457	0.370	0.286	0.208	0.140	0.090	0.050	0.025	0.010	0.004
250	0.552	0.467	0.384	0.297	0.220	0.151	0.097	0.053	0.026	0.011	0.004
300	0.558	0.477	0.390	0.304	0.222	0.156	0.099	0.058	0.029	0.014	0.004
350	0.566	0.489	0.402	0.316	0.238	0.166	0.106	0.060	0.030	0.013	0.005
400	0.579	0.496	0.414	0.332	0.244	0.170	0.109	0.067	0.036	0.015	0.006
450	0.592	0.513	0.424	0.337	0.257	0.181	0.114	0.067	0.035	0.016	0.005
500	0.600	0.520	0.435	0.349	0.264	0.188	0.120	0.070	0.036	0.016	0.005
550	0.616	0.536	0.449	0.367	0.278	0.199	0.130	0.081	0.041	0.021	0.008
600	0.636	0.552	0.467	0.376	0.284	0.200	0.127	0.075	0.040	0.018	0.007
650	0.637	0.558	0.475	0.387	0.299	0.218	0.144	0.086	0.044	0.019	0.008
700	0.655	0.577	0.492	0.401	0.308	0.226	0.153	0.091	0.049	0.024	0.008
750	0.660	0.580	0.497	0.410	0.316	0.225	0.153	0.092	0.050	0.024	0.009
800	0.676	0.598	0.510	0.417	0.328	0.237	0.159	0.099	0.054	0.026	0.009
850	0.689	0.608	0.520	0.427	0.333	0.251	0.167	0.108	0.061	0.029	0.010
900	0.704	0.632	0.552	0.456	0.361	0.266	0.181	0.112	0.064	0.030	0.011
950	0.694	0.620	0.533	0.442	0.350	0.259	0.175	0.110	0.062	0.030	0.012
1000	0.716	0.639	0.552	0.463	0.368	0.278	0.189	0.121	0.068	0.033	0.015

Table K.14 Probability of population being below unharvested size after 25 years. Productivity based on late (2000-2011).

25 years Productivity: 2000-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.427	0.354	0.280	0.208	0.149	0.098	0.059	0.031	0.015	0.006
50	0.513	0.437	0.360	0.286	0.211	0.152	0.105	0.064	0.033	0.016	0.007
100	0.538	0.462	0.383	0.304	0.231	0.168	0.110	0.067	0.037	0.017	0.007
150	0.535	0.465	0.388	0.313	0.240	0.170	0.116	0.073	0.043	0.022	0.009
200	0.548	0.474	0.402	0.325	0.249	0.181	0.123	0.077	0.040	0.019	0.008
250	0.562	0.488	0.413	0.333	0.257	0.190	0.129	0.081	0.047	0.023	0.010
300	0.577	0.500	0.420	0.340	0.264	0.197	0.135	0.085	0.050	0.025	0.011
350	0.590	0.518	0.439	0.361	0.287	0.213	0.146	0.092	0.054	0.026	0.011
400	0.608	0.536	0.458	0.382	0.298	0.222	0.155	0.096	0.058	0.031	0.014
450	0.622	0.551	0.465	0.386	0.300	0.230	0.160	0.104	0.061	0.030	0.014
500	0.633	0.559	0.480	0.394	0.314	0.235	0.163	0.104	0.059	0.029	0.014
550	0.640	0.571	0.493	0.409	0.327	0.248	0.180	0.120	0.075	0.043	0.019
600	0.660	0.586	0.507	0.424	0.340	0.252	0.181	0.120	0.070	0.038	0.019
650	0.664	0.595	0.523	0.438	0.351	0.272	0.192	0.127	0.078	0.040	0.019
700	0.683	0.615	0.540	0.458	0.373	0.288	0.208	0.139	0.082	0.044	0.020
750	0.687	0.617	0.541	0.464	0.379	0.296	0.212	0.146	0.091	0.046	0.023
800	0.707	0.638	0.561	0.477	0.392	0.305	0.220	0.149	0.093	0.051	0.022
850	0.720	0.658	0.583	0.495	0.405	0.317	0.230	0.156	0.098	0.053	0.027
900	0.730	0.664	0.594	0.514	0.428	0.343	0.257	0.173	0.110	0.060	0.029
950	0.731	0.667	0.594	0.509	0.418	0.334	0.249	0.174	0.107	0.058	0.026
1000	0.749	0.687	0.616	0.531	0.447	0.357	0.272	0.190	0.120	0.066	0.033

Table K.15 Probability of population being below unharvested size after 5 years. Productivity based on all years (1988-2011).

5 years Productivity: 1988-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.361	0.232	0.131	0.060	0.023	0.006	0.001	0.000	0.000	0.000
50	0.499	0.364	0.232	0.131	0.061	0.022	0.006	0.002	0.000	0.000	0.000
100	0.501	0.368	0.244	0.139	0.062	0.023	0.006	0.001	0.000	0.000	0.000
150	0.511	0.372	0.242	0.139	0.066	0.023	0.007	0.001	0.000	0.000	0.000
200	0.519	0.382	0.248	0.145	0.067	0.025	0.006	0.001	0.000	0.000	0.000
250	0.514	0.378	0.248	0.144	0.069	0.025	0.007	0.001	0.000	0.000	0.000
300	0.515	0.383	0.252	0.148	0.072	0.025	0.008	0.002	0.000	0.000	0.000
350	0.523	0.382	0.250	0.147	0.071	0.028	0.008	0.002	0.000	0.000	0.000
400	0.543	0.400	0.261	0.152	0.076	0.030	0.007	0.002	0.000	0.000	0.000
450	0.538	0.399	0.263	0.152	0.073	0.028	0.009	0.002	0.000	0.000	0.000
500	0.535	0.402	0.269	0.157	0.073	0.030	0.009	0.001	0.000	0.000	0.000
550	0.542	0.403	0.270	0.155	0.079	0.029	0.008	0.001	0.000	0.000	0.000
600	0.549	0.413	0.272	0.160	0.077	0.028	0.009	0.002	0.000	0.000	0.000
650	0.550	0.408	0.274	0.163	0.082	0.031	0.008	0.002	0.000	0.000	0.000
700	0.551	0.415	0.274	0.162	0.082	0.032	0.010	0.001	0.000	0.000	0.000
750	0.563	0.421	0.284	0.166	0.082	0.031	0.009	0.002	0.000	0.000	0.000
800	0.552	0.413	0.279	0.164	0.079	0.029	0.007	0.002	0.000	0.000	0.000
850	0.564	0.421	0.285	0.166	0.083	0.032	0.010	0.003	0.000	0.000	0.000
900	0.573	0.434	0.299	0.179	0.089	0.034	0.010	0.003	0.000	0.000	0.000
950	0.574	0.437	0.296	0.171	0.085	0.036	0.012	0.002	0.000	0.000	0.000
1000	0.573	0.433	0.298	0.183	0.092	0.036	0.012	0.003	0.000	0.000	0.000

Table K.16 Probability of population being below unharvested size after 10 years. Productivity based on all years (1988-2011).

10 years Productivity: 1988-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.397	0.295	0.199	0.124	0.068	0.032	0.013	0.005	0.002	0.000
50	0.515	0.405	0.296	0.202	0.121	0.064	0.028	0.010	0.003	0.001	0.000
100	0.518	0.412	0.301	0.204	0.128	0.070	0.031	0.013	0.004	0.001	0.000
150	0.534	0.425	0.314	0.215	0.134	0.073	0.035	0.013	0.005	0.001	0.000
200	0.535	0.428	0.319	0.228	0.140	0.076	0.035	0.013	0.004	0.001	0.000
250	0.521	0.416	0.312	0.214	0.131	0.072	0.035	0.014	0.004	0.001	0.000
300	0.540	0.428	0.322	0.224	0.139	0.078	0.039	0.016	0.006	0.002	0.000
350	0.551	0.444	0.334	0.232	0.149	0.082	0.038	0.015	0.005	0.002	0.000
400	0.561	0.448	0.338	0.233	0.147	0.082	0.040	0.016	0.005	0.001	0.000
450	0.561	0.455	0.350	0.247	0.156	0.086	0.043	0.016	0.005	0.001	0.000
500	0.571	0.464	0.353	0.248	0.159	0.088	0.045	0.019	0.006	0.001	0.000
550	0.571	0.463	0.351	0.250	0.161	0.091	0.045	0.018	0.006	0.002	0.000
600	0.587	0.473	0.365	0.259	0.170	0.098	0.050	0.022	0.009	0.002	0.001
650	0.580	0.471	0.369	0.258	0.167	0.095	0.049	0.020	0.006	0.001	0.000
700	0.594	0.490	0.380	0.270	0.176	0.101	0.050	0.020	0.007	0.001	0.000
750	0.600	0.495	0.381	0.280	0.182	0.104	0.052	0.022	0.008	0.002	0.000
800	0.607	0.502	0.387	0.280	0.182	0.107	0.051	0.022	0.007	0.002	0.000
850	0.607	0.503	0.395	0.289	0.188	0.112	0.055	0.024	0.008	0.001	0.000
900	0.614	0.513	0.403	0.294	0.195	0.114	0.060	0.026	0.008	0.002	0.001
950	0.623	0.517	0.405	0.296	0.197	0.116	0.061	0.027	0.009	0.002	0.000
1000	0.631	0.529	0.409	0.301	0.197	0.118	0.060	0.025	0.008	0.002	0.000

Table K.17 Probability of population being below unharvested size after 15 years. Productivity based on all years (1986-2011).

15 years Productivity: 1986-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.410	0.321	0.241	0.167	0.106	0.061	0.030	0.013	0.004	0.001
50	0.514	0.418	0.327	0.240	0.161	0.101	0.054	0.028	0.013	0.004	0.001
100	0.523	0.430	0.338	0.249	0.174	0.108	0.062	0.031	0.012	0.003	0.001
150	0.533	0.443	0.351	0.261	0.183	0.119	0.069	0.036	0.017	0.006	0.002
200	0.549	0.457	0.361	0.266	0.182	0.122	0.072	0.037	0.015	0.005	0.001
250	0.542	0.451	0.356	0.266	0.186	0.120	0.070	0.034	0.016	0.006	0.001
300	0.552	0.459	0.364	0.276	0.191	0.127	0.075	0.043	0.019	0.008	0.002
350	0.566	0.474	0.378	0.288	0.209	0.137	0.079	0.041	0.018	0.007	0.002
400	0.573	0.482	0.388	0.294	0.209	0.134	0.082	0.044	0.022	0.007	0.002
450	0.587	0.494	0.398	0.306	0.217	0.142	0.086	0.044	0.020	0.006	0.002
500	0.584	0.500	0.405	0.307	0.223	0.150	0.090	0.047	0.022	0.007	0.003
550	0.595	0.508	0.412	0.322	0.230	0.152	0.095	0.051	0.024	0.009	0.003
600	0.609	0.519	0.430	0.333	0.245	0.164	0.099	0.051	0.023	0.008	0.002
650	0.609	0.525	0.424	0.325	0.237	0.158	0.094	0.052	0.025	0.010	0.004
700	0.624	0.535	0.440	0.344	0.252	0.167	0.103	0.055	0.026	0.010	0.003
750	0.636	0.545	0.451	0.353	0.258	0.175	0.108	0.057	0.026	0.009	0.003
800	0.644	0.556	0.455	0.356	0.267	0.180	0.109	0.058	0.026	0.012	0.003
850	0.636	0.548	0.454	0.360	0.267	0.183	0.112	0.064	0.030	0.012	0.004
900	0.654	0.568	0.470	0.373	0.277	0.195	0.123	0.064	0.030	0.012	0.003
950	0.668	0.583	0.490	0.385	0.289	0.203	0.124	0.070	0.034	0.013	0.003
1000	0.675	0.589	0.495	0.397	0.295	0.205	0.128	0.068	0.032	0.012	0.003

Table K.18 Probability of population being below unharvested size after 20 years. Productivity based on all years (1986-2011).

20 years Productivity: 2000-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.418	0.340	0.262	0.191	0.128	0.083	0.046	0.022	0.010	0.004
50	0.516	0.432	0.351	0.262	0.191	0.126	0.078	0.044	0.022	0.009	0.004
100	0.518	0.439	0.357	0.276	0.204	0.141	0.087	0.048	0.027	0.012	0.005
150	0.531	0.450	0.363	0.286	0.215	0.148	0.097	0.059	0.034	0.014	0.006
200	0.542	0.465	0.383	0.302	0.224	0.153	0.100	0.059	0.032	0.014	0.005
250	0.538	0.460	0.379	0.297	0.221	0.152	0.099	0.057	0.030	0.012	0.004
300	0.559	0.481	0.397	0.313	0.233	0.163	0.106	0.064	0.031	0.015	0.006
350	0.572	0.499	0.415	0.332	0.251	0.179	0.113	0.065	0.036	0.016	0.005
400	0.582	0.502	0.421	0.335	0.248	0.177	0.115	0.068	0.038	0.019	0.009
450	0.587	0.509	0.428	0.347	0.265	0.190	0.124	0.072	0.037	0.017	0.007
500	0.607	0.532	0.446	0.358	0.279	0.199	0.134	0.082	0.042	0.020	0.009
550	0.612	0.530	0.448	0.363	0.284	0.203	0.136	0.082	0.046	0.021	0.007
600	0.618	0.546	0.462	0.380	0.295	0.212	0.141	0.086	0.048	0.024	0.009
650	0.628	0.547	0.470	0.381	0.292	0.210	0.144	0.087	0.048	0.023	0.009
700	0.640	0.565	0.481	0.399	0.309	0.229	0.154	0.096	0.056	0.028	0.011
750	0.655	0.577	0.494	0.406	0.317	0.235	0.158	0.100	0.057	0.028	0.011
800	0.667	0.589	0.506	0.415	0.330	0.247	0.173	0.107	0.057	0.027	0.011
850	0.662	0.591	0.506	0.420	0.329	0.242	0.167	0.108	0.059	0.028	0.011
900	0.676	0.602	0.522	0.430	0.340	0.256	0.180	0.117	0.065	0.032	0.013
950	0.690	0.615	0.535	0.449	0.358	0.269	0.184	0.119	0.067	0.034	0.014
1000	0.703	0.625	0.542	0.453	0.360	0.272	0.196	0.125	0.076	0.037	0.017

Table K.19 Probability of population being below unharvested size after 25 years. Productivity based on all late (1986-2011).

25 years Productivity: 1986-2011	Threshold percentage population size										
Additional mortality	**100**	**95**	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**
0	0.500	0.432	0.360	0.291	0.222	0.157	0.106	0.065	0.036	0.018	0.008
50	0.516	0.443	0.369	0.292	0.223	0.159	0.104	0.061	0.035	0.018	0.009
100	0.520	0.449	0.375	0.304	0.236	0.171	0.114	0.071	0.039	0.020	0.009
150	0.542	0.469	0.394	0.318	0.248	0.180	0.125	0.082	0.048	0.024	0.010
200	0.551	0.476	0.403	0.327	0.258	0.192	0.132	0.085	0.049	0.026	0.012
250	0.549	0.478	0.402	0.329	0.255	0.190	0.133	0.082	0.046	0.024	0.011
300	0.572	0.498	0.428	0.352	0.274	0.205	0.143	0.092	0.052	0.025	0.012
350	0.591	0.516	0.439	0.362	0.285	0.213	0.147	0.094	0.055	0.027	0.013
400	0.589	0.518	0.443	0.362	0.290	0.217	0.149	0.098	0.057	0.031	0.014
450	0.604	0.535	0.460	0.384	0.309	0.233	0.164	0.112	0.067	0.035	0.016
500	0.621	0.553	0.479	0.403	0.319	0.241	0.173	0.115	0.068	0.035	0.015
550	0.624	0.556	0.481	0.399	0.319	0.243	0.173	0.116	0.073	0.041	0.018
600	0.640	0.573	0.495	0.412	0.336	0.257	0.188	0.124	0.074	0.041	0.019
650	0.651	0.583	0.503	0.423	0.341	0.259	0.188	0.128	0.076	0.041	0.019
700	0.665	0.596	0.520	0.440	0.357	0.279	0.200	0.139	0.085	0.047	0.023
750	0.680	0.614	0.536	0.455	0.371	0.289	0.217	0.148	0.091	0.052	0.024
800	0.691	0.625	0.548	0.470	0.385	0.304	0.224	0.151	0.093	0.053	0.024
850	0.685	0.622	0.549	0.470	0.387	0.304	0.225	0.156	0.099	0.057	0.026
900	0.700	0.635	0.565	0.484	0.404	0.322	0.243	0.170	0.108	0.060	0.030
950	0.718	0.654	0.581	0.501	0.419	0.332	0.247	0.176	0.111	0.062	0.033
1000	0.730	0.663	0.589	0.511	0.423	0.339	0.255	0.180	0.117	0.067	0.034

Table of Contents

Introduction

SMart Wind Ltd (the applicant) has submitted to the Planning Inspectorate an application for a development consent order (DCO) under section 37 of the Planning Act 2008 (as amended) for the proposed Hornsea Project One Offshore Wind Farm, and associated offshore and onshore electrical infrastructure.

The Secretary of State (SoS) is the competent authority for the purposes of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and The Conservation of Habitats and Species Regulations 2010 (as amended) (the Habitats Regulations) and Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) (“the 2007 Offshore Regulations”).

This report compiles, documents and signposts information from the application. It is issued to ensure that the statutory nature conservation bodies (SNCB’s), Natural England (NE) and the Joint Nature Conservation Committee (JNCC), are consulted and this process may be relied on by the SofS for the purposes of Regulation 61(3) of the Habitats Regulations. This report, and the consultation responses received upon it, will inform the Examining Authority’s report to the SofS as to:

- the implications of the project for the European sites in view of their conservation objectives; and
- whether the integrity of any of the European sites will be adversely affected.

The following documents have been used to inform this report:

Application documents

- Hornsea Offshore Wind Farm Project One Environmental Statement;
- Hornsea Offshore Wind Farm Project One Habitats Regulations Assessment
- To be completed

Representations

To be completed

Hearings

To be completed

Statements of Common Ground

To be completed

Structure of the report

This report is in two parts:

1. Screening Matrices

The first part is a series of screening matrices for the European (Natura 2000) sites that might potentially be affected by the proposed Hornsea Project One Offshore Wind Farm. These matrices collate evidence on whether the project is likely to have significant effects on the key features of each European site.

The applicant’s Habitats Regulations Assessment (HRA) report has screened the European sites listed below for likely significant effects.

2. Integrity Matrices

The second part comprises matrices summarising the anticipated effects on the integrity of the Natura 2000 sites, in the context of their conservation objectives.

Stage 1: Screening for Likely Significant Effects

The project is not connected with or necessary to the management for nature conservation of any of the European sites considered within the assessment. It has been subject to a screening exercise by the applicant for likely significant effects of the project in relation to all of the sites potentially affected.

Potential Impacts

Potential impacts upon the Natura 2000 sites which are considered within the applicant's HRA report are provided in the table below. They have been grouped into broad ecological impacts. Potential impacts upon the European site(s)***** which are considered within the submitted Habitats Regulations Assessment report (Smart Wind, 2013) are provided in the table below. Impacts have been grouped where appropriate for ease of presentation.

* As defined in Advice Note 10.

Table 1: Impacts considered within the screening matrices

Designation	Impacts in submission information	Presented in screening matrices as	Screening Matrix
SPA			
Humber Estuary SPA/Ramsar	Habitat extent: Temporary habitat loss due to cable laying operations in the intertidal and construction of HVDC converter/HVAC substation.	Habitat extent	Matrix 1
	Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of HVDC converter/HVAC substation.	Disturbance and displacement	
	Indirect effects: Temporary reduction or redistribution in prey items for marine mammals/birds due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Indirect effects	
	Collisions with rotating turbine blades may result in direct mortality of birds.	Collision	
	Barrier effects caused by the physical presence of turbines may prevent clear transit of birds between foraging and breeding sites, or on migration.	Barrier	
	Displacement of birds from physical presence of wind turbines during the operational and maintenance phase may result in effective habitat loss and reduction in survival or fitness rates.	Displacement	
Coquet Island SPA	As above for Humber Estuary SPA/Ramsar		Matrix 2
Farne Islands SPA	As above for Humber Estuary SPA/Ramsar		Matrix 3
Hermaness Saxa Vord & Valla Field SPA & Ramsar	Collisions with rotating turbine blades may result in direct mortality of birds.	Collision	Matrix 4
	Barrier effects caused by the physical presence of turbines may prevent clear transit of birds between foraging and breeding sites, or on migration.	Barrier	
	Displacement of birds from physical presence of wind turbines during the operational and maintenance phase may result in effective habitat loss and reduction in survival or fitness rates.	Displacement	
Fetlar SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 5
Ronas Hill – North Roe and Tingon SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 6
Papa Stour SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 7
Noss SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 8
Foula SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 9
Mousa SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 10
Sumburgh Head SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 11
Fair Isle SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 12
Papa Westray SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 13
East Sanday Coast SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 14
West Westray SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 15
Marwick Head SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 16
Calf of Eday SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 17
Rousay SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 18
Auskerry SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 19
Orkney Mainland Moors SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 20
Copinsay SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 21
Hoy SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 22

Designation	Impacts in submission information	Presented in screening matrices as	Screening Matrix
Pentland Firth Islands SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 23
North Caithness Cliffs SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 24
East Caithness Cliffs SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 25
Dornoch Firth & Loch Fleet SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 26
Cromarty Firth SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 27
Inner Moray Firth SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 28
Moray and Nairn Coast SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 29
Troup Penan and Lion's Heads SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 30
Loch of Strathbeg SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 31
Buchan Ness to Collieston Coast SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 32
Ythan Estuary, Sands of Forvie and Meikle Loch SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 33
Fowlsheugh SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 34
Montrose Basin SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 35
Firth Tay & Eden Estuary SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 36
Forth Islands SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 37
Firth of Forth SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 38
Imperial Dock Lock, Leith SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 39
St Abb's Head to Fast Castle SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 40
Lindisfarne SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 41
Northumbria Coast SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 42
Teesmouth and Cleveland SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 43
Flamborough Head and Bempton Cliffs SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 44
Hornsea Mere SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 45
Gibraltar Point SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 46
The Wash SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 47
North Norfolk Coast SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 48
Breydon Water SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 49
Great Yarmouth and North Denes SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 50
Broadland SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 51
Minsmere and Walberswick SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 52
Alde Ore Estuary SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 53
Stour and Orwell Estuaries SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 54
Hamford Water SPA and Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 55
Colne Estuary SPA and Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 56
Foulness SPA and Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 57
Abberton Reservoir SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 58
Blackwater Estuary SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 59
Dengie Marshes SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 60
Benfleet and Southend Marshes SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 61
Thames Estuary Marshes SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 62
Medway Estuary SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 63
Swale Estuary SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 64
Thanet Coast and Sandwich Bay SPA & Ramsar	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 65
Outer Thames Estuary SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 66
Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 67
Östliche Deutsche Bucht SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 68

Designation	Impacts in submission information	Presented in screening matrices as	Screening Matrix
Sylter Aussenriff (Sylt Outer Reef) SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 69
Seevogelschutzgebiet Helgoland SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 70
Borkum-Riffgrund SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 71
Littoral Seino-Marin SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 72
Baie de Seine Occidentale SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 73
Falaise du Bessin Occidental SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 74
Frisian Front SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 75
Waddenzee (Wadden Sea) SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 76
Voordelta SPA	As for Hermaness Saxa Vord & Valla Field SPA & Ramsar		Matrix 77
SAC / SCI			
Humber Estuary SAC and Ramsar	Extent: Temporary habitat loss during cable laying operations in the intertidal.	Habitat extent	Matrix 78
	Extent: Temporary habitat disturbance due to access to the intertidal during the operational phase for routine inspections of export cables in the intertidal.		
	Water quality: Temporary increase in suspended sediments, resuspension of sediment bound contaminants and smothering during cable laying.	Water quality	
	River morphology: Disruption of fish migratory pathways, or creation of artificial barriers during cable laying operations and operational phase (i.e. Electromagnetic Fields (EMF)).	Disruption to migration	
	Marine Mammals: Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.	Injury/Disturbance	
	Marine Mammals: Behavioural disturbance from underwater noise from vessel noise and other activities.		
	Marine Mammals: Physical injury from increased risk of collision with vessels.	Collision risk	
	Marine Mammals: Change in prey (fish) species distribution and/or abundance (indirect effect).	Change in prey species distribution/abundance	
River Derwent SAC	Annex I habitats: no impacts.	N/A	Matrix 79
	Water quality: Temporary increase in suspended sediments during cable laying in the Humber Estuary. River morphology: Disruption of migratory pathways, or creation of artificial barriers during cable laying operations and operational phase (i.e. EMF).	Disruption to migration	
Moray Firth SAC	Annex I habitats: no impacts.	N/A	Matrix 80
	Marine Mammals: Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.	Injury/Disturbance	
	Marine Mammals: Behavioural disturbance from underwater noise from vessel noise and other activities.		
	Marine Mammals: Physical injury from increased risk of collision with vessels.	Collision risk	

Designation	Impacts in submission information	Presented in screening matrices as	Screening Matrix
	Marine Mammals: Change in prey (fish) species distribution and/or abundance (indirect effect).	Change in prey species distribution/abundance	
Firth of Tay and Eden Estuary SAC	Annex I habitats: no impacts.	N/A	Matrix 81
	Marine Mammals: Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.	Injury/Disturbance	
	Marine Mammals: Behavioural disturbance from underwater noise from vessel noise and other activities.		
	Marine Mammals: Physical injury from increased risk of collision with vessels.	Collision risk	
	Marine Mammals: Change in prey (fish) species distribution and/or abundance (indirect effect).	Change in prey species distribution/abundance	
Berwickshire and North Northumberland Coast SAC	As for Moray Firth SAC		Matrix 82
Flamborough Head SAC	Annex I habitats: no impacts.	N/A	Matrix 83
Dogger Bank cSAC	As for Flamborough Head SAC		Matrix 84
The Wash and North Norfolk Coast SAC	As for Moray Firth SAC		Matrix 85
Haisborough, Hammond and Winterton cSAC/SCI	Annex I habitats: no impacts.	N/A	Matrix 86
North Norfolk Sandbanks and Saturn Reef cSAC/SCI	As for Haisborough, Hammond and Winterton cSAC/SCI		Matrix 87
Inner Dowsing, Race Bank and North Ridge cSAC/SCI	As for Haisborough, Hammond and Winterton cSAC/SCI		Matrix 88
SBZ 1 / ZPS 1 (Belgium) SCI	Annex I habitats: no impacts.	N/A	Matrix 89
	Annex I migratory bird species: no impacts.	N/A	
	Annex II migratory fish species: no impacts.	N/A	
	Marine Mammals: Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.	Injury/Disturbance	
	Marine Mammals: Behavioural disturbance from underwater noise from vessel noise and other activities.		
	Marine Mammals: Physical injury from increased risk of collision with vessels.	Collision risk	
	Marine Mammals: Change in prey (fish) species distribution and/or abundance (indirect effect).	Change in prey species	
SBZ 2 / ZPS 2 (Belgium) SCI	As for SBZ 1 / ZPS 1 SCI		Matrix 90
SBZ 3 / ZPS 3 (Belgium) SCI	As for SBZ 1 / ZPS 1 SCI		Matrix 91
Vlakte van de Raan (Belgium) pSCI	As for SBZ 1 / ZPS 1 SCI		Matrix 92
NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)	As for SBZ 1 / ZPS 1 SCI		Matrix 93
Doggerbank SCI (Germany)	As for SBZ 1 / ZPS 1 SCI (except Annex II migratory fish)		Matrix 94
Östliche Deutsche Bucht SCI (Germany)	As for SBZ 1 / ZPS 1 SCI		Matrix 95
Sylter Außenriff SCI (Germany)	As for SBZ 1 / ZPS 1 SCI		Matrix 96
Steingrund SCI (Germany)	As for SBZ 1 / ZPS 1 SCI (except Annex II migratory fish)		Matrix 97
Helgoland mit Helgoländer Felssockel SCI (Germany)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 98
Hamburgisches Wattenmeer SCI (Germany)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 99
Unterelbe SCI (Germany)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 100
Borkum-Riffgrund SAC (Germany)	As for SBZ 1 / ZPS 1 SCI		Matrix 101
Nationalpark Niedersächsisches Wattenmeer SCI (Germany)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 102
Venø, Venø Sund SAC (Denmark)	As for SBZ 1 / ZPS 1 SCI (except Annex II migratory fish)		Matrix 103

Designation	Impacts in submission information	Presented in screening matrices as	Screening Matrix
Dråby Vig SAC (Denmark)	As for SBZ 1 / ZPS 1 SCI		Matrix 104
Løgstør Bredning, Vejlerne og Bulbjerg SAC (Denmark)	As for SBZ 1 / ZPS 1 SCI		Matrix 105
Gule Rev SAC (Denmark)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 106
Sydlige Nordsø SAC (Denmark)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 107
Estuaires Et Littoral Picards (baies de Somme et d'Authie) pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 108
Estuaire de la Seine pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 109
Rècifs et landes de la Hague pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 110
Rècifs et marais arrière-littoraux du Cap Lèvi à la Pointe de Saire pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 111
Banc et rècifs de Surtainville pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 112
Anse de Vauville pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 113
Baie de Seine occidentale SCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 114
Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 115
Bancs des Flandres pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 116
Recifs Gris-nez Blanc-nez pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 117
Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 118
Baie de canche et couloir des trois estuaires pSCI (France)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 119
Doggersbank pSCI (Netherlands)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 120
Klaverbank pSCI (Netherlands)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds and Annex II migratory fish)		Matrix 121
Vlakte van de Raan SAC (Netherlands)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 122
Noordzeekustzone SAC (Netherlands)	As for SBZ 1 / ZPS 1 SCI		Matrix 123
Noordzeekustzone II pSCI (Netherlands)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 124
Waddenzee (Wadden Sea) SCI (Netherlands)	As for SBZ 1 / ZPS 1 SCI (except Annex I migratory birds)		Matrix 125

Screening Matrices

The European sites included within the applicant's assessment and the likely significant effects on their qualifying features are detailed within the screening matrices below. Under each table a set of evidence footnotes is provided which outline the evidence on which the decision of likely significant effects has been based. This evidence has come from the documents listed in the introduction to this report. Evidence for likely significant effects on their qualifying features is detailed within the footnotes to the screening matrices below.

The European Sites included within the Applicant's assessment are:

SPAs/Ramsar Sites
The Humber Estuary SPA and Ramsar
Coquet Island SPA
Farne Islands SPA
Hermaness Saxa Vord & Valla Field SPA & Ramsar
Fetlar SPA & Ramsar
Ronas Hill – North Roe and Tingon SPA & Ramsar
Papa Stour SPA
Noss SPA
Foula SPA
Mousa SPA
Sumburgh Head SPA
Fair Isle SPA
Papa Westray SPA
East Sanday Coast SPA & Ramsar
West Westray SPA
Marwick Head SPA
Calf of Eday SPA
Rousay SPA
Auskerry SPA
Orkney Mainland Moors SPA
Copinsay SPA
Hoy SPA
Pentland Firth Islands SPA
North Caithness Cliffs SPA
East Caithness Cliffs SPA
Dornoch Firth & Loch Fleet SPA & Ramsar
Cromarty Firth SPA & Ramsar
Inner Moray Firth SPA & Ramsar
Moray and Nairn Coast SPA & Ramsar
Troup Penan and Lion's Heads SPA
Loch of Strathbeg SPA & Ramsar
Buchan Ness to Collieston Coast SPA
Ythan Estuary, Sands of Forvie and Meikle Loch SPA & Ramsar
Fowlsheugh SPA
Montrose Basin SPA & Ramsar
Firth Tay & Eden Estuary SPA & Ramsar
Forth Islands SPA
Firth of Forth SPA & Ramsar
Imperial Dock Lock, Leith SPA
St Abb's Head to Fast Castle SPA
Lindisfarne SPA & Ramsar
Northumbria Coast SPA & Ramsar
Flamborough Head and Bempton Cliffs SPA & Ramsar
Hornsea Mere SPA
The Humber Estuary SPA & Ramsar
Gibraltar Point SPA & Ramsar
The Wash SPA & Ramsar
North Norfolk Coast SPA & Ramsar
Breydon Water SPA
Great Yarmouth and North Denes SPA
Broadland SPA & Ramsar
Minsmere and Walberswick SPA & Ramsar
Alde Ore Estuary SPA & Ramsar
Stour and Orwell Estuaries SPA & Ramsar
Hamford Water SPA and Ramsar
Colne Estuary SPA and Ramsar
Foulness SPA and Ramsar
Abberton Reservoir SPA & Ramsar
Blackwater Estuary SPA & Ramsar
Dengie Marshes SPA & Ramsar
Benfleet and Southend Marshes SPA & Ramsar
Thames Estuary Marshes SPA
Medway Estuary SPA & Ramsar
Swale Estuary SPA & Ramsar
Thanet Coast and Sandwich Bay SPA & Ramsar
Outer Thames Estuary SPA
Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete
Östliche Deutsche Bucht SPA
Sylter Aussenriff (Sylt Outer Reef) SPA
Seevogelschutzgebiet Helgoland SPA
Borkum-Riffgrund SPA
Littoral Seino-Marin SPA
Baie de Seine Occidentale SPA
Falaise du Bessin Occidental SPA
Frisian Front SPA
Waddenzee (Wadden Sea) SPA
Voordelta SPA

SACs/SCIs
Moray Firth SAC
Firth of Tay and Eden Estuary SAC
Berwickshire and North Northumberland Coast SAC
Humber Estuary SAC and Ramsar
Flamborough Head SAC
Dogger Bank cSAC
The Wash and North Norfolk Coast SAC
River Derwent SAC
Haisborough, Hammond and Winterton cSAC

North Norfolk Sandbanks and Saturn Reef cSAC
Inner Dowsing, Race Bank and North Ridge cSAC
SBZ 1 / ZPS 1 (Belgium) SCI
SBZ 2 / ZPS 2 (Belgium) SCI
SBZ 3 / ZPS 3 (Belgium) SCI
Vlakte van de Raan (Belgium) pSCI
NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)
Doggerbank SCI (Germany)
Östliche Deutsche Bucht SCI (Germany)
Sylter Außenriff SCI (Germany)
Steingrund SCI (Germany)
Helgoland mit Helgoländer Felssockel SCI (Germany)
Hamburgisches Wattenmeer SCI (Germany)
Unterelbe SCI (Germany)
Borkum-Riffgrund SAC (Germany)
Nationalpark Niedersächsisches Wattenmeer SCI (Germany)
Venø, Venø Sund SAC (Denmark)
Dråby Vig SAC (Denmark)
Løgstør Bredning, Vejlerne og Bulbjerg SAC (Denmark)
Gule Rev SAC (Denmark)
Sydlige Nordsø SAC (Denmark)
Estuaires Et Littoral Picards (baies de Somme et d'Authie) pSCI (France)
Estuaire de la Seine pSCI (France)
Rècifs et landes de la Hague pSCI (France)
Rècifs et marais arri**è**re-littoraux du Cap L**è**vi à la Pointe de Saire pSCI (France)
Banc et rècifs de Surtainville pSCI (France)
Anse de Vauville pSCI (France)
Baie de Seine occidentale SCI (France)
Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)
Bancs des Flandres pSCI (France)
Recifs Gris-nez Blanc-nez pSCI (France)
Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)
Baie de canche et couloir des trois estuaires pSCI (France)
Doggersbank pSCI (Netherlands)
Klaverbank pSCI (Netherlands)
Vlakte van de Raan SAC (Netherlands)
Noordzeekustzone SAC (Netherlands)
Noordzeekustzone II pSCI (Netherlands)
Waddenzee (Wadden Sea) SCI (Netherlands)

Matrix Key:

✓ = Likely significant effect **cannot** be excluded
✕ = Likely significant effect **can** be excluded

C = construction
O = operation
D = decommissioning

[grey cell] Some cells have been greyed out because the potential impacts did not appear to be relevant to those individual features.

Stage 1 Matrix 1: Humber Estuary SPA and Ramsar

Name of European site: Humber Estuary SPA and Ramsar

Distance to Hornsea Project One: 0 km

European site features	Likely Effects of Project One																				
	Habitat extent			Disturbance and displacement			Indirect effects			Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Bittern – Breeding and wintering	×a		×aa	×a		×aa	×a		×aa		×bb			×bb			×bb		×a	×qq	×aa
Marsh harrier – Breeding	×b		×aa	×b		×aa	×b		×aa		×bb			×bb			×bb		×b	×qq	×aa
Avocet – Breeding and wintering	×c		×aa	×c		×aa	×c		×aa		×bb			×bb			×bb		×c	×qq	×aa
Little tern – Breeding	×d		×aa	×d		×aa	×d		×aa		×dd			×ff			×gg		×d	×qq	×aa
Hen harrier – Wintering	×e		×aa	×e		×aa	×e		×aa		×bb			×bb			×bb		×e	×qq	×aa
Bar-tailed godwit – Wintering and on passage	✓f		×aa	✓f		×aa	✓f		×aa		×hh			×cc			×ee		✓ss	×qq	×aa
Golden plover – Wintering	✓g		×aa	✓g		×aa	✓g		×aa		×bb			×cc			×dd		✓ss	×qq	×aa
Ruff – On passage	×h		×aa	×h		×aa	×h		×aa		×bb			×bb			×bb		×h	×qq	×aa
Dunlin – Over winter and on passage	✓i		×aa	✓i		×aa	✓i		×aa		×dd			×cc			×ee		✓ss	×qq	×aa
Knot – Over winter and on passage	✓j		×aa	✓j		×aa	✓j		×aa		×dd			×cc			×ee		✓ss	×qq	×aa
Black-tailed godwit – Over winter and on passage	×k		×aa	×k		×aa	×k		×aa		×bb			×bb			×bb		×k	×qq	×aa
Shelduck – Over winter	×l		×aa	×l		×aa	×l		×aa		×bb			×bb			×bb		×l	×qq	×aa
Redshank – Over winter and on passage	✓m		×aa	✓m		×aa	✓m		×aa		×bb			×bb			×bb		✓ss	×qq	×aa
Teal – Over winter (assemblage)	×n		×aa	×n		×aa	×n		×aa		×ii			×cc			×ee		×n	×qq	×aa
Wigeon – Over winter (assemblage)	×o		×aa	×o		×aa	×o		×aa		×jj			×kk			×ll		×o	×qq	×aa
Mallard – Over winter (assemblage)	×p		×aa	×p		×aa	×p		×aa		×bb			×cc			×ee		×p	×qq	×aa
Turnstone – Over winter (assemblage)	×q		×aa	×q		×aa	×q		×aa		×dd			×cc			×ee		×q	×qq	×aa
Pochard – Over winter (assemblage)	×a		×aa	×a		×aa	×a		×aa		×dd			×cc			×ee		×a	×qq	×aa
Greater scaup – Over winter (assemblage)	×a		×aa	×a		×aa	×a		×aa		×bb			×bb			×bb		×a	×qq	×aa
Dark-bellied brent goose – Over winter (assemblage)	✓r		×aa	✓r		×aa	✓r		×aa		×mm			×nn			×ee		✓ss	×qq	×aa
Goldeneye – Over winter (assemblage)	×a		×aa	×a		×aa	×a		×aa		×bb			×bb			×bb		×a	×qq	×aa
Sanderling – Over winter and on passage (assemblage)	✓s		×aa	✓s		×aa	✓s		×aa		×bb			×bb			×bb		✓ss	×qq	×aa

Name of European site: Humber Estuary SPA and Ramsar																					
Distance to Hornsea Project One: 0 km																					
European site features	**Likely Effects of Project One**																				
	Habitat extent			Disturbance and displacement			Indirect effects			Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Ringed plover – Over winter and on passage (assemblage)	**✓t**		**✗aa**	**✓t**		**✗aa**	**✓t**		**✗aa**		**✗dd**			**✗cc**			**✗ee**		**✓ss**	**✗qq**	**✗aa**
Oystercatcher – Over winter (assemblage)	**✓u**		**✗aa**	**✓u**		**✗aa**	**✓u**		**✗aa**		**✗dd**			**✗cc**			**✗ee**		**✓ss**	**✗qq**	**✗aa**
Curlew – Over winter (assemblage)	**✗v**		**✗aa**	**✗v**		**✗aa**	**✗v**		**✗aa**		**✗oo**			**✗cc**			**✗ee**		**✗v**	**✗qq**	**✗aa**
Whimbrel – Over winter (assemblage)	**✗w**		**✗aa**	**✗w**		**✗aa**	**✗w**		**✗aa**		**✗pp**			**✗cc**			**✗ee**		**✗w**	**✗qq**	**✗aa**
Grey plover – Over winter (assemblage)	**✓x**		**✗aa**	**✓x**		**✗aa**	**✓x**		**✗aa**		**✗bb**			**✗cc**			**✗ee**		**✓ss**	**✗qq**	**✗aa**
Greenshank – Over winter (assemblage)	**✗y**		**✗aa**	**✗y**		**✗aa**	**✗y**		**✗aa**		**✗bb**			**✗bb**			**✗bb**		**✗y**	**✗qq**	**✗aa**
Lapwing – Over winter (assemblage)	**✗z**		**✗aa**	**✗z**		**✗aa**	**✗z**		**✗aa**		**✗qq**			**✗rr**			**✗ee**		**✗z**	**✗qq**	**✗aa**

Evidence supporting conclusions

a. No LSE as no bitterns were recorded during surveys. Habitat surrounding cable landfall, onshore cable route corridor and HVDC converter/HVAC substation is unsuitable for this species (Ref: **Table 4.11** of HRA).

b. No LSEs alone or in-combination as cable landfall area is unsuitable breeding habitat for this species. Recorded single individuals are probably passage or wandering individuals and area is of little importance to SPA population. No LSE for onshore cable route corridor and HVDC converter/HVAC substation as there was no evidence of feeding or roosting during surveys (Ref: **Table 4.11** of HRA).

c. No LSEs alone or in-combination as this species is largely absent from the Horseshoe Point landfall site due to unsuitable habitat (peak of 0.3% of current SPA population). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

d. No LSEs alone or in-combination as this species no longer breeds in the vicinity of Horseshoe Point landfall site, with the small number of individuals recorded during WeBS counts only likely to be loafing or feeding offshore away from the nearest colonies. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

e. No LSEs alone or in-combination as the sandy substrate at Horseshoe Point is unsuitable for foraging hen harrier, although with occasional individuals recorded during baseline surveys, the area may form a minor part of the wintering range of the SPA population. Birds disperse from roost sites during daylight hours so are unlikely to be affected by activities. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

f. Potential for LSEs as the species is known to roost near the cable landfall site in numbers that are potentially significant in the context of the SPA population (up to 13% of current SPA value, although numbers appear to be highly variable between and within years). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

g. Potential for LSEs as the species was found near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<16% of current value), despite considerable growth since the citation figure. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

h. No LSEs alone or in-combination as the species is found predominantly on the north estuary, and only a small number of individuals (peak count of 3) have been recorded briefly within the cable landfall site area on passage or over winter. Not significant within the context of the SPA population. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

i. Potential for LSEs as the species was found near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<10%), particularly since there is evidence of decline since the citation figure. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

j. Potential for LSEs as the species was found near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<7.8% of passage citation), despite growth since the citation figure. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

k. No LSEs alone or in-combination as very small peak numbers within the context of cited and current SPA populations, during all surveys, were recorded in the vicinity of the cable landfall site, indicating that the area is of unsuitable habitat and little significance to this species at an SPA level. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

l. No LSEs alone or in-combination for this species as numbers are increasing within the SPA and peak counts suggest that the population within the potential zone of influence of the cable landfall site is insignificant (<1%) compared to the cited SPA population, and that the habitat is unsuitable. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

m. Potential for LSEs. Although peak numbers in the area of the cable landfall site are relatively low compared to the overall SPA passage and wintering populations (<2%), the species has undergone a recent decline in numbers, and so significant effects cannot be ruled out at this stage. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

n. No LSEs alone or in-combination for this species, as low numbers recorded during surveys suggest that the area of the cable landfall site is of little importance in the context of the SPA (<0.2% of population) and the habitat is unsuitable. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

o. No LSEs alone or in-combination for this species. Wigeon are distributed widely across the whole estuary, and despite an apparent decrease in overall numbers, the area around the cable landfall site appears to be of little importance within the context of the SPA population (<0.3%), and the habitat is unsuitable. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

p. No LSEs alone or in-combination for this species. Mallard are distributed widely across the whole estuary, and despite an apparent sharp decline in overall numbers, the area around the cable landfall site appears to be an unfavoured habitat and of little importance within the context of the SPA population (<0.1%). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

q. No LSEs alone or in-combination. WeBS surveys generally recorded low numbers, although recent surveys in the vicinity of the cable landfall site recorded higher numbers in late October. This however appeared to be a brief occurrence, as numbers were very low during the remainder of the survey period and habitat is generally unsuitable as the species prefers more rocky shorelines. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

r. Potential for LSEs as the species was found near the cable landfall site in numbers that are potentially significant (<18% of current SPA population) in the context of the cited SPA population (although there has been a large growth in SPA population since). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

s. Potential for LSEs as the species was found roosting near the cable landfall site in numbers that are potentially significant in the context of the SPA population (<15% of current SPA population). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

t. Potential for LSEs. The species was recorded in high numbers on passage and possibly over winter, (<4.8% of current SPA population) and although the SPA population appears to have stabilised over the recent past, a significant effect cannot be ruled out at this stage. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

u. Potential for LSEs. The species was recorded in very high numbers within the context of the SPA population (<91% of current population). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

v. No LSEs alone or in-combination for this species. The cable landfall site is not within a recognised key feeding or roosting area within the SPA, and in general peak numbers found close to this site are unlikely to be important in the context of the SPA population (<1.7% of current population recorded within the Horseshoe Point survey area). Converter station habitats outside of the SPA do not appear to provide significant functional support for curlew (i.e. not important as an important feeding or roost site) (Ref: **Table 4.11** of HRA).

w. No LSEs alone or in-combination for this species, as peak counts were very low during all surveys, with a peak of four birds during low tide counts in the vicinity of the cable landfall site. Only recorded on one occasion near to the converter station site. Only recorded on one occasion near to the converter station site (Ref: **Table 4.11** of HRA).

x. Potential for LSEs. Although SPA numbers appear to have increased since the citation date, peak survey counts during brief passage periods were relatively high (<31% of current SPA population) and distributed throughout the Horseshoe Point survey area, and so a LSE cannot be discounted. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

y. No LSEs alone or in-combination for this species. Although up to seven individuals were recorded near the cable landfall site in late August and September, these were the only surveys where this species was recorded. Birds are therefore likely only to be briefly on-site during passage periods. No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

z. No LSEs alone or in-combination. Although the wider Grainthorpe area (to the south) appears to hold significant numbers, evidence from surveys at Horseshoe Point suggests that closer to the cable landfall site, numbers are much lower and unlikely to be important within the context of the SPA population (<1.9% of current SPA population). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.11** of HRA).

aa. No LSE during the decommissioning phase (either alone or in-combination) as cables are likely to remain in situ (Ref: **Section 2.5 of HRA**).

bb. These species were recorded at very low abundances or not recorded during Project One surveys (Ref: **Annex A, Table A45**).

cc. These species may fly around the wind farm, though the incremental increase in flight distance to the SPA is likely to be negligible (Ref: **Annex A, Table A45**).

dd. These species were recorded at low abundances and flying at low levels (i.e. below rotor height) and therefore are not at risk of collision (Ref: **Annex A, Table A45**).

ee. No birds were recorded using the area and no displacement effects are predicted (Ref: **Annex A, Table A45**).

ff. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006) (Ref: **Annex A, Table A45**).

gg. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006) (Ref: **Annex A, Table A45)**.

hh. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect (Ref: **Annex A, Table A45**).

ii. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision (Ref: **Annex A, Table A45**).

jj. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (Ref: **Annex A, Table A45**).

kk. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small (Ref: **Annex A, Table A45**).

ll. All wigeon were recorded in flight and none were seen using the Hornsea Project One. Therefore no displacement effects will occur (Ref: **Annex A, Table A45**).

mm. A total of 7 dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (Ref: **Annex A, Table A45**).

nn. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds (Ref: **Annex A, Table A45**).

oo. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low (Ref: **Annex A, Table A45**).

pp. Eleven out of a total of 49 whimbrel recorded were in the Hornsea Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect (Ref: **Annex A, Table A45**).

qq. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant (Ref: **Annex A, Table A45**).

rr. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated (Ref: **Annex A, Table A45**).

ss. Plans/projects with potential for LSE on qualifying features in-combination with Project One infrastructure within the Humber Estuary and onshore include: Land at Bishopthorpe Farm Newton Marsh Wind Farm Extension, Phillips 66 Tetney Sea Line Replacement Project, Tetney to Saltfleet Tidal Flood Defence Scheme and Able Marine Energy Park (AMEP) (see HRA **Table 4.13 and para 4.4.15 – 4.4.61**).

qq. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Table A45** of **Annex A**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 2: Coquet Island SPA

Name of European site: Coquet Island SPA																					
Distance to Hornsea Project One: 204.3 km at nearest point																					
European site features	**Likely Effects of Project One**																				
	Habitat extent			Disturbance and displacement			Indirect effects			Collision			Barrier			Displacement			In combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Common tern – Breeding and assemblage	**✓a**		**×b**	**✓a**		**×b**	**✓a**		**×b**		**×c**			**×d**			**×e**		**✓o**	**×p**	
Arctic Tern – Breeding and assemblage											**×f**			**×d**			**×e**			**×p**	
Roseate Tern – Breeding and assemblage											**×g**			**×g**			**×g**			**×p**	
Sandwich Tern – Breeding and assemblage											**×h**			**×i**			**×e**			**×p**	
Puffin – Breeding and assemblage											**×j**			**×k**			**×l**			**×p**	
Black-headed Gull – assemblage											**×m**			**×n**			**×e**			**×p**	

Evidence supporting conclusions

a. Potential for LSEs as the species was found roosting on passage near the cable landfall site in numbers that are potentially significant in the context of the two SPA populations (i.e. Coquet Island and Farne Islands SPAs). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.12** of HRA).

b. No LSE during the decommissioning phase as cables are likely to remain in situ (Ref: **Section 2.5** of HRA).

c. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted (Ref: **Annex A, Table A40**).

d. No barrier effects on these species have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for these species and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown (Ref: **Annex A, Table A40**).

e. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005) (Ref: **Annex A, Table A40**).

f. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact (Ref: **Annex A, Table A40**).

g. No roseate terns were recorded (Ref: **Annex A, Table A40**).

h. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact (Ref: **Annex A, Table A40**).

i. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006) (Ref: **Annex A, Table A40**).

j. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision (Ref: **Annex A, Table A40**).

k. The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown (Ref: **Annex A, Table A40**).

l. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not (Ref: **Annex A, Table A40**). HRA screening (see **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected. Outside of the breeding season birds disperse widely.

m. A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from the proposed development and the low usage of the site indicates low risk of a significant impact (Ref: **Annex A, Table A40**).

n. The SPA is outwith the maximum foraging range for black-headed gull during the breeding season and therefore no regularly barrier effects will occur during the breeding season. Birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in energetic costs during migration (Ref: **Annex A, Table A40**).

o. Plans/projects with potential for LSE on qualifying features in-combination with Project One infrastructure within the Humber Estuary and onshore include: Land at Bishopthorpe Farm Newton Marsh Wind Farm Extension, Phillips 66 Tetney Sea Line Replacement Project, Tetney to Saltfleet Tidal Flood Defence Scheme and Able Marine Energy Park (AMEP) (see HRA **Table 4.13 and para 4.4.15 – 4.4.61**).

p. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A40**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 3: Farne Islands SPA

Name of European site: Farne Islands SPA																					
Distance to Hornsea Project One: 235.8 km at nearest point																					
European site features	**Likely Effects of Project One**																				
	Habitat extent			Disturbance and displacement			Indirect effects			Collision			Barrier			Displacement			In combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Common tern – Breeding	✓a		×b	✓a		×b	✓a		×b		×c			×d			×e		✓u	×v	
Arctic Tern – Breeding and assemblage											×f			×d			×e			×v	
Roseate Tern – Breeding and assemblage											×g			×g			×g			×v	
Sandwich Tern – Breeding and assemblage											×h			×i			×e			×v	
Puffin – Breeding and assemblage											×j			×k			×l			×v	
Guillemot – Breeding and assemblage											×m			×k			×n			×v	
Kittiwake (assemblage)											×o			×k			×e			×v	
Shag (assemblage)											×p			×q			×r			×v	
Cormorant (assemblage)											×s			×t			×e			×v	

Evidence supporting conclusions

a. Potential for LSEs as the species was found roosting on passage near the cable landfall site in numbers that are potentially significant in the context of the two SPA populations (i.e. Coquet Island and Farne Islands SPAs). No LSE for onshore cable route corridor or HVDC converter/HVAC substation as this species was either absent or recorded at very low abundances in these areas (Ref: **Table 4.12** of HRA).

b. No LSE during the decommissioning phase as cables are likely to remain in situ (Ref: **Section 2.5** of HRA).

c. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted (Ref: **Annex A, Table A39**).

d. No barrier effects on these species have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for these species and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown (Ref: **Annex A, Table A39**).

e. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005) (Ref: **Annex A, Table A39**).

f. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact (Ref: **Annex A, Table A39**).

g. No roseate terns were recorded (Ref: **Annex A, Table A39**).

h. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact (Ref: **Annex A, Table A39**).

i. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006) (Ref: **Annex A, Table A39**).

j. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision (Ref: **Annex A, Table A39**).

k. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown (Ref: **Annex A, Table A39**).

l. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not (Ref: **Annex A, Table A39**). HRA screening (see **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected. Outside of the breeding season birds disperse widely.

m. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate) (Ref: **Annex A, Table A39**).

n. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006) (Ref: **Annex A, Table A39**). HRA screening (see **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

o. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted (Ref: **Annex A, Table A39**). HRA screening (see **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

p. The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision (Ref: **Annex A, Table A39**).

q. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible (Ref: **Annex A, Table A39**).

r. There are a no records of shags using the area and therefore no displacement impacts are predicted (Ref: **Annex A, Table A39**).

s. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low (Ref: **Annex A, Table A39**).

t. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration (Ref: **Annex A, Table A39**).

u. Plans/projects with potential for LSE on qualifying features in-combination with Project One infrastructure within the Humber Estuary and onshore include: Land at Bishopthorpe Farm Newton Marsh Wind Farm Extension, Phillips 66 Tetney Sea Line Replacement Project, Tetney to Saltfleet Tidal Flood Defence Scheme and Able Marine Energy Park (AMEP) (see HRA **Table 4.13 and para 4.4.15 – 4.4.61**).

v. In-combination LSE informed by the footnotes above for the individual receptors as presented **in Annex A, Table A39**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 4: Hermaness Saxa Vord & Valla Field SPA & Ramsar

Name of European site: Hermaness Saxa Vord & Valla Field SPA & Ramsar

Distance to Hornsea Project One: 771.8 km

European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver		×a			×b			×c			×z	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Gannet		×d			×e			×f			×z	
Great skua		×g			×h			×i			×z	
Puffin		×j			×k			×l			×z	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		×m			×n			×o			×z	
Kittiwake		×p			×q			×r			×z	
Shag		×s			×t			×u			×z	
Fulmar		×v			×w			×y			×z	
Gannet		×d			×e			×f			×z	
Great skua		×g			×h			×i			×z	
Puffin		×j			×k			×l			×z	

Evidence supporting conclusions (Ref: Table A1 of Annex A).

a. Collision: Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. **LAL 2006**).

b. Barrier: Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.

c. Displacement: Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.

d. Collision: A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season. Therefore birds at this site will not likely regularly occur in the area. Outwith the breeding season gannets from this SPA may disperse widely.

e. Barrier: The SPA is outwith the mean maximum foraging range and the maximum range for gannet during the breeding season and therefore barrier effects will not occur during the breeding season. Outwith the breeding season gannets are highly pelagic and the incremental increases in flight caused by the barrier effect will be insignificant.

f. Displacement: There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere.

g. Collision: A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates no one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.

h. Barrier: There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.

i. Displacement: Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.

j. Collision: A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.

k. Barrier: The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

l. Displacement: There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. However, from Annex B, the size of the colony and distance from Project One indicates that impacts will not be significant.

m. Collision: 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

n. Barrier: The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

o. Displacement: Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. **Petersen *et al.* 2006**). However a likely significant effect for this site was ruled out in **Annex B in the HRA**.

p. Collision: A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Zone 1 (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments might increase the risk of a significant impact. However a likely significant effect for this site was ruled out in **Annex B in the HRA**.

q. Barrier: The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regular barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

r. Displacement: Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. **Petersen *et al.* 2006**).

s. Collision: The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. **npower 2006**). Therefore there is a low risk of collision.

t. Barrier: There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.

u. Displacement: There are a no records of shags using the area and therefore no displacement impacts are predicted.

v. Collision: A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.

w. Barrier: The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.

y. Displacement: There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.

z. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A1**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects**.**

Stage 1 Matrix 5: Fetlar SPA & Ramsar

Name of European site: Fetlar SPA & Ramsar												
Distance to Hornsea Project One: 755.1 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×r**	
Red-necked Phalarope		**×d**			**×d**			**×d**			**×r**	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dunlin		**×e**			**×f**			**×g**			**×r**	
Great Skua		**×h**			**×i**			**×j**			**×r**	
Whimbrel		**×k**			**×f**			**×g**			**×r**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Skua		**×l**			**×m**			**×n**			**×r**	
Fulmar		**×o**			**×p**			**×q**			**×r**	
Great Skua		**×j**			**×k**			**×l**			**×r**	
Arctic Tern		**×a**			**×b**			**×c**			**×r**	
Red-necked Phalarope		**×d**			**×d**			**×d**			**×r**	

Evidence supporting conclusions (see Table A2 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.

b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

c. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms **(e.g. Zucco *et al.* 2006, Pettersson 2005).**

d. No red-necked phalaropes were recorded.

e. A total of 23 dunlin were recorded in the Hornsea Project One area. All were flying below 22.5 m and therefore not at risk of collision.

f. These species may migrate around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.

g. These species were not recorded using the development area and no displacement effects are predicted.

h. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.

i. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.

j. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.

k. Eleven out of a total of 49 whimbrel recorded were in the Hornsea Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.

l. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.

m. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.* 2006).

n. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.

o. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.

p. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.

q. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.

r. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A2**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 6: Ronas Hill – North Roe and Tingon SPA & Ramsar

Name of European site: Ronas Hill – North Roe and Tingon SPA & Ramsar												
Distance to Hornsea Project One: 751.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Great Skua		**×a**			**×b**			**×c**			**×h**	
Merlin		**×d**			**×d**			**×d**			**×h**	
Red-throated diver		**×e**			**×f**			**×g**			**×h**	

Evidence supporting conclusions (see Table A3 of Annex A).

a. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.

b. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.

c. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.

d. No merlins were recorded

e. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).

f. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.

g. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.

h. In-combination LSE informed by the footnotes above for the individual receptors as presented **in Annex A, Table A3**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 7: Papa Stour SPA

Name of European site: Papa Stour SPA

Distance to Hornsea Project One: 736.6 km

European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×g**	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover		**×d**			**×e**			**×f**			**×g**	

Evidence supporting conclusions (Ref: Table A4 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.

b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

c. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).

d. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.

e. Migrating ringed plover may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.

f. No ringed plover were recorded using the development area and no displacement effects are predicted.

g. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A4**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 8: Noss SPA

Name of European site: Noss SPA

Distance to Hornsea Project One: 702.5 km

European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Gannet		**×a**			**×b**			**×c**			**×s**	
Great Skua		**×d**			**×e**			**×f**			**×s**	
Guillemot		**×g**			**×h**			**×i**			**×s**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Gannet		**×a**			**×b**			**×c**			**×s**	
Great Skua		**×d**			**×e**			**×f**			**×s**	
Guillemot		**×g**			**×h**			**×i**			**×s**	
Puffin		**×j**			**×k**			**×l**			**×s**	
Kittiwake		**×m**			**×n**			**×o**			**×s**	
Fulmar		**×p**			**×q**			**×r**			**×s**	

Evidence supporting conclusions (Ref: Table A5 of Annex A).

a. A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely.

b. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect does occur, be a small incremental increase in overall distance flown by this highly pelagic species.

c. There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere.

d. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.

e. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.

f. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.

g. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

h. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

i. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

j. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.

k. The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

l. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

m. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

n. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

o. Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al.* 2006).

p. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.

q. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.

r. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

s. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A5**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 9: Foula SPA

Name of European site: Foula SPA												
Distance to Hornsea Project One: 712.7 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		×a			×b			×c			×ad	
Leach's Storm-petrel		×d			×e			×f			×ad	
Red-throated Diver		×g			×h			×i			×ad	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Great Skua		×aa			×ab			×ac			×ad	
Guillemot		×j			×k			×l			×ad	
Puffin		×m			×k			×n			×ad	
Shag		×o			×p			×q			×ad	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Leach's Storm-petrel		×d			×e			×f			×ad	
Razorbill		×r			×k			×s			×ad	
Kittiwake		×t			×k			×c			×ad	
Arctic Skua		×u			×v			×w			×ad	
Fulmar		×x			×y			×z			×ad	
Puffin		×m			×k			×o			×ad	
Guillemot		×j			×k			×l			×ad	
Great Skua		×aa			×ab			×ac			×ad	
Shag		×p			×q			×r			×ad	
Arctic Tern		×a			×b			×c			×ad	

Evidence supporting conclusions (Ref: Table A6 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.

b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).

d. Leach's petrel is a scarce to rare migrant off the Yorkshire coast (Thomas 2011). Two Leach's petrels were recorded in Year 1 and three in Year 2. All were recorded flying below 2.5 m and therefore not at risk of collision.
e. There is no evidence of whether or not Leach's petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.
f. There is no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence, based on the low number of observations, that the area is a favoured foraging location for this species.
g. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
h. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
i. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts are likely to be negligible.
j. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
k. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
l. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
m. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.
n. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
o. The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.
p. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
q. There are a no records of shags using the area and therefore no displacement impacts are predicted.
r. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
s. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
t. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
u. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.
v. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.*, 2006).
w. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.
x. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
y. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
z. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.

aa. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.
ab. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.
ac. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.
ad. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A6**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 10: Mousa SPA

Name of European site: Mousa SPA												
Distance to Hornsea Project One: 697.6 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	C	C	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×g**	
Storm Petrel		**×d**			**×e**			**×f**			**×g**	

Evidence supporting conclusions (Ref: Table A7 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. Storm petrels are an uncommon to scarce migrant off the Yorkshire coast (Thomas 2011). A total of 29 storm petrels were recorded across both years and all were recorded flying below 2.5 m and therefore not at risk of collision.
e. There's no evidence of whether or not storm petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.
f. There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence based on the low number of observations that the area is a favoured foraging location for this species.
g. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A7**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 11: Sumburgh Head SPA

Name of European site: Sumburgh Head SPA												
Distance to Hornsea Project One: 679.2 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×l**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×d**			**×e**			**×f**			**×l**	
Kittiwake		**×g**			**×h**			**×c**			**×l**	
Fulmar		**×i**			**×j**			**×k**			**×l**	
Arctic Tern		**×a**			**×b**			**×c**			**×l**	

Evidence supporting conclusions (Ref: Table A8 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
e. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
g. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
i. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
j. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
k. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
l. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A8**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 12: Fair Isle SPA

Name of European site: Fair Isle SPA												
Distance to Hornsea Project One: 645.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×ab**	
Fair Isle Wren		**×d**			**×d**			**×d**			**×ab**	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×e**			**×f**			**×g**			**×ab**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Puffin		**×h**			**×f**			**×i**			**×ab**	
Razorbill		**×j**			**×f**			**×k**			**×ab**	
Kittiwake		**×l**			**×f**			**×c**			**×ab**	
Great Skua		**×m**			**×n**			**×o**			**×ab**	
Arctic Skua		**×p**			**×q**			**×r**			**×ab**	
Shag		**×s**			**×t**			**×u**			**×ab**	
Gannet		**×v**			**×w**			**×x**			**×ab**	
Fulmar		**×y**			**×z**			**×aa**			**×ab**	
Guillemot		**×e**			**×f**			**×g**			**×ab**	
Arctic Tern		**×a**			**×b**			**×c**			**×ab**	

Evidence supporting conclusions (Ref: Table A9 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. Four wrens were recorded.
e. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
f. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
g. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.

i. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
j. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
k. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
l. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
m. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.
n. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant
increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.
o. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.
p. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.
q. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.* 2006).
r. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.
s. The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.
t. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
u. There are a no records of shags using the area and therefore no displacement impacts are predicted.
v. A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
w. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect does occur, be a small incremental increase in overall distance flown by this highly pelagic species.
x. There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere.
y. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
z. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
aa. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
ab. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A9**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 13: Papa Westray SPA

Name of European site: Papa Westray SPA												
Distance to Hornsea Project One: 654 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×g**	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Skua		**×d**			**×e**			**×f**			**×g**	

Evidence supporting conclusions (Ref: Table A10 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.
e. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.* 2006).
f. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.
g. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A10**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 14: East Sanday Coast SPA & Ramsar

Name of European site: East Sanday Coast SPA & Ramsar												
Distance to Hornsea Project One: 640.3 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed godwit		**×a**			**×b**			**×c**			**×h**	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Turnstone		**×d**			**×e**			**×f**			**×h**	
Purple Sandpiper		**×g**			**×g**			**×g**			**×h**	

Evidence supporting conclusions (Ref: Table A11 of Annex A):

a. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
b. Migrating bar-tailed godwit may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
c. No bar-tailed godwit were recorded using the development area and no displacement effects are predicted.
d. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
e. Migrating turnstone may fly around the wind farm but the incremental increase in flight distance to or from the SPA is likely to be negligible.
f. No turnstones were recorded using the development area and no displacement effects are predicted.
g. Only one purple sandpiper was recorded during two years of surveys.
h. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A11**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects**.**

Stage 1 Matrix 15: West Westray SPA

Name of European site: West Westray SPA												
Distance to Hornsea Project One: 646.7 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×p**	
Article 4.2 Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×d**			**×e**			**×f**			**×p**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill		**×g**			**×e**			**×h**			**×p**	
Kittiwake		**×i**			**×e**			**×c**			**×p**	
Arctic Skua		**×j**			**×k**			**×l**			**×p**	
Fulmar		**×m**			**×n**			**×o**			**×p**	
Guillemot		**×d**			**×e**			**×f**			**×p**	
Arctic Tern		**×a**			**×b**			**×c**			**×p**	

Evidence supporting conclusions (Ref: Table A12 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
e. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). There is therefore the potential for a likely significant effect outwith the breeding season.
g. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
h. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
i. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
j. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.

k. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.* 2006).
l. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.
m. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
n. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
o. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
p. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A12**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 16: Marwick Head SPA

Name of European site: Marwick Head SPA												
Distance to Hornsea Project One: 634.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×a**			**×b**			**×c**			**×g**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×a**			**×b**			**×c**			**×g**	
Kittiwake		**×d**			**×e**			**×f**			**×g**	

Evidence supporting conclusions (Ref: Table A13 of Annex A).

a. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
b. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
e. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al.* 2006).
g. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A13**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects**.**

Stage 1 Matrix 17: Calf of Eday SPA

Name of European site: Calf of Eday SPA												
Distance to Hornsea Project One: 643.7 km												
European site features	**Likely Effects of Project One**											
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×a**			**×b**			**×c**			**×p**	
Kittiwake		**×d**			**×e**			**×f**			**×p**	
Great black-backed gull		**×g**			**×h**			**×i**			**×p**	
Cormorant		**×j**			**×k**			**×l**			**×p**	
Fulmar		**×m**			**×n**			**×o**			**×p**	

Evidence supporting conclusions (Ref: Table A14 of Annex A).

a. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
b. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. There is therefore the potential for a likely significant effect outwith the breeding season. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
e. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will
be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al.* 2006).
g. A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and will therefore unlikely to occur in the Hornsea Project One.
h. The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
i. Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al.* 2006).
j. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
k. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
l. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

m. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
n. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
o. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
p. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A14**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 18: Rousay SPA

Name of European site: Rousay SPA												
Distance to Hornsea Project One: 635.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×n**	
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot		**×d**			**×e**			**×f**			**×n**	
Kittiwake		**×g**			**×e**			**×c**			**×n**	
Arctic Skua		**×h**			**×i**			**×j**			**×n**	
Fulmar		**×k**			**×l**			**×m**			**×n**	
Arctic Tern		**×a**			**×b**			**×c**			**×n**	

Evidence supporting conclusions (Ref: Table A15 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
e. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). There is therefore the potential for a likely significant effect outwith the breeding season. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
g. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
i. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.* 2006).
j. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.

k. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
l. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
m. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
n. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A15**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 et seq.** for Collision Effects, **paragraphs 4.3.224 et seq.** for Displacement Effects and **paragraphs 4.3.229 et seq.** for Barrier Effects.

Stage 1 Matrix 19: Auskerry SPA

Name of European site: Auskerry SPA												
Distance to Hornsea Project One: 235.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding birds	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern		**×a**			**×b**			**×c**			**×g**	
Storm Petrel		**×d**			**×e**			**×f**			**×g**	

Evidence supporting conclusions (Ref: Table A16 of Annex A).

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. Storm petrels are an uncommon to scarce migrant off the Yorkshire coast (Thomas 2011). A total of 29 storm petrels were recorded across both years and all were recorded flying below 2.5 m and therefore not at risk of collision.
e. There's no evidence of whether or not storm petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.
f. There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence based on the low number of observations that the area is a favoured foraging location for this species.
g. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A16**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 20: Orkney Mainland Moors SPA

Name of European site: Orkney Mainland Moors SPA												
Distance to Hornsea Project One: 614.6 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Hen Harrier *Circus cyaneus*		**×a**			**×a**			**×a**			**×h**	
Red-throated Diver *Gavia stellata*		**×b**			**×c**			**×d**			**×h**	
Short-eared Owl *Asio flammeus*		**×e**			**×f**			**×g**			**×h**	
Article 4.1 Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Hen Harrier *Circus cyaneus*		**×a**			**×a**			**×a**			**×h**	

Evidence supporting conclusions (Ref: Table A17 of Annex A):

a. No hen harriers were recorded.

b. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height **(e.g. LAL 2006).**

c. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.

d. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.

e. Only two short-eared owls were recorded in the Hornsea Project One area in September and November of Year 1. One was flying at rotor height. The very low numbers recorded indicate that there is negligible risk of an effect.
f. Migrating short-eared owls may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
g. No short-eared owls were recorded using the development area and no displacement effects are predicted.
h. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A17**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 21: Copinsay SPA

Name of European site: Copinsay SPA

Distance to Hornsea Project One: 614.3 km

European site features	Likely Effects of Project One											
Article 4.2 Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot *Uria aalge*		**×a**			**×b**			**×c**			**×j**	
Kittiwake *Rissa tridactyla*		**×d**			**×b**			**×e**			**×j**	
Great Black-backed Gull *Larus marinus*		**×f**			**×b**			**×e**			**×j**	
Fulmar *Fulmarus glacialis*		**×g**			**×h**			**×i**			**×j**	

Evidence supporting conclusions (Ref: Table A18 of Annex A):

a. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
b. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
e. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (Zucco *et al.*, 2006; Petersen *et al.* 2006).
f. A total of 3,151 great black-backed gulls were recorded in Year 1 with peak numbers occurring in January. Of those in flight 76.7% were below rotor height. Collision risk modelling predicts up to 306 collisions per year (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris, 1962) and will therefore unlikely to occur in the Hornsea Project One.
g. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
h. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
i. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
j. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A18**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 22: Hoy SPA

Name of European site: Hoy SPA

Distance to Hornsea Project One: 600.4 km

European site features	**Likely Effects of Project One**											
Article 4.1 Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Peregrine *Falco peregrinus*		**×a**			**×a**			**×a**			**×w**	
Red-throated Diver *Gavia stellata*		**×b**			**×c**			**×d**			**×w**	
Article 4.2 – Migratory Species (br)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Great Skua *Catharacta skua*		**×e**			**×f**			**×g**			**×w**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Puffin *Fratercula arctica*		**×h**			**×i**			**×j**			**×w**	
Guillemot *Uria aalge*		**×k**			**×l**			**×m**			**×w**	
Kittiwake *Rissa tridactyla*		**×n**			**×l**			**×o**			**×w**	
Great Black-backed Gull *Larus marinus*		**×p**			**×l**			**×p**			**×w**	
Arctic Skua *Stercorarius parasiticus*		**×q**			**×r**			**×s**			**×w**	
Fulmar *Fulmarus glacialis*		**×t**			**×u**			**×v**			**×w**	
Great Skua *Catharacta skua*		**×e**			**×f**			**×g**			**×w**	

Evidence supporting conclusions (Ref: Table A19 of Annex A):

a. No peregrines were recorded.
b. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
c. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
d. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.
e. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.
f. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.
g. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.
h. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.

i. The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
j. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
k. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
l. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
m. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
n. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
o. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (Zucco *et al.* 2006; Petersen *et al.* 2006).
p. A total of 3,151 great black-backed gulls were recorded in Year 1 with peak numbers occurring in January. Of those in flight 76.7% were below rotor height. Collision risk modelling predicts up to 306 collisions per year (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris, 1962) and are therefore unlikely to occur in the Hornsea Project One.
q. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.
r. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.*, 2006).
s. Arctic skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.
t. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
u. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
v. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
w. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A19**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 23: Pentland Firth Islands SPA

Name of European site: Pentland Firth Islands SPA												
Distance to Hornsea Project One: 584.7 km												
European site features	**Likely Effects of Project One**											
Article 4.1 Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern *Sterna paradisaea*		**×a**			**×b**			**×c**			**×d**	

Evidence supporting conclusions (Ref: Table A20 of Annex A):

a. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.

b. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.,* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

c. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.,* 2006, Pettersson, 2005).

d. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A20**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 et seq**. for Collision Effects, **paragraphs 4.3.224 et seq.** for Displacement Effects and **paragraphs 4.3.229 et seq.** for Barrier Effects.

Stage 1 Matrix 24: North Caithness Cliffs SPA

Name of European site: North Caithness Cliffs SPA

Distance to Hornsea Project One: 574.1 km

European site features	Likely Effects of Project One											
Article 4.1 Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Peregrine *Falco peregrinus*		×a			×a			×a			×q	
Article 4.2 – Migratory Species (breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot *Uria aalge*		×b			×c			×d			×q	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Puffin *Fratercula arctica*		×e			×f			×g			×q	
Fulmar *Fulmarus glacialis*		×h			×i			×j			×q	
Razorbill *Alca torda*		×k			×l			×m			×q	
Guillemot *Uria aalge*		×b			×c			×d			×q	
Kittiwake *Rissa tridactyla*		×n			×o			×p			×q	

Evidence supporting conclusions (Ref: Table A21 of Annex A):

a. No peregrines were recorded.
b. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
c. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
d. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.*, 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
e. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.
f. The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
g. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
i. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
j. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
k. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
l. The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

m. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.,* 2006; Petersen *et al.*, 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

n. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

o. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

p. Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (Zucco *et al.*, 2006).

q. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A21**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 et seq.** for Collision Effects, **paragraphs 4.3.224 et seq.** for Displacement Effects and **paragraphs 4.3.229 et seq.** for Barrier Effects.

Stage 1 Matrix 25: East Caithness Cliffs SPA

Name of European site: East Caithness Cliffs SPA												
Distance to Hornsea Project One: 540 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Peregrine *Falco peregrinus*		**×a**			**×a**			**×a**			**×v**	
Article 4.2 – Migratory Species (breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot *Uria aalge*		**×b**			**×c**			**×d**			**×v**	
Herring Gull *Larus argentatus*		**×e**			**×c**			**×f**			**×v**	
Kittiwake *Rissa tridactyla*		**×g**			**×c**			**×f**			**×v**	
Razorbill *Alca torda*		**×h**			**×c**			**×m**			**×v**	
Shag *Phalacrocorax aristotelis*		**×n**			**×o**			**×p**			**×v**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Puffin *Fratercula arctica*		**×n**			**×c**			**×o**			**×v**	
Great Black-backed Gull *Larus marinus*		**×m**			**×c**			**×f**			**×v**	
Cormorant *Phalacrocorax carbo*		**×s**			**×t**			**×u**			**×v**	
Fulmar *Fulmarus glacialis*		**×p**			**×q**			**×r**			**×v**	
Razorbill *Alca torda*		**×h**			**×c**			**×i**			**×v**	
Guillemot *Uria aalge*		**×b**			**×c**			**×d**			**×v**	
Kittiwake *Rissa tridactyla*		**×g**			**×c**			**×f**			**×v**	
Herring Gull *Larus argentatus*		**×e**			**×c**			**×f**			**×v**	
Shag *Phalacrocorax aristotelis*		**×j**			**×k**			**×l**			**×v**	

Evidence supporting conclusions (Ref: Table A22 of Annex A):

a. No peregrines were recorded.
b. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
c. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
d. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
e. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding

season numbers recorded were higher and birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

f. Evidence from constructed offshore wind farms indicate that these species are not displaced by wind farms (Petersen *et al.*, 2006).

g. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

h. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.

i. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.,* 2006; Petersen *et al.*, 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

j. The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g., npower, 2006). Therefore there is a low risk of collision.

k. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.

l. There are a no records of shags using the area and therefore no displacement impacts are predicted.

m. A total of 3,151 great black-backed gulls were recorded in Year 1 with peak numbers occurring in January. Of those in flight 76.7% were below rotor height. Collision risk modelling predicts up to 353 collisions per year (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris, 1962) and are therefore unlikely to occur in the Hornsea Project One.

n. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.

o. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

p. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.

q. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.

r. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.

s. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g., npower, 2005). Consequently, the risk of an impact is low.

t. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.*, 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

u. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.,* 2006).

v. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A22**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 26: Dornoch Firth & Loch Fleet SPA & Ramsar

Name of European site: Dornoch Firth & Loch Fleet SPA & Ramsar

Distance to Hornsea Project One: 517.4 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Osprey *Pandion haliaetus*		**×a**			**×a**			**×a**			**×n**	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		**×b**			**×c**			**×d**			**×n**	
Article 4.2 – Migratory Species (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose		**×e**			**×f**			**×d**			**×n**	
Wigeon *Anas penelope*		**×k**			**×l**			**×m**			**×n**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Curlew *Numenius arquata*		**×g**			**×c**			**×d**			**×n**	
Dunlin *Calidris alpina alpina*		**×h**			**×c**			**×d**			**×n**	
Oystercatcher *Haematopus ostralegus*		**×i**			**×c**			**×d**			**×n**	
Teal *Anas crecca*		**×j**			**×c**			**×d**			**×n**	
Wigeon *Anas penelope*		**×k**			**×l**			**×m**			**×n**	
Greylag Goose *Anser anser*		**×e**			**×f**			**×d**			**×n**	
Bar-tailed Godwit *Limosa lapponica*		**×b**			**×c**			**×d**			**×n**	

Evidence supporting conclusions (Ref: Table A23 of Annex A):

a. No ospreys were recorded.
b. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
c. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
d. These species were not recorded using the development area and no displacement effects are predicted.
e. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas, 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
f. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
g. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
h. A total of 23 dunlin were recorded in the Hornsea Project One area. All were flying below 22.5 m and therefore not at risk of collision.
i. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.

j. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
k. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
l. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
m. All wigeon were recorded in flight and none were seen using the Hornsea Project One. Therefore no displacement effects will occur.
n. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A23**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 27: Cromarty Firth SPA & Ramsar

Name of European site: Cromarty Firth SPA & Ramsar												
Distance to Hornsea Project One: 507.1 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common Tern *Sterna hirundo*		**×a**			**×b**			**×c**			**×q**	
Osprey *Pandion haliaetus*		**×d**			**×d**			**×d**			**×q**	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		**×e**			**×f**			**×g**			**×q**	
Whooper Swan *Cygnus cygnus*		**×d**			**×d**			**×d**			**×q**	
Article 4.2 – Migratory Species (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose		**×i**			**×j**			**×g**			**×q**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		**×k**			**×k**			**×k**			**×q**	
Curlew *Numenius arquata*		**×l**			**×f**			**×g**			**×q**	
Dunlin *Calidris alpina alpina*		**×m**			**×f**			**×g**			**×q**	
Knot *Calidris canutus*		**×n**			**×f**			**×g**			**×q**	
Oystercatcher *Haematopus ostralegus*		**×o**			**×f**			**×g**			**×q**	
Red-breasted Merganser *Mergus serrator*		**×p**			**×z**			**×z**			**×q**	
Scaup *Aythya marila*		**×d**			**×d**			**×d**			**×q**	
Pintail *Anas acuta*		**×d**			**×d**			**×d**			**×q**	
Wigeon *Anas penelope*		**×d**			**×d**			**×d**			**×q**	
Greylag Goose *Anser anser*		**×i**			**×j**			**×g**			**×q**	
Bar-tailed Godwit *Limosa lapponica*		**×e**			**×f**			**×g**			**×q**	
Whooper Swan *Cygnus cygnus*		**×d**			**×d**			**×d**			**×q**	

Evidence supporting conclusions (Ref: Table A24 of Annex A):

a. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.

b. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.,* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.,* 2006, Pettersson, 2005).
d. These species were not recorded during surveys.
e. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
f. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
g. These species were not recorded using the development area and no displacement effects are predicted.
h. No whooper swans were recorded.
i. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
j. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
k. Only seven redshank were recorded during two years of surveys.
l. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
m. A total of 23 dunlin were recorded in the Hornsea Project One area. All were flying below 22.5 m and therefore not at risk of collision.
n. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
o. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
p. Only two red-breasted merganser were recorded during two years of surveys.
q. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A24**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 28: Inner Moray Firth SPA & Ramsar

Name of European site: Inner Moray Firth SPA & Ramsar												
Distance to Hornsea Project One: 495.1 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common Tern *Sterna hirundo*		×a			×b			×c			×v	
Osprey *Pandion haliaetus*		×d			×d			×d			×v	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		×e			×f			×g			×v	
Article 4.2 – Migratory Species (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose *Anser anser*		×h			×i			×g			×v	
Red-breasted Merganser *Mergus serrator*		×j			×j			×j			×v	
Redshank *Tringa totanus*		×k			×k			×k			×v	
Scaup *Aythya marila*		×d			×d			×d			×v	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Scaup *Aythya marila*		×d			×d			×d			×v	
Curlew *Numenius arquata*		×l			×f			×g			×v	
Oystercatcher *Haematopus ostralegus*		×m			×f			×g			×v	
Goosander *Mergus merganser*		×n			×t			×t			×v	
Goldeneye *Bucephala clangula*		×o			×u			×u			×v	
Teal *Anas crecca*		×p			×f			×g			×v	
Wigeon *Anas penelope*		×q			×r			×g			×v	
Cormorant *Phalacrocorax carbo*		×s			×t			×u			×v	
Redshank *Tringa totanus*		×l			×l			×l			×v	
Red-breasted Merganser *Mergus serrator*		×k			×k			×k			×v	
Greylag Goose *Anser anser*		×h			×i			×g			×v	
Bar-tailed Godwit *Limosa lapponica*		×e			×f			×g			×v	

Evidence supporting conclusions (Ref: Table A25 of Annex A):

a. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
b. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g., Zucco *et al.,* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g., Zucco *et al.,* 2006, Pettersson, 2005).
d. These species were not recorded during Project One surveys.
e. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
f. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
g. These species were not recorded using the development area and no displacement effects are predicted.
h. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas, 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
i. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
j. Only two red-breasted merganser were recorded during two years of surveys.
k. Only seven redshank were recorded during two years of surveys.
l. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
m. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
n. Three goosander were recorded outwith the Hornsea Project One in Year 2.
o. Only one goldeneye was recorded during two years of surveys.
p. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
q. A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision. Collision risk modelling predicts up to 20 collisions per year (APEM, 2012).
r. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
s. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g., npower, 2005). Consequently, the risk of an impact is low.
t. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.*, 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
u. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.,* 2006).
v. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A25**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 29: Moray and Nairn Coast SPA & Ramsar

Name of European site: Moray and Nairn Coast SPA & Ramsar

Distance to Hornsea Project One: 476.8 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Osprey *Pandion haliaetus*		×a			×a			×a			×q	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		×b			×c			×d			×q	
Article 4.2 – Migratory Species (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose *Anser anser*		×e			×f			×d			×q	
Pink-footed Goose *Anser brachyrhynchus*		×h			×i			×d			×q	
Redshank *Tringa totanus*		×i			×i			×i			×q	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Pink-footed Goose *Anser brachyrhynchus*		×g			×h			×d			×q	
Dunlin *Calidris alpina alpina*		×j			×c			×d			×q	
Oystercatcher *Haematopus ostralegus*		×k			×c			×d			×q	
Red-breasted Merganser *Mergus serrator*		×l			×r			×r			×q	
Velvet Scoter *Melanitta fusca*		×a			×a			×a			×q	
Common Scoter *Melanitta nigra*		×m			×n			×d			×q	
Long-tailed duck *Clangula hyemalis*		×a			×a			×a			×q	
Wigeon *Anas penelope*		×o			×o			×d			×q	
Redshank *Tringa totanus*		×i			×i			×i			×q	
Greylag Goose *Anser anser*		×e			×f			×d			×q	
Bar-tailed Godwit *Limosa lapponica*		×b			×c			×d			×q	

Evidence supporting conclusions (Ref: Table A26 of Annex A):

a. These species were not recorded during Project One surveys.
b. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
c. Migrating birds from these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.

d. These species were not recorded using the development area and no displacement effects are predicted.
e. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
f. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
g. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
h. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.
i. Only seven redshank were recorded during two years of surveys.
j. A total of 23 dunlin were recorded in the Hornsea Project One area. All were flying below 22.5 m and therefore not at risk of collision.
k. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
l. Only two red-breasted merganser were recorded during two years of surveys.
m. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
n. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
o. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
p. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
q. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A26**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 30: Troup Penan and Lion's Heads SPA

Name of European site: Troup Penan and Lion's Heads SPA												
Distance to Hornsea Project One: 464.9 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot *Uria aalge*		**×a**			**×b**			**×c**			**×l**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda*		**×j**			**×b**			**×k**			**×l**	
Kittiwake *Rissa tridactyla*		**×i**			**×b**			**×h**			**×l**	
Herring Gull *Larus argentatus*		**×g**			**×b**			**×h**			**×l**	
Fulmar *Fulmarus glacialis*		**×d**			**×e**			**×f**			**×l**	
Guillemot *Uria aalge*		**×a**			**×b**			**×c**			**×l**	

Evidence supporting conclusions (Ref: Table A27 of Annex A):

a. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
b. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
e. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
f. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
g. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. Evidence from constructed offshore wind farms indicate that these species are not displaced by wind farms (Petersen *et al.* 2006).
i. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
j. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.

k. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

l. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A27**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 31: Loch of Strathbeg SPA & Ramsar

Name of European site: Loch of Strathbeg SPA & Ramsar

Distance to Hornsea Project One: 462.2 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich Tern *Sterna sandvicensis*		**×a**			**×b**			**×c**			**×l**	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Barnacle Goose *Branta leucopsis*		**×d**			**×d**			**×d**			**×l**	
Whooper Swan *Cygnus cygnus*		**×d**			**×d**			**×d**			**×l**	
Article 4.2 – Migratory Species (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose *Anser anser*		**×j**			**×k**			**×g**			**×l**	
Pink-footed Goose *Anser brachyrhynchus*		**×e**			**×f**			**×g**			**×l**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Teal *Anas crecca*		**×h**			**×i**			**×g**			**×l**	
Greylag Goose *Anser anser*		**×j**			**×k**			**×g**			**×l**	
Pink-footed Goose *Anser brachyrhynchus*		**×e**			**×f**			**×g**			**×l**	
Barnacle Goose *Branta leucopsis*		**×d**			**×d**			**×d**			**×l**	
Whooper Swan *Cygnus cygnus*		**×d**			**×d**			**×d**			**×l**	

Evidence supporting conclusions (Ref: Table A28 of Annex A):

a. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
b. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that Sandwich terns are not displaced by wind farms (e.g. Petersen *et al.* 2006).
d. These species were not recorded during Project One surveys.
e. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
f. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.
g. These species were not recorded using the Hornsea Project One and therefore no displacement effects are predicted to occur.
h. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
i. Migrating birds may fly around the wind farm but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.

j. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in Project One are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.

k. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.

l. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A28**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 32: Buchan Ness to Collieston Coast SPA

Name of European site: Buchan Ness to Collieston Coast SPA												
Distance to Hornsea Project One: 421.8 km												
European site features	**Likely Effects of Project One**											
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot *Uria aalge*		**×a**			**×b**			**×c**			**×o**	
Kittiwake *Rissa tridactyla*		**×j**			**×k**			**×i**			**×o**	
Herring Gull *Larus argentatus*		**×g**			**×h**			**×i**			**×o**	
Shag *Phalacrocorax aristotelis*		**×l**			**×m**			**×n**			**×o**	
Fulmar *Fulmarus glacialis*		**×d**			**×e**			**×f**			**×o**	

Evidence supporting conclusions (Ref: Table A29 of Annex A):

a. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
b. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
e. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
f. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
g. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
i. Evidence from constructed offshore wind farms indicate that these species are not displaced by wind farms (Petersen *et al.* 2006).
j. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
k. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
l. The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.

m. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
n. There are a no records of shags using the area and therefore no displacement impacts are predicted.
o. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A29**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 33: Ythan Estuary, Sands of Forvie and Meikle Loch SPA & Ramsar

Name of European site: Ythan Estuary, Sands of Forvie and Meikle Loch SPA & Ramsar

Distance to Hornsea Project One: 437.4 km

European site features	Likely Effects of Project One											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common Tern *Sterna hirundo*		×a			×b			×c			×p	
Little Tern *Sterna albifrons*		×d			×e			×c			×p	
Sandwich Tern *Sterna sandvicensis*		×f			×g			×c			×p	
Article 4.2 – Migratory Species (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Pink-footed Goose *Anser brachyrhynchus*		×h			×i			×j			×p	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		×k			×k			×k			×p	
Lapwing *Vanellus vanellus*		×l			×m			×j			×p	
Eider *Somateria mollissima*		×n			×o			×j			×p	
Pink-footed Goose *Anser brachyrhynchus*		×j			×k			×j			×p	

Evidence supporting conclusions (Ref: Table A30 of Annex A):

a. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
b. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
d. Three little terns were recorded, all flying below 5 m.
e. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
f. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
g. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
h. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
i. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.
j. These species were not recorded using the Hornsea Project One and therefore no displacement effects are predicted to occur.
k. Only seven redshank were recorded during two years of surveys.
l. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
m. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.

n. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
o. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
p. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A30**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 34: Fowlsheugh SPA

Name of European site: Fowlsheugh SPA

Distance to Hornsea Project One: 380.3 km

European site features	**Likely Effects of Project One**											
Article 4.2 – Migratory Species (Breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot *Uria aalge*		**×a**			**×b**			**×c**			**×l**	
Kittiwake *Rissa tridactyla*		**×d**			**×b**			**×e**			**×l**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda*		**×f**			**×b**			**×g**			**×l**	
Herring Gull *Larus argentatus*		**×h**			**×b**			**×e**			**×l**	
Fulmar *Fulmarus glacialis*		**×i**			**×j**			**×k**			**×l**	
Guillemot *Uria aalge*		**×a**			**×b**			**×c**			**×l**	
Kittiwake *Rissa tridactyla*		**×d**			**×b**			**×e**			**×l**	

Evidence supporting conclusions (Ref: Table A31 of Annex A):

a. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
b. The SPA is outwith the maximum foraging range for these species during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5 m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
e. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (Petersen *et al.* 2006).
f. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
g. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
i. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.

j. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
k. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
l. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A31**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 35: Montrose Basin SPA & Ramsar

Name of European site: Montrose Basin SPA & Ramsar												
Distance to Hornsea Project One: 367.4 km												
European site features	**Likely Effects of Project One**											
Article 4.2 – Migratory Species (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose *Anser anser*		×a			×b			×c			×r	
Knot *Calidris canutus*		×d			×e			×c			×r	
Pink-footed Goose *Anser brachyrhynchus*		×f			×g			×c			×r	
Redshank *Tringa totanus*		×i			×i			×i			×r	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dunlin *Calidris alpina alpina*		×j			×e			×c			×r	
Oystercatcher *Haematopus ostralegus*		×k			×e			×c			×r	
Eider *Somateria mollissima*		×l			×m			×c			×r	
Wigeon *Anas penelope*		×n			×o			×c			×r	
Shelduck *Tadorna tadorna*		×p			×q			×y			×r	
Redshank *Tringa totanus*		×i			×i			×i			×r	
Knot *Calidris canutus*		×d			×e			×c			×r	
Greylag Goose *Anser anser*		×a			×b			×c			×r	
Pink-footed Goose *Anser brachyrhynchus*		×f			×g			×c			×r	

Evidence supporting conclusions (Ref: Table A32 of Annex A):

a. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas, 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
b. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
c. These species were not recorded using the development area and no displacement effects are predicted.
d. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
e. Migrating knot may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
f. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
g. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c.* 32 km is considered negligible.
i. Only seven redshank were recorded during two years of surveys.

j. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
k. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
l. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
m. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
n. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM, 2012).
o. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
p. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM, 2012).
q. Only one shelduck was recorded during two years of surveys.
r. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A32**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 36: Firth Tay & Eden Estuary SPA & Ramsar

Name of European site: Firth Tay & Eden Estuary SPA & Ramsar												
Distance to Hornsea Project One: 275.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		×a			×b			×c			×ee	
Marsh Harrier *Circus aeruginosus*		×d			×d			×d			×ee	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		×e			×f			×g			×ee	
Article 4.2 – Migratory Species (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Greylag Goose *Anser anser*		×i			×j			×g			×ee	
Pink-footed Goose *Anser brachyrhynchus*		×k			×l			×g			×ee	
Redshank *Tringa totanus*		×h			×h			×h			×ee	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Velvet Scoter *Melanitta fusca*		×d			×d			×d			×ee	
Pink-footed Goose *Anser brachyrhynchus*		×k			×l			×g			×ee	
Greylag Goose *Anser anser*		×i			×j			×g			×ee	
Redshank *Tringa totanus*		×h			×h			×h			×ee	
Cormorant *Phalacrocorax carbo*		×m			×n			×o			×ee	
Shelduck *Tadorna tadorna*		×bb			×cc			×cc			×ee	
Eider *Somateria mollissima*		×p			×q			×g			×ee	
Bar-tailed Godwit *Limosa lapponica*		×e			×f			×g			×ee	
Common Scoter *Melanitta nigra*		×r			×s			×g			×ee	
Black-tailed Godwit *Limosa limosa islandica*		×d			×d			×d			×ee	
Goldeneye *Bucephala clangula*		×t			×t			×t			×ee	
Red-breasted Merganser *Mergus serrator*		×u			×u			×u			×ee	
Goosander *Mergus merganser*		×dd			×dd			×g			×ee	
Oystercatcher *Haematopus ostralegus*		×v			×w			×g			×ee	
Grey Plover *Pluvialis squatarola*		×z			×aa			×g			×ee	
Sanderling *Calidris alba*		×d			×d			×d			×ee	
Dunlin *Calidris alpina alpina*		×x			×y			×g			×ee	
Long-tailed duck *Clangula hyemalis*		×d			×d			×d			×ee	

Evidence supporting conclusions (Ref: Table A33 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. These species were not recorded during Project One surveys.
e. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
f. Migrating bar-tailed godwit may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
g. These species were not recorded using the development area and no displacement effects are predicted.
h. Only seven redshank were recorded during two years of surveys.
i. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
j. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
k. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
l. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional *c*. 32 km is considered negligible.
m. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
n. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
o. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
p. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
q. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
r. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
s. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
t. Only one goldeneye was recorded during two years of surveys.
u. Only two red-breasted merganser were recorded during two years of surveys.
v. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
w. Migrating birds may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
x. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
y. Migrating dunlin may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.
z. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
aa. Migrating grey plover may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
bb. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
cc. Only one shelduck was recorded during two years of surveys.
dd. Three goosander were recorded outwith the Hornsea Project One in Year 2.
ee. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A33**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 37: Forth Islands SPA

Name of European site: Forth Islands SPA												
Distance to Hornsea Project One: 308.5 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Arctic Tern *Sterna paradisaea*		**×a**			**×b**			**×c**			**×ee**	
Common Tern *Sterna hirundo*		**×d**			**×e**			**×c**			**×ee**	
Roseate Tern *Sterna dougallii*		**×f**			**×f**			**×f**			**×ee**	
Sandwich Tern *Sterna sandvicensis*		**×g**			**×h**			**×c**			**×ee**	
Article 4.2 – Migratory Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Gannet *Morus bassanus*		**✓i**			**×j**			**✓k**			**×ee**	
Lesser Black-backed Gull *Larus fuscus*		**×l**			**×m**			**×c**			**×ee**	
Puffin *Fratercula arctica*		**×n**			**×m**			**×o**			**×ee**	
Shag *Phalacrocorax aristotelis*		**×p**			**×q**			**×r**			**×ee**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda*		**×s**			**×m**			**×t**			**×ee**	
Guillemot *Uria aalge*		**×u**			**×m**			**×v**			**×ee**	
Kittiwake *Rissa tridactyla*		**×w**			**×m**			**×c**			**×ee**	
Herring Gull *Larus argentatus*		**×x**			**×m**			**×c**			**×ee**	
Cormorant *Phalacrocorax carbo*		**×y**			**×z**			**×aa**			**×ee**	
Fulmar *Fulmarus glacialis*		**×bb**			**×cc**			**×dd**			**×ee**	
Puffin *Fratercula arctica*		**×n**			**×m**			**×o**			**×ee**	
Lesser Black-backed Gull *Larus fuscus*		**×n**			**×m**			**×c**			**×ee**	
Shag *Phalacrocorax aristotelis*		**×p**			**×q**			**×r**			**×ee**	
Gannet *Morus bassanus*		**✓i**			**×j**			**✓k**			**×ee**	
Arctic Tern *Sterna paradisaea*		**×a**			**×b**			**×c**			**×ee**	
Common Tern *Sterna hirundo*		**×d**			**×e**			**×c**			**×ee**	
Roseate Tern *Sterna dougallii*		**×g**			**×g**			**×g**			**×ee**	
Sandwich Tern *Sterna sandvicensis*		**×h**			**×i**			**×j**			**×ee**	

Evidence supporting conclusions (Ref: Table A34 of Annex A):

- **a.** A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
- **b.** No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **c.** Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
- **d.** A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
- **e.** No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **f.** No roseate terns were recorded.
- **g.** One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
- **h.** Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
- **i.** A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely. Collision risk modelling predicted on average up to 94 collisions of adult gannets per year for Hornsea Hornsea Project One, of which 38 may be from the Forth Islands SPA and therefore, there is the potential for a significant impact alone and in-combination. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in combination.
- **j.** The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect does occur, be a small incremental increase in overall distance flown by this highly pelagic species.
- **k.** There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in-combination.
- **l.** A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. It is estimated that none of the collision impacts during the non-breeding season will be from this SPA (See Annex B).
- **m.** The SPA is outwith the mean maximum foraging range for these species during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in distance flown.
- **n.** A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.
- **o.** There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
- **p.** The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.
- **q.** There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
- **r.** There are a no records of shags using the area and therefore no displacement impacts are predicted.
- **s.** A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
- **t.** Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
- **u.** 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
- **v.** Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

- **w.** A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
- **x.** A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
- **y.** Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
- **z.** There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
- **aa.** Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
- **bb.** A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore birds at this site are at a low risk of being impacted. Outwith the breeding season fulmars from this SPA may disperse widely. Collision risk modelling predicted zero collisions. Therefore the risk is very low.
- **cc.** The SPA is outwith the mean maximum foraging range but within the maximum range for fulmar during the breeding season and therefore barrier effects may occur. However, the additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
- **dd.** There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
- **ee.** In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A34**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 38: Firth of Forth SPA & Ramsar

Name of European site: Firth of Forth SPA & Ramsar

Distance to Hornsea Project One: 299.2 km

European site features	Likely Effects of Project One											
Article 4.1 – Breeding (Passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich Tern *Sterna sandvicensis*		×a			×b			×c			×nn	
Article 4.1 – Breeding (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		×d			×e			×f			×nn	
Golden Plover *Pluvialis apricaria*		×g			×e			×f			×nn	
Red-throated *Diver Gavia stellata*		×h			×e			×i			×nn	
Slavonian Grebe *Podiceps auritus*		×j			×j			×j			×nn	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Knot *Calidris canutus*		×k			×e			×f			×nn	
Pink-footed Goose *Anser brachyrhynchus*		×l			×m			×f			×nn	
Redshank *Tringa totanus*		×n			×n			×n			×nn	
Shelduck *Tadorna tadorna*		×o			×o			×o			×nn	
Turnstone *Arenaria interpres*		×p			×e			×f			×nn	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Scaup Aythya marila		×q			×q			×q			×nn	
Slavonian Grebe Podiceps auritus		×j			×j			×j			×nn	
Golden Plover *Pluvialis apricaria*		×g			×e			×f			×nn	
Bar-tailed Godwit *Limosa lapponica*		×d			×e			×f			×nn	
Pink-footed Goose *Anser brachyrhynchus*		×l			×m			×f			×nn	
Shelduck *Tadorna tadorna*		×o			×o			×o			×nn	
Knot *Calidris canutus*		×k			×e			×f			×nn	
Redshank *Tringa totanus*		×n			×n			×n			×nn	
Turnstone *Arenaria interpres*		×p			×e			×f			×nn	
Great Crested Grebe *Podiceps cristatus*		×r			×e			×s			×nn	
Cormorant *Phalacrocorax carbo*		×t			×u			×v			×nn	

Red-throated Diver *Gavia stellata*		**×h**			**×e**			**×i**			**×nn**	
Mallard *Anas platyrhynchos*		**×w**			**×e**			**×f**			**×nn**	
Curlew *Numenius arquata*		**×x**			**×e**			**×f**			**×nn**	
Eider *Somateria mollissima*		**×ll**			**×mm**			**×f**			**×nn**	
Long-tailed duck *Clangula hyemalis*		**×q**			**×q**			**×q**			**×nn**	
Common Scoter *Melanitta nigra*		**×y**			**×z**			**×aa**			**×nn**	
Velvet Scoter *Melanitta fusca*		**×q**			**×q**			**×q**			**×nn**	
Goldeneye *Bucephala clangula*		**×bb**			**×bb**			**×bb**			**×nn**	
Red-breasted Merganser *Mergus serrator*		**×cc**			**×cc**			**×cc**			**×nn**	
Oystercatcher *Haematopus ostralegus*		**×dd**			**×e**			**×f**			**×nn**	
Ringed Plover *Charadrius hiaticula*		**×ee**			**×e**			**×f**			**×nn**	
Grey Plover *Pluvialis squatarola*		**×ff**			**×e**			**×f**			**×nn**	
Lapwing *Vanellus vanellus*		**×gg**			**×hh**			**×f**			**×nn**	
Dunlin *Calidris alpina alpina*		**×ii**			**×e**			**×f**			**×nn**	
Wigeon *Anas penelope*		**×jj**			**×kk**			**×f**			**×nn**	

Evidence supporting conclusions (Ref: Table A35 of Annex A):

a. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
b. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that Sandwich terns are not displaced by wind farms (e.g. Petersen *et al.* 2006).
d. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
e. Migrating birds from these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
f. These species were not recorded using the development area and no displacement effects are predicted.
g. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
h. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. The SPA is outwith the mean maximum foraging range for red-throated diver during the breeding season. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
i. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.
j. Only one Slavonian grebe was recorded, flying below turbine height.
k. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
l. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
m. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional c. 32 km is considered negligible.

n. Only seven redshank were recorded during two years of surveys.
o. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
p. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
q. These species were not recorded during Project One surveys.
r. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision
s. No great-crested grebes were recorded using the development area and no displacement effects are predicted.
t. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
u. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
v. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
w. A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.
x. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
y. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
z. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
aa. There are a no records of common scoter using the Hornsea Project One and therefore no displacement impacts are predicted.
bb. Only one goldeneye was recorded during two years of surveys.
cc. Only two red-breasted merganser were recorded during two years of surveys.
dd. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
ee. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
ff. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
gg. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 mand therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant
hh. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
ii. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
jj. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
kk. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
ll. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
mm. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
nn. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A35**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 39: Imperial Dock Lock, Leith SPA

Name of European site: Imperial Dock Lock, Leith SPA												
Distance to Hornsea Project One: 319.6 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common tern *Sterna hirundo*		**×a**			**×b**			**×c**			**×d**	

Evidence supporting conclusions (Ref: Table A36 of Annex A):

a. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.

b. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

c. Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).

d. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A36**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 40: St Abb's Head to Fast Castle SPA

Name of European site: St Abb's Head to Fast Castle SPA												
Distance to Hornsea Project One: 277 km												
European site features	**Likely Effects of Project One**											
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda*		×a			×b			×c			×m	
Guillemot *Uria aalge*		×d			×e			×f			×m	
Kittiwake *Rissa tridactyla*		×g			×h			×i			×m	
Herring Gull *Larus argentatus*		×g			×h			×i			×m	
Shag *Phalacrocorax aristotelis*		×j			×k			×l			×m	

Evidence supporting conclusions (Ref: Table A37 of Annex A):

a. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
b. The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
d. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
e. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
g. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
h. The SPA is outwith the mean maximum or maximum foraging range for kittiwake during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
i. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (Petersen *et al.* 2006).
j. The SPA is outwith the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.
k. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
l. There are a no records of shags using the area and therefore no displacement impacts are predicted.
m. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A37**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 41: Lindisfarne SPA & Ramsar

Name of European site: Lindisfarne SPA & Ramsar

Distance to Hornsea Project One: 237.8 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding (Passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		**×a**			**×b**			**×c**			**×bb**	
Article 4.1 – Breeding (Over Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		**×d**			**×e**			**×f**			**×bb**	
Golden Plover *Pluvialis apricaria*		**×g**			**×e**			**×f**			**×bb**	
Whooper Swan *Cygnus cygnus*		**×h**			**×h**			**×h**			**×bb**	
Article 4.2 – Migratory (On Passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		**×i**			**×e**			**×f**			**×bb**	
Article 4.2 – Migratory (Over Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey Plover *Pluvialis squatarola*		**×j**			**×e**			**×f**			**×bb**	
Greylag Goose *Anser anser*		**×k**			**×l**			**×f**			**×bb**	
Knot *Calidris canutus*		**×m**			**×e**			**×f**			**×bb**	
Light-bellied Brent Goose *Branta bernicla hrota*		**×n**			**×n**			**×n**			**×bb**	
Wigeon *Anas penelope*		**×o**			**×p**			**×f**			**×bb**	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Pink-footed Goose *Anser brachyrhynchus*		**×q**			**×r**			**×f**			**×bb**	
Golden Plover *Pluvialis apricaria*		**×g**			**×e**			**×f**			**×bb**	
Bar-tailed Godwit *Limosa lapponica*		**×d**			**×e**			**×f**			**×bb**	
Greylag Goose *Anser anser*		**×k**			**×l**			**×f**			**×bb**	
Light-bellied Brent Goose *Branta bernicla hrota*		**×n**			**×n**			**×n**			**×bb**	
Wigeon *Anas penelope*		**×o**			**×p**			**×f**			**×bb**	
Whooper Swan *Cygnus cygnus*		**×h**			**×h**			**×h**			**×bb**	
Knot *Calidris canutus*		**×m**			**×e**			**×f**			**×bb**	
Redshank *Tringa totanus*		**×s**			**×s**			**×s**			**×bb**	

Shelduck *Tadorna tadorna*		×t			×t			×f			×bb	
Eider *Somateria mollissima*		×u			×v			×f			×bb	
Common Scoter *Melanitta nigra*		×w			×x			×f			×bb	
Ringed Plover *Charadrius hiaticula*		×i			×e			×f			×bb	
Lapwing *Vanellus vanellus*		×y			×z			×f			×bb	
Dunlin *Calidris alpina alpina*		×aa			×e			×f			×bb	
Grey Plover *Pluvialis squatarola*		×j			×e			×f			×bb	

Evidence supporting conclusions (Ref: Table A38 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
e. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
f. These species were not recorded using the development area and no displacement effects are predicted.
g. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
h. No whooper swans were recorded.
i. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
j. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
k. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
l. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
m. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
n. No light bellied brent geese were recorded in Year 1.
o. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
p. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
q. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
r. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional c. 32 km is considered negligible.
s. Only seven redshank were recorded during two years of surveys.
t. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
u. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
v. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
w. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
x. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.

y. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.

z. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.

aa. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.

bb. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A38**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 42: Northumbria Coast SPA & Ramsar

Name of European site: Northumbria Coast SPA & Ramsar

Distance to Hornsea Project One: 136.2 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		**×a**			**×b**			**×c**			**×h**	
Article 4.2 – Migratory	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Purple Sandpiper *Calidris maritima*		**×d**			**×d**			**×d**			**×h**	
Turnstone *Arenaria interpres*		**×g**			**×h**			**×i**			**×h**	

Evidence supporting conclusions (Ref: Table A41 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. Only one purple sandpiper was recorded during two years of surveys.
e. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
f. Migrating turnstone may fly around the wind farm but the incremental increase in flight distance to or from the SPA is likely to be negligible.
g. No turnstone were recorded using the development area and no displacement effects are predicted.
h. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A41**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 43: Teesmouth and Cleveland SPA

Name of European site: Teesmouth and Cleveland SPA												
Distance to Hornsea Project One: 119.1 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		×a			×b			×c			×r	
Article 4.1 – Breeding (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich Tern *Sterna sandvicensis*		×d			×e			×c			×r	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		×f			×g			×h			×r	
Article 4.2 – Migratory (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Knot *Calidris canutus*		×i			×g			×h			×r	
Redshank *Tringa tetanus*		×j			×j			×j			×r	
Article 4.2 – Assemblage (Waterfowl)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Sanderling *Calidris alba*		×k			×k			×k			×r	
Lapwing *Vanellus vanellus*		×p			×q			×h			×r	
Shelduck *Tadorna tadorna*		×l			×l			×l			×r	
Cormorant *Phalacrocorax carbo*		×m			×n			×o			×r	
Redshank *Tringa totanus*		×j			×j			×j			×r	
Knot *Calidris canutus*		×i			×g			×h			×r	

Evidence supporting conclusions (Ref: Table A42 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006).
d. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
e. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
f. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
g. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
h. These species were not recorded using the development area and no displacement effects are predicted.
i. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.

j. Only seven redshank were recorded during two years of surveys.
k. No sanderling were recorded.
l. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
m. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
n. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
o. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
p. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
q. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
r. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A42**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 44: Flamborough Head and Bempton Cliffs SPA & Ramsar

Name of European site: Flamborough Head and Bempton Cliffs SPA & Ramsar

Distance to Hornsea Project One: 51.2 km

European site features	**Likely Effects of Project One**											
Article 4.2 – Migratory (Breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake *Rissa tridactyla*		✓a			✗b			✓c			✓v	
Article 4.2 – Assemblage	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Puffin *Fratercula arctica*,		✗d			✗e			✓f			✓v	
Razorbill *Alca torda*,		✗g			✗h			✓i			✓v	
Guillemot *Uria aalge*,		✗j			✗k			✓l			✓v	
Herring Gull *Larus argentatus*,		✓m			✗n			✗o			✓v	
Gannet *Morus bassanus*,		✓p			✗q			✓r			✓v	
Kittiwake *Rissa tridactyla.*		✓a			✗b			✓c			✓v	
Fulmar *Fulmaris glacialis*		✗s			✗t			✓u			✓v	

Evidence supporting conclusions (Ref: Table A43 of Annex A):

a. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the mean maximum foraging range for kittiwake but within the maximum foraging range during the breeding season and therefore birds at this site may occur within the development area. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact. Screening (see HRA, **Annex A and Table 4.3)** identified a potential likely significant effect alone and/or in combination.

b. The SPA is within the maximum foraging range for kittiwake during the breeding season and therefore regularly barrier effects may occur during this period. However, the distance from the breeding colony is at the far end of reported foraging range (Thaxter *et al.* 2012) and therefore barrier effects are not predicted to be significant. Furthermore, evidence from existing wind farms have not reported any barrier effects on kittiwakes (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

c. Results from site specific monitoring indicate that kittiwakes are widespread across the Hornsea Zone throughout the year, with peak densities from July to September, corresponding with post-breeding movements from colonies. Kittiwakes recorded within Project One/Subzone 1 are at the maximum reported foraging range for this species. However, observations of flying birds recorded a significant majority of birds flying in an east-west direction across the Hornsea Zone during the breeding period, indicating that at least some kittiwakes recorded during the breeding period will be birds from the Flamborough Head and Bempton Cliffs SPA. Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Zucco et al. 2006). However, due to high peak counts recorded within Project One, and the proximity to this SPA, a likely significant effect cannot be discounted.

d. A total of 2,495 puffins were recorded in Year 1 and 4,733 in Year 2. Peak numbers occurred from August to October. Of those recorded in flight all were below rotor height and therefore not at risk of collision.

e. The SPA is outwith the maximum foraging range for puffin during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

f. There is little evidence from constructed offshore wind farms on whether puffins may be displaced or not. However, should it occur there is the potential for a likely significant effect outwith the breeding season. Screening (see HRA, **Annex A and Table 4.3** identified a potential likely significant effect alone and/or in combination.

g. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.

h. The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

i. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). There is therefore the potential for a likely significant effect from displacement outwith the breeding season. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in combination.

j. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

k. The SPA is outwith the maximum foraging range for guillemot during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

l. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). There is therefore the potential for a likely significant effect outwith the breeding season. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in combination.

m. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Birds from this SPA may be at risk of a significant impact either alone or in-combination with other potential future developments. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in combination.

n. The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

o. Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al.* 2006).

p. A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. Of those recorded in flight 82.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely. Collision risk modelling predicted on average up to 94 collisions per year for Hornsea Hornsea Project One, of which 31 may be from this SPA. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in combination.

q. The SPA is within the mean maximum foraging range for gannet during the breeding season and therefore barrier effects may occur. The additional estimated distance of up to 36 km will, if a barrier effect does occur, be a very small incremental increase in overall distance flown and therefore not cause an increase in energetic costs.

r. There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere. However, the proximity of this SPA to the proposed development area indicates that there may be the potential for a significant effect. Screening (see HRA, **Annex A and Table 4.3**) identified a potential likely significant effect alone and/or in combination.

s. A total of 6,608 fulmars were recorded in Year 1 and 8,300 in Year 2; with peak numbers in May. Of those in flight 99.9% were below 22.5 m and therefore not at risk of collision. Collision risk modelling predicted zero collisions. Therefore the risk is very low.

t. The SPA is within the mean maximum foraging range for fulmar during the breeding season and therefore barrier effects may potentially occur. However, the additional estimated foraging distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.

u. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species. Nevertheless, due to the proximity of this SPA population to Project One, this cannot be ruled out.

v. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A43**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 45: Hornsea Mere SPA

Name of European site: Hornsea Mere SPA												
Distance to Hornsea Project One: 28.8 km												
European site features	**Likely Effects of Project One**											
Article 4.2 – Migratory	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Gadwall		**×a**			**×a**			**×a**			**×b**	

Evidence supporting conclusions (Ref: Table A44 of Annex A):

a. Only one gadwall was recorded during two years of surveys.

b. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A44**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 46: Gibraltar Point SPA & Ramsar

Name of European site: Gibraltar Point SPA & Ramsar

Distance to Hornsea Project One: 39.6 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		**×a**			**×b**			**×c**			**×j**	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		**×d**			**×e**			**×f**			**×j**	
Article 4.2 – Migratory (Overwinter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey Plover *Pluvialis squatarola*		**×g**			**×e**			**×f**			**×j**	
Knot *Calidris canutus*		**×h**			**×e**			**×f**			**×j**	
Article 4.2 – Assemblage (Waterfowl)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Oystercatcher *Haematopus ostralegus*		**×i**			**×e**			**×f**			**×j**	
Knot *Calidris canutus*		**×h**			**×e**			**×f**			**×j**	
Grey Plover *Pluvialis squatarola*		**×g**			**×e**			**×f**			**×j**	
Bar-tailed Godwit *Limosa lapponica*		**×d**			**×e**			**×f**			**×j**	

Evidence supporting conclusions (Ref: Table A46 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
e. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
f. No birds of these species were recorded using the development area and no displacement effects are predicted.
g. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
h. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
i. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
j. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A46**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 47: The Wash SPA & Ramsar

Name of European site: The Wash SPA & Ramsar

Distance to Hornsea Project One: 42.7 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common Tern *Sterna hirundo*		×a			×b			×c			×jj	
Little Tern *Sterna albifrons*		×d			×e			×f			×jj	
Marsh Harrier *Circus aeruginosus*		×g			×g			×g			×jj	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×h			×h			×h			×jj	
Bar-tailed Godwit *Limosa lapponica*		×i			×j			×k			×jj	
Golden Plover *Pluvialis apricaria*		×l			×j			×k			×jj	
Whooper Swan *Cygnus cygnus*		×g			×g			×g			×jj	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey Plover *Pluvialis squatarola*		×m			×j			×k			×jj	
Knot *Calidris canutus*		×n			×j			×k			×jj	
Article 4.2 – Migratory (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×g			×g			×g			×jj	
Curlew *Numenius arquata*		×o			×j			×k			×jj	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×p			×q			×k			×jj	
Dunlin *Calidris alpina alpina*		×r			×j			×k			×jj	
Grey Plover *Pluvialis squatarola*		×m			×j			×k			×jj	
Knot *Calidris canutus*		×n			×j			×k			×jj	
Oystercatcher *Haematopus ostralegus*		×ii			×j			×k			×jj	
Pink-footed Goose *Anser brachyrhynchus*		×s			×t			×k			×jj	
Pintail *Anas acuta*		×g			×g			×g			×jj	
Redshank *Tringa totanus*		×u			×u			×u			×jj	
Shelduck *Tadorna tadorna*		×v			×w			×w			×jj	

Turnstone *Arenaria interpres*		×x			×j			×k			×jj	
Article 4.2 – Assemblage (Waterfowl)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×g			×g			×g			×jj	
Avocet *Recurvirostra avosetta*		×h			×h			×h			×jj	
Golden Plover *Pluvialis apricaria*		×l			×j			×k			×jj	
Bar-tailed Godwit *Limosa lapponica*		×i			×j			×k			×jj	
Pink-footed Goose *Anser brachyrhynchus*		×s			×t			×k			×jj	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×p			×q			×k			×jj	
Shelduck *Tadorna tadorna*		×v			×w			×w			×jj	
Pintail *Anas acuta*		×g			×g			×g			×jj	
Oystercatcher *Haematopus ostralegus*		×ii			×j			×k			×jj	
Grey Plover *Pluvialis squatarola*		×m			×j			×k			×jj	
Whooper Swan *Cygnus cygnus*		×g			×g			×g			×jj	
Dunlin *Calidris alpina alpina*		×r			×j			×k			×jj	
Sanderling *Calidris alba*		×g			×g			×g			×jj	
Curlew *Numenius arquata*		×o			×j			×k			×jj	
Redshank *Tringa totanus*		×u			×u			×u			×jj	
Turnstone *Arenaria interpres*		×x			×j			×k			×jj	
Little Grebe *Tachybaptus ruficollis*		×g			×g			×g			×jj	
Cormorant *Phalacrocorax carbo*		×y			×z			×aa			×jj	
White-fronted Goose *Anser albifrons albifrons*		×g			×g			×g			×jj	
Wigeon *Anas penelope*		×bb			×cc			×k			×jj	
Mallard *Anas platyrhynchos*		×dd			×j			×k			×jj	
Ringed Plover *Charadrius hiaticula*		×ee			×j			×k			×jj	
Lapwing *Vanellus vanellus*		×ff			×gg			×k			×jj	
Knot *Calidris canutus*		×n			×j			×k			×jj	
Whimbrel *Numenius phaeopus*		×hh			×j			×k			×jj	

Evidence supporting conclusions (Ref: Table A47 of Annex A):

- **a.** A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6.% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
- **b.** No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **c.** Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
- **d.** Three little terns were recorded, all flying below 5 m.
- **e.** Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
- **f.** Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
- **g.** No marsh harriers were recorded.
- **h.** Only two avocets were recorded during two years of surveys.
- **i.** A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
- **j.** Migrating bar-tailed godwit may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
- **k.** No bar-tailed godwit were recorded using the development area and no displacement effects are predicted.
- **l.** A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
- **m.** One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
- **n.** A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
- **o.** Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
- **p.** A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
- **q.** Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
- **r.** A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
- **s.** Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
- **t.** Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional c. 32 km is considered negligible.
- **u.** Only seven redshank were recorded during two years of surveys.
- **v.** Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
- **w.** Only one shelduck was recorded during two years of surveys.
- **x.** Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
- **y.** Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
- **z.** There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
- **aa.** Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
- **bb.** A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
- **cc.** Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
- **dd.** A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.
- **ee.** Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
- **ff.** A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
- **gg.** A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
- **hh.** Eleven out of a total of 49 whimbrel recorded were in the Hornsea Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.

ii. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.

jj. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A47**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 48: North Norfolk Coast SPA & Ramsar

Name of European site: North Norfolk Coast SPA & Ramsar												
Distance to Hornsea Project One: 57.9 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		**×a**			**×a**			**×a**			**×kk**	
Bittern *Botaurus stellaris*		**×b**			**×b**			**×b**			**×kk**	
Common Tern *Sterna hirundo*		**×c**			**×d**			**×e**			**×kk**	
Little Tern *Sterna albifrons*		**×f**			**×g**			**×e**			**×kk**	
Marsh Harrier *Circus aeruginosus*		**×a**			**×a**			**×a**			**×kk**	
Mediterranean Gull *Larus melanocephalus*		**×a**			**×a**			**×a**			**×kk**	
Roseate Tern *Sterna dougallii*		**×a**			**×a**			**×a**			**×kk**	
Sandwich Tern *Sterna sandvicensis*		**×h**			**×i**			**×e**			**×kk**	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		**×a**			**×a**			**×a**			**×kk**	
Bar-tailed Godwit *Limosa lapponica*		**×j**			**×k**			**×l**			**×kk**	
Bittern *Botaurus stellaris*		**×b**			**×b**			**×b**			**×kk**	
Golden Plover *Pluvialis apricaria*		**×m**			**×k**			**×l**			**×kk**	
Hen Harrier *Circus cyaneus*		**×a**			**×a**			**×a**			**×kk**	
Ruff *Philomachus pugnax*		**×a**			**×a**			**×a**			**×kk**	
Article 4.2 – Migratory (Breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		**×n**			**×n**			**×n**			**×kk**	
Ringed Plover *Charadrius hiaticula*		**×o**			**×k**			**×l**			**×kk**	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		**×o**			**×k**			**×l**			**×kk**	
Article 4.2 – Migratory (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×p**			**×q**			**×l**			**×kk**	
Knot *Calidris canutus*		**×r**			**×k**			**×l**			**×kk**	

Pink-footed Goose *Anser brachyrhynchus*		×s			×t			×l			×kk	
Pintail *Anas acuta*		×a			×a			×a			×kk	
Redshank *Tringa totanus*		×n			×n			×n			×kk	
Wigeon *Anas penelope*		×u			×v			×l			×kk	

<u>Article 4.2 – Assemblage (Waterfowl)</u>	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Shelduck *Tadorna tadorna*		×w			×w			×w			×kk	
Avocet *Recurvirostra avosetta*		×a			×a			×a			×kk	
Golden Plover *Pluvialis apricaria*		×m			×k			×l			×kk	
Ruff *Philomachus pugnax*		×a			×a			×a			×kk	
Bar-tailed Godwit *Limosa lapponica*		×j			×k			×l			×kk	
Pink-footed Goose *Anser brachyrhynchus*		×s			×t			×l			×kk	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×p			×q			×l			×kk	
Wigeon *Anas penelope*		×u			×v			×l			×kk	
Pintail *Anas acuta*		×a			×a			×a			×kk	
Knot *Calidris canutus*		×r			×k			×l			×kk	
Redshank *Tringa totanus*		×n			×n			×n			×kk	
Bittern *Botaurus stellaris*		×b			×b			×b			×kk	
White-fronted Goose *Anser albifrons albifrons*		×a			×a			×a			×kk	
Dunlin *Calidris alpina alpina*		×x			×k			×l			×kk	
Gadwall *Anas strepera*		×y			×y			×y			×kk	
Teal *Anas crecca*		×z			×k			×l			×kk	
Shoveler *Anas clypeata*		×aa			×aa			×aa			×kk	
Common Scoter *Melanitta nigra*		×bb			×cc			×l			×kk	
Velvet Scoter *Melanitta fusca*		×a			×a			×a			×kk	
Oystercatcher *Haematopus ostralegus*		×dd			×k			×l			×kk	
Ringed Plover *Charadrius hiaticula*		×o			×k			×l			×kk	
Grey Plover *Pluvialis squatarola*		×ee			×k			×l			×kk	
Lapwing *Vanellus vanellus*		×ff			×gg			×l			×kk	
Sanderling *Calidris alba*		×a			×a			×a			×kk	

Cormorant *Phalacrocorax carbo*		×hh			×ii			×jj			×kk	

Evidence supporting conclusions (Ref: Table A48 of Annex A):

a. Only two avocets were recorded during two years of surveys.
b. No bitterns were recorded.
c. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
d. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
e. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
f. Three little terns were recorded, all flying below 5 m.
g. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
h. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
i. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
j. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
k. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
l. These species were not recorded using the development area and no displacement effects are predicted.
m. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. None were recorded flying above 22.5 m and therefore at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
n. Only seven redshank were recorded during two years of surveys.
o. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
p. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
q. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
r. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
s. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
t. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional c. 32 km is considered negligible.
u. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
v. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
w. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
x. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
y. Only one gadwall was recorded during two years of surveys.
z. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
aa. Only four shoveler were recorded during two years of surveys.
bb. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
cc. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
dd. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
ee. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.

ff. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.

gg. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.

hh. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

ii. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

jj. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

kk. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A48**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 49: Breydon Water SPA

Name of European site: Breydon Water SPA												
Distance to Hornsea Project One: 120.7 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common Tern *Sterna hirundo*		×a			×b			×c			×r	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×d			×d			×d			×r	
Bewick's Swan *Cygnus columbianus bewickii*		×e			×e			×e			×r	
Golden Plover *Pluvialis apricaria*		×f			×g			×h			×r	
Article 4.2 – Assemblage (Waterfowl)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×e			×e			×e			×r	
Dunlin *Calidris alpina alpina*		×i			×g			×h			×r	
Lapwing *Vanellus vanellus*		×j			×k			×h			×r	
Shoveler *Anas clypeata*		×l			×l			×l			×r	
Wigeon *Anas penelope*		×m			×n			×h			×r	
White-fronted Goose *Anser albifrons albifrons*		×e			×e			×e			×r	
Cormorant *Phalacrocorax carbo*		×o			×p			×q			×r	
Golden Plover *Pluvialis apricaria*		×f			×g			×h			×r	
Avocet *Recurvirostra avosetta*		×d			×d			×d			×r	
Bewick's Swan *Cygnus columbianus bewickii*		×e			×e			×e			×r	

Evidence supporting conclusions (Ref: Table A49 of Annex A):

- **a.** A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
- **b.** No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **c.** Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
- **d.** Only two avocets were recorded during two years of surveys.
- **e.** These species were not recorded during Project One surveys.
- **f.** A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No goldenplover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
- **g.** Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.

h. These species were not recorded using the development area and no displacement effects are predicted.
i. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
j. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
k. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
l. Only four shoveler were recorded during two years of surveys.
m. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
n. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
o. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
p. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
q. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
r. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A49**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 50: Great Yarmouth and North Denes SPA

Name of European site: Great Yarmouth and North Denes SPA												
Distance to Hornsea Project One: 107 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little tern *Sterna albifrons*		**×a**			**×b**			**×c**			**×d**	

Evidence supporting conclusions (Ref: Table A50 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A50**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 51: Broadland SPA & Ramsar

Name of European site: Broadland SPA & Ramsar

Distance to Hornsea Project One: 99.1 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bittern *Botaurus stellaris*		×a			×a			×a			×s	
Marsh Harrier *Circus aeruginosus*		×a			×a			×a			×s	
Article 4.1 – Over winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bewick's Swan *Cygnus columbianus bewickii*		×a			×a			×a			×s	
Bittern *Botaurus stellaris*		×a			×a			×a			×s	
Hen Harrier *Circus cyaneus*		×a			×a			×a			×s	
Ruff *Philomachus pugnax*		×a			×a			×a			×s	
Whooper Swan *Cygnus cygnus*		×a			×a			×a			×s	
Article 4.2 – Migratory (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Gadwall *Anas strepera*		×b			×b			×b			×s	
Pink-footed Goose *Anser brachyrhynchus*		×c			×d			×e			×s	
Shoveler *Anas clypeata*		×f			×f			×f			×s	
Article 4.2 – Assemblage (Waterfowl)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Cormorant *Phalacrocorax carbo*		×g			×h			×i			×s	
Bewick's Swan *Cygnus columbianus bewickii*		×a			×a			×a			×s	
Whooper Swan *Cygnus cygnus*		×a			×a			×a			×s	
Ruff *Philomachus pugnax*		×a			×a			×a			×s	
Pink-footed Goose *Anser brachyrhynchus*		×h			×i			×e			×s	
Gadwall *Anas strepera*		×g			×g			×g			×s	
Bittern *Botaurus stellaris*		×a			×a			×a			×s	
Great Crested Grebe *Podiceps cristatus*		×j			×k			×e			×s	
Coot *Fulica atra*		×a			×a			×a			×s	
Bean Goose *Anser fabalis*		×l			×m			×e			×s	
White-fronted Goose *Anser albifrons albifrons*		×a			×a			×a			×s	

Wigeon *Anas penelope*		×n			×o			×e			×s	
Teal *Anas crecca*		×p			×k			×e			×s	
Pochard *Aythya ferina*		×q			×k			×e			×s	
Tufted Duck *Aythya fuligula*		×r			×r			×r			×s	
Shoveler *Anas clypeata*		×k			×k			×k			×s	

Evidence supporting conclusions (Ref: Table A51 of Annex A):

a. These species were not recorded during Project One surveys.
b. Only one gadwall was recorded during two years of surveys.
c. Twenty-two pink-footed geese were recorded on the eastern boundary of the Hornsea Zone in Year 1 and three in Year 2. Known migration routes are mainly from Iceland to North-east Scotland, across to Lancashire and on to Norfolk (Mitchell & Hearn 2004; WWT 2007). A smaller passage also occurs through Yorkshire in the autumn (Thomas 2011). All birds were at rotor height but the very small numbers recorded indicate that should there be a collision risk the significance will be negligible.
d. Pink-footed geese are known to fly around or over offshore wind farms (e.g. BOW 2007). The incremental increase in overall migration distance due to flying an additional c. 32 km is considered negligible.
e. These species were not recorded using the Hornsea Project One and therefore no displacement effects are predicted to occur.
f. Only four shoveler were recorded during two years of surveys.
g. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
h. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
i. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
j. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
k. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to or from the SPA is negligible.
l. Three bean geese were recorded in year 2, one of which was in Hornsea Project One.
m. The incremental increase in flight distance will be negligible compared to the overall distance flown during migration.
n. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
o. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
p. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
q. Three pochard were recorded flying at 10 m in height in the development area but outwith the Hornsea Project One in Year 1 and two birds were recorded in Year 2. Therefore, at very low risk of collision.
r. Only seven tufted duck were recorded during two years of surveys.
s. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A51**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 52: Minsmere and Walberswick SPA & Ramsar

Name of European site: Minsmere and Walberswick SPA & Ramsar												
Distance to Hornsea Project One: 146.9 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*,		**×a**			**×a**			**×a**			**×k**	
Bittern *Botaurus stellarius*		**×b**			**×b**			**×b**			**×k**	
Little Tern *Sterna albifrons*		**×c**			**×d**			**×e**			**×k**	
Marsh Harrier *Circus aeruginosus*		**×b**			**×b**			**×b**			**×k**	
Nightjar *Camprimulgus europaeus*		**×b**			**×b**			**×b**			**×k**	
Woodlark *Lullula arborea*		**×b**			**×b**			**×b**			**×b**	
Gadwall *Anas strepera*		**×f**			**×f**			**×f**			**×k**	
Shoveler *Anas clypeata*		**×g**			**×g**			**×g**			**×k**	
Teal *Anas crecca*		**×h**			**×i**			**×j**			**×k**	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*,		**×a**			**×a**			**×a**			**×k**	
Bittern *Botaurus stellarius*		**×b**			**×b**			**×b**			**×k**	
Hen harrier *Circus cyaneus*		**×b**			**×b**			**×b**			**×k**	
Gadwall *Anas strepera*		**×f**			**×f**			**×f**			**×k**	
Shoveler *Anas clypeata*		**×g**			**×g**			**×g**			**×k**	
White-fronted goose *Anser albifrons albifrons*		**×b**			**×b**			**×b**			**×k**	

Evidence supporting conclusions (Ref: Table A52 of Annex A):

a. Only two avocets were recorded during two years of surveys.
b. These species were not recorded during Project One surveys.
c. Three little terns were recorded, all flying below 5 m.
d. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
e. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
f. Only one gadwall was recorded during two years of surveys.
g. Only four shoveler were recorded during two years of surveys.
h. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
i. Migrating birds may fly around the wind farm but the incremental increase in flight distance is likely to be negligible compared to the overall distance flown during migration.
j. No birds were recorded using the area and no displacement effects are predicted.
k. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A52**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 53: Alde Ore Estuary SPA & Ramsar

Name of European site: Alde Ore Estuary SPA & Ramsar												
Distance to Hornsea Project One: 161.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×a			×a			×a			×x	
Little Tern *Sterna albifrons*		×b			×c			×d			×x	
Marsh Harrier *Circus aeruginosus*		×e			×e			×e			×x	
Sandwich Tern Sterna sandvicensis		×f			×g			×d			×x	
Article 4.2 – Migratory (Breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Lesser Black-backed Gull *Larus fuscus*		×h			×i			×j			×x	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		×k			×k			×k			×x	
Article 4.2 – Assemblage (Seabirds)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Herring Gull *Larus argentatus*		×l			×j			×k			×x	
Black-headed Gull *Larus ridibundus*		×m			×j			×k			×x	
Lesser Black-backed Gull *Larus fuscus*		×h			×i			×j			×x	
Little Tern *Sterna albifrons*		×b			×c			×d			×x	
Sandwich Tern *Sterna sandvicensis*		×f			×g			×d			×x	
Article 4.2 – Assemblage (Waterbirds)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×e			×e			×e			×x	
Dunlin *Calidris alpina alpina*		×n			×o			×p			×x	
Lapwing *Vanellus vanellus*		×q			×r			×p			×x	
Shoveler *Anas clypeata*		×s			×s			×s			×x	
Teal *Anas crecca*		×t			×o			×p			×x	
Wigeon *Anas penelope*		×u			×v			×p			×x	
Shelduck *Tadorna tadorna*		×w			×w			×w			×x	
White-fronted Goose *Anser albifrons albifrons*		×e			×e			×e			×x	

Redshank *Tringa totanus*		×k			×k			×k			×x	
Avocet *Recurvirostra avosetta*		×a			×a			×a			×x	

Evidence supporting conclusions (Ref: Table A53 of Annex A):

a. Only two avocets were recorded during two years of surveys.
b. Three little terns were recorded, all flying below 5 m.
c. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
d. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006).
e. These species were not recorded during Project One surveys.
f. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
g. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
h. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. During the non-breeding period none of the collisions are predicted to be of birds from this SPA (see Annex B).
i. The SPA is outwith the mean maximum foraging range for these species gull during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in distance flown.
j. Evidence from constructed offshore wind farms indicates that these species are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006).
k. Only seven redshank were recorded during two years of surveys.
l. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. Birds from this SPA may be at risk of a significant impact either alone or in-combination with other potential future developments.
m. A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from the proposed development and the low usage of the site indicates low risk of a significant impact.
n. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
o. Migrating birds may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.
p. These species were not recorded using the development area and no displacement effects are predicted.
q. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
r. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
s. Only four shoveler were recorded during two years of surveys.
t. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
u. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
v. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
w. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
x. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A53**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 54: Stour and Orwell Estuaries SPA & Ramsar

Name of European site: Stour and Orwell Estuaries SPA & Ramsar

Distance to Hornsea Project One: 169.5 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Hen Harrier *Circus cyaneus*		**×a**			**×a**			**×a**			**×y**	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*,		**×a**			**×a**			**×a**			**×y**	
Dunlin *Calidris alpina alpina*,		**×b**			**×c**			**×d**			**×y**	
Grey Plover *Pluvialis squatarola*,		**×e**			**×c**			**×d**			**×y**	
Pintail *Anas acuta*,		**×a**			**×a**			**×a**			**×y**	
Redshank *Tringa totanus*,		**×f**			**×f**			**×f**			**×y**	
Ringed Plover *Charadrius hiaticula*,		**×g**			**×c**			**×d**			**×y**	
Shelduck *Tadorna tadorna*,		**×h**			**×i**			**×i**			**×y**	
Turnstone *Arenaria interpres*,		**×j**			**×c**			**×d**			**×y**	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Cormorant *Phalacrocorax carbo*		**×k**			**×l**			**×m**			**×y**	
Pintail *Anas acuta*		**×a**			**×a**			**×a**			**×y**	
Ringed Plover *Charadrius hiaticula*		**×g**			**×d**			**×k**			**×y**	
Grey Plover *Pluvialis squatarola*		**×e**			**×c**			**×d**			**×y**	
Dunlin *Calidris alpina alpina*		**×c**			**×d**			**×d**			**×y**	
Black-tailed Godwit *Limosa limosa islandica*		**×a**			**×a**			**×a**			**×y**	
Redshank *Tringa totanus*		**×h**			**×h**			**×h**			**×y**	
Shelduck *Tadorna tadorna*		**×h**			**×i**			**×i**			**×y**	
Great Crested Grebe *Podiceps cristatus*		**×n**			**×d**			**×d**			**×y**	
Curlew *Numenius arquata*		**×o**			**×d**			**×d**			**×y**	
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×p**			**×q**			**×d**			**×y**	
Wigeon *Anas penelope*		**×r**			**×s**			**×d**			**×y**	
Goldeneye *Bucephala clangula*		**×t**			**×t**			**×t**			**×y**	

Oystercatcher *Haematopus ostralegus*		**×u**			**×d**			**×d**			**×y**	
Lapwing *Vanellus vanellus*		**×v**			**×w**			**×d**			**×y**	
Knot *Calidris canutus*		**×x**			**×d**			**×d**			**×y**	
Turnstone *Arenaria interpres*		**×j**			**×c**			**×d**			**×y**	

Evidence supporting conclusions (Ref: Table A54 of Annex A):

a. These species were not recorded during Project One surveys.
b. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
c. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.
d. These species were not recorded using the development area and no displacement effects are predicted.
e. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
f. Only seven redshank were recorded during two years of surveys.
g. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
h. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
i. Only one shelduck was recorded during two years of surveys.
j. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
k. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
l. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
m. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
n. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
o. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
p. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
q. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
r. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
s. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
t. Only one goldeneye was recorded during two years of surveys.
u. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
v. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
w. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
x. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
y. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A54**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 55: Hamford Water SPA and Ramsar

Name of European site: Hamford Water SPA and Ramsar												
Distance to Hornsea Project One: 183.3 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		×a			×b			×c			×v	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×d			×d			×d			×v	
Golden Plover *Pluvialis apricaria*		×e			×f			×g			×v	
Ruff *Philomachus pugnax*		×h			×h			×h			×v	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		×i			×f			×g			×v	
Article 4.2 – Migratory (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×h			×h			×h			×v	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×j			×k			×g			×v	
Grey Plover *Pluvialis squatarola*		×l			×f			×g			×v	
Ringed Plover *Charadrius hiaticula*		×i			×f			×g			×v	
Teal *Anas crecca*		×m			×f			×g			×v	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		×n			×n			×n			×v	
Dunlin *Calidris alpina alpina*		×o			×f			×g			×v	
Lapwing *Vanellus vanellus*		×p			×q			×g			×v	
Wigeon *Anas penelope*		×r			×s			×g			×v	
Shelduck *Tadorna tadorna*		×t			×u			×u			×v	
Black-tailed Godwit *Limosa limosa islandica*		×h			×h			×h			×v	
Grey Plover *Pluvialis squatarola*		×l			×f			×g			×v	
Ringed Plover *Charadrius hiaticula*		×i			×f			×g			×v	
Teal *Anas crecca*		×m			×f			×g			×v	

Dark-bellied Brent Goose *Branta bernicla bernicla*		**×j**			**×k**			**×g**			**×v**	
Ruff *Philomachus pugnax*		**×h**			**×h**			**×h**			**×v**	
Golden Plover *Pluvialis apricaria*		**×e**			**×f**			**×g**			**×v**	
Avocet *Recurvirostra avosetta*		**×d**			**×d**			**×d**			**×v**	

Evidence supporting conclusions (Ref: Table A55 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. Only two avocets were recorded during two years of surveys.
e. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
f. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
g. These species were not recorded using the development area and no displacement effects are predicted.
h. These species were not recorded during Project One surveys.
i. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
j. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
k. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
l. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
m. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
n. Only seven redshank were recorded during two years of surveys.
o. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
p. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
q. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
r. A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision.
s. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
t. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
u. Only one shelduck was recorded during two years of surveys.
v. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A55**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 56: Colne Estuary SPA and Ramsar

Name of European site: Colne Estuary SPA and Ramsar

Distance to Hornsea Project One: 185.9 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little Tern *Sterna albifrons*		×a			×b			×c			×w	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×d			×d			×d			×w	
Golden Plover *Pluvialis apricaria*		×e			×f			×g			×w	
Hen Harrier *Circus cyaneus*		×h			×h			×h			×w	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dark-bellied Brent Goose *Branta bernicla bernicla*		×i			×j			×g			×w	
Redshank *Tringa totanus*		×k			×k			×k			×w	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×h			×h			×h			×w	
Dunlin *Calidris alpina alpina*		×l			×f			×g			×w	
Lapwing *Vanellus vanellus*		×m			×n			×g			×w	
Grey Plover *Pluvialis squatarola*		×o			×f			×g			×w	
Ringed Plover *Charadrius hiaticula*		×p			×f			×g			×w	
Shelduck *Tadorna tadorna*		×q			×r			×z			×w	
Cormorant *Phalacrocorax carbo*		×s			×t			×u			×w	
Great Crested Grebe *Podiceps cristatus*		×v			×f			×g			×w	
Redshank *Tringa totanus*		×k			×k			×k			×w	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×i			×j			×g			×w	
Golden Plover *Pluvialis apricaria*		×e			×f			×g			×w	
Avocet *Recurvirostra avosetta*		×d			×d			×d			×w	

Evidence supporting conclusions (Ref: Table A56 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. Only two avocets were recorded during two years of surveys.
e. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
f. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
g. These species were not recorded using the development area and no displacement effects are predicted.
h. These species were not recorded during Project One surveys.
i. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
j. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
k. Only seven redshank were recorded during two years of surveys.
l. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
m. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
n. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
o. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
p. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
q. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
r. Only one shelduck was recorded during two years of surveys.
s. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
t. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
u. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
v. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
w. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A56**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 57: Foulness SPA and Ramsar

Name of European site: Foulness SPA and Ramsar

Distance to Hornsea Project One: 208.4 km

European site features	Likely Effects of Project One											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×a			×a			×a			×aa	
Common Tern *Sterna hirundo*		×b			×c			×d			×aa	
Little Tern *Sterna albifrons*		×e			×f			×d			×aa	
Sandwich Tern *Sterna sandvicensis*		×g			×h			×d			×aa	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×a			×a			×a			×aa	
Bar-tailed Godwit *Limosa lapponica*		×i			×j			×k			×aa	
Golden Plover *Pluvialis apricaria*		×l			×j			×k			×aa	
Hen Harrier *Circus cyaneus*		×m			×m			×m			×aa	
Article 4.2 – Migratory (Winter on passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		×n			×n			×n			×aa	
Article 4.2 – Migratory (Over winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dark-bellied Brent Goose *Branta bernicla bernicla*,		×o			×p			×k			×aa	
Grey Plover *Pluvialis squatarola*,		×q			×j			×k			×aa	
Knot *Calidris canutus*,		×r			×j			×k			×aa	
Oystercatcher *Haematopus ostralegus*		×s			×j			×k			×aa	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		×n			×n			×n			×aa	
Curlew *Numenius arquata*		×t			×j			×k			×aa	
Black-tailed Godwit *Limosa limosa islandica*		×m			×m			×m			×aa	
Dunlin *Calidris alpina alpina*		×u			×ii			×k			×aa	
Lapwing *Vanellus vanellus*		×v			×w			×k			×aa	
Wigeon *Anas penelope*		×x			×y			×k			×aa	

Shelduck *Tadorna tadorna*		**×z**			**×z**			**×z**			**×aa**	
Little Grebe *Tachybaptus ruficollis*		**×m**			**×m**			**×m**			**×aa**	
Knot *Calidris canutus*		**×r**			**×j**			**×k**			**×aa**	
Grey Plover *Pluvialis squatarola*		**×q**			**×j**			**×k**			**×aa**	
Oystercatcher *Haematopus ostralegus*		**×s**			**×j**			**×k**			**×aa**	
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×o**			**×p**			**×k**			**×aa**	
Bar-tailed Godwit *Limosa lapponica*		**×k**			**×j**			**×k**			**×aa**	
Golden Plover *Pluvialis apricaria*		**×l**			**×j**			**×k**			**×aa**	
Avocet *Recurvirostra avosetta*		**×a**			**×a**			**×a**			**×aa**	

Evidence supporting conclusions (Ref: Table A57 of Annex A):

a. Only two avocets were recorded during two years of surveys.
b. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
c. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
d. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
e. Three little terns were recorded, all flying below 5 m.
f. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
g. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
h. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
i. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
j. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
k. These species were not recorded using the development area and no displacement effects are predicted.
l. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
m. These species were not recorded during Project One surveys.
n. Only seven redshank were recorded during two years of surveys.
o. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
p. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
q. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
r. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
s. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
t. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
u. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
v. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.

w. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
x. A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision.
y. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
z. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
aa. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A57**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 58: Abberton Reservoir SPA & Ramsar

Name of European site: Abberton Reservoir SPA & Ramsar												
Distance to Hornsea Project One: 185.6 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Golden Plover *Pluvialis apricaria*		×a			×b			×c			×c	
Article 4.2 – Migratory (Breeding)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Cormorant *Phalacrocorax carbo*		×d			×e			×f			×c	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Gadwall *Anas strepera*,		×g			×g			×g			×c	
Shoveler *Anas clypeata*,		×h			×h			×h			×c	
Teal *Anas crecca*		×i			×b			×c			×c	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×j			×j			×j			×c	
Lapwing *Vanellus vanellus*		×k			×l			×c			×c	
Coot *Fulica atra*		×j			×j			×j			×c	
Goldeneye *Bucephala clangula*		×m			×m			×m			×c	
Tufted Duck *Aythya fuligula*		×n			×n			×n			×c	
Pochard *Aythya ferina*		×o			×b			×c			×c	
Pintail *Anas acuta*		×j			×j			×j			×c	
Wigeon *Anas penelope*		×p			×q			×c			×c	
Cormorant *Phalacrocorax carbo*		×d			×e			×f			×c	
Great Crested Grebe *Podiceps cristatus*		×r			×b			×c			×c	
Shoveler *Anas clypeata*		×h			×h			×h			×c	
Teal *Anas crecca*		×i			×b			×c			×c	
Gadwall *Anas strepera*		×g			×g			×g			×c	
Golden Plover *Pluvialis apricaria*		×a			×b			×c			×c	

Evidence supporting conclusions (Ref: Table A58 of Annex A):

- **a.** A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
- **b.** Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
- **c.** These species were not recorded using the development area and no displacement effects are predicted.
- **d.** Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
- **e.** There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
- **f.** Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
- **g.** Only one gadwall was recorded during two years of surveys.
- **h.** Only four shoveler were recorded during two years of surveys.
- **i.** Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
- **j.** These species were not recorded during Project One surveys.
- **k.** A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
- **l.** A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
- **m.** Only one goldeneye was recorded during two years of surveys.
- **n.** Only seven tufted duck were recorded during two years of surveys.
- **o.** Three pochard were recorded flying at 10 m in height in the development area but outwith the Hornsea Project One in Year 1 and two birds were recorded in Year 2. Therefore, at very low risk of collision.
- **p.** A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
- **q.** Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
- **r.** Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
- **s.** In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A58**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 59: Blackwater Estuary SPA & Ramsar

Name of European site: Blackwater Estuary SPA & Ramsar												
Distance to Hornsea Project One: 189.9 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little tern *Sterna albifrons*		**×a**			**×b**			**×c**			**×aa**	
Article 4.2 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		**×d**			**×d**			**×d**			**×aa**	
Golden Plover *Pluvialis apricaria*		**×e**			**×f**			**×g**			**×aa**	
Hen Harrier *Circus cyaneus*		**×h**			**×h**			**×h**			**×aa**	
Ruff *Philomachus pugnax*		**×h**			**×h**			**×h**			**×aa**	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		**×i**			**×f**			**×g**			**×aa**	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		**×h**			**×h**			**×h**			**×aa**	
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×j**			**×k**			**×l**			**×aa**	
Dunlin *Calidris alpina alpina*		**×m**			**×f**			**×g**			**×aa**	
Grey Plover *Pluvialis squatarola*		**×n**			**×f**			**×g**			**×aa**	
Redshank *Tringa totanus*		**×o**			**×o**			**×o**			**×aa**	
Ringed Plover *Charadrius hiaticula*		**×i**			**×f**			**×g**			**×aa**	
Shelduck *Tadorna tadorna*		**×p**			**×q**			**×q**			**×aa**	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Great Crested Grebe *Podiceps cristatus*		**×r**			**×f**			**×g**			**×aa**	
Golden Plover *Pluvialis apricaria*		**×e**			**×f**			**×g**			**×aa**	
Ruff *Philomachus pugnax*		**×h**			**×h**			**×h**			**×aa**	
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×j**			**×k**			**×l**			**×aa**	
Shelduck *Tadorna tadorna*		**×p**			**×q**			**×q**			**×aa**	
Ringed Plover *Charadrius hiaticula*		**×i**			**×f**			**×g**			**×aa**	

Grey Plover *Pluvialis squatarola*		**×n**			**×f**			**×g**			**×aa**	
Dunlin *Calidris alpina alpina*		**×m**			**×f**			**×g**			**×aa**	
Avocet *Recurvirostra avosetta*		**×d**			**×d**			**×d**			**×aa**	
Redshank *Tringa totanus*		**×o**			**×o**			**×o**			**×aa**	
Curlew *Numenius arquata*		**×s**			**×f**			**×g**			**×aa**	
Cormorant *Phalacrocorax carbo*		**×t**			**×u**			**×v**			**×aa**	
Wigeon *Anas penelope*		**×w**			**×x**			**×g**			**×aa**	
Teal *Anas crecca*		**×y**			**×f**			**×g**			**×aa**	
Pintail *Anas acuta*		**×h**			**×h**			**×h**			**×aa**	
Shoveler *Anas clypeata*		**×z**			**×z**			**×z**			**×aa**	
Goldeneye *Bucephala clangula*		**×o**			**×o**			**×o**			**×aa**	
Red-breasted Merganser *Mergus serrator*		**×p**			**×p**			**×p**			**×aa**	
Lapwing *Vanellus vanellus*		**×q**			**×q**			**×q**			**×aa**	
Black-tailed Godwit *Limosa limosa islandica*		**×h**			**×h**			**×h**			**×aa**	

Evidence supporting conclusions (Ref: Table A59 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. Only two avocets were recorded during two years of surveys.
e. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
f. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
g. These species were not recorded using the development area and no displacement effects are predicted.
h. These species were not recorded during Project One surveys.
i. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
j. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
k. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
l. No brent geese were recorded using the development area and no displacement effects are predicted.
m. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
n. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
o. Only seven redshank were recorded during two years of surveys.
p. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
q. Only one shelduck was recorded during two years of surveys.
r. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
s. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.

t. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

u. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

v. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

w. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).

x. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.

y. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.

z. Only four shoveler were recorded during two years of surveys.

aa. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A59**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 60: Dengie Marshes SPA & Ramsar

Name of European site: Dengie Marshes SPA & Ramsar

Distance to Hornsea Project One: 196.4 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed Godwit *Limosa lapponica*		**×a**			**×b**			**×c**			**×r**	
Hen Harrier *Circus cyaneus*		**×d**			**×d**			**×d**			**×r**	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey Plover *Pluvialis squatarola*		**×e**			**×b**			**×c**			**×r**	
Knot *Calidris canutus*		**×f**			**×b**			**×c**			**×r**	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		**×g**			**×g**			**×g**			**×r**	
Dunlin *Calidris alpina alpina*		**×h**			**×b**			**×c**			**×r**	
Lapwing *Vanellus vanellus*		**×i**			**×j**			**×c**			**×r**	
Oystercatcher *Haematopus ostralegus*		**×k**			**×b**			**×c**			**×r**	
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×l**			**×m**			**×c**			**×r**	
Cormorant *Phalacrocorax carbo*		**×n**			**×o**			**×p**			**×r**	
Great Crested Grebe *Podiceps cristatus*		**×q**			**×b**			**×c**			**×r**	
Knot *Calidris canutus*		**×f**			**×b**			**×h**			**×r**	
Grey Plover *Pluvialis squatarola*		**×e**			**×b**			**×c**			**×r**	
Bar-tailed Godwit *Limosa lapponica*		**×a**			**×b**			**×c**			**×r**	

Evidence supporting conclusions (Ref: Table A60 of Annex A):

a. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
b. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
c. These species were not recorded using the development area and no displacement effects are predicted.
d. No hen harriers were recorded.
e. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
f. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
g. No black-tailed godwits were recorded.
h. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
i. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.

j. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
k. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
l. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
m. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
n. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
o. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
p. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
q. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
r. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A60**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 61: Benfleet and Southend Marshes SPA & Ramsar

Name of European site: Benfleet and Southend Marshes SPA & Ramsar

Distance to Hornsea Project One: 215.9 km

European site features	Likely Effects of Project One											
Article 4.2 – Migratory (Passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		✕a			✕b			✕c			✕j	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dark-bellied Brent Goose *Branta bernicla bernicla*		✕d			✕e			✕c			✕j	
Knot *Calidris canutus*		✕f			✕b			✕c			✕j	
Grey Plover *Pluvialis squatarola*		✕g			✕b			✕c			✕j	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Dunlin *Calidris alpina alpina*		✕h			✕b			✕c			✕j	
Ringed Plover *Charadrius hiaticula*		✕a			✕b			✕c			✕j	
Oystercatcher *Haematopus ostralegus*		✕i			✕b			✕c			✕j	
Knot *Calidris canutus*		✕f			✕b			✕c			✕j	
Grey Plover *Pluvialis squatarola*		✕g			✕b			✕c			✕j	
Dark-bellied Brent Goose *Branta bernicla bernicla*		✕d			✕e			✕c			✕j	

Evidence supporting conclusions (Ref: Table A61 of Annex A):

a. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
b. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
c. These species were not recorded using the development area and no displacement effects are predicted.
d. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
e. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
f. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
g. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
h. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
i. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
j. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A61**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 62: Thames Estuary Marshes SPA

Name of European site: Thames Estuary Marshes SPA												
Distance to Hornsea Project One: 219.4 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×a			×a			×a			×p	
Hen Harrier *Circus cyaneus*		×b			×b			×b			×p	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		×c			×d			×e			×p	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		×c			×d			×e			×p	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Redshank *Tringa totanus*		×f			×f			×f			×p	
Black-tailed Godwit *Limosa limosa islandica*		×b			×b			×b			×p	
Dunlin *Calidris alpina alpina*		×g			×d			×e			×p	
Lapwing *Vanellus vanellus*		×h			×h			×e			×p	
Grey Plover *Pluvialis squatarola*		×j			×d			×e			×p	
Shoveler *Anas clypeata*		×k			×k			×k			×p	
Pintail *Anas acuta*		×b			×b			×b			×p	
Gadwall *Anas strepera*		×l			×l			×l			×p	
Shelduck *Tadorna tadorna*		×m			×n			×n			×p	
White-fronted Goose *Anser albifrons albifrons*		×b			×b			×b			×p	
Little Grebe *Tachybaptus ruficollis*		×b			×b			×b			×p	
Ringed Plover *Charadrius hiaticula*		×c			×d			×e			×p	
Avocet *Recurvirostra avosetta*		×a			×a			×a			×p	
Whimbrel *Numenius phaeopus*		×o			×d			×e			×p	

Evidence supporting conclusions (Ref: Table A62 of Annex A):

a. Only two avocets were recorded during two years of surveys.
b. These species were not recorded during Project One surveys.

c. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
d. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
e. These species were not recorded using the development area and no displacement effects are predicted.
f. Only seven redshank were recorded during two years of surveys.
g. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
h. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
i. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
j. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
k. Only four shoveler were recorded during two years of surveys.
l. Only one gadwall was recorded during two years of surveys.
m. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
n. Only one shelduck was recorded during two years of surveys.
o. Eleven out of a total of 49 whimbrel recorded were in the Hornsea Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.
p. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A62**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 63: Medway Estuary SPA & Ramsar

Name of European site: Medway Estuary SPA & Ramsar

Distance to Hornsea Project One: 227.5 km

European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Little tern *Sterna albifrons*		×a			×b			×c			×bb	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×d			×d			×d			×bb	
Golden Plover *Pluvialis apricaria*		×e			×f			×g			×bb	
Hen Harrier *Circus cyaneus*		×h			×h			×h			×bb	
Ruff *Philomachus pugnax*		×h			×h			×h			×bb	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		×i			×f			×g			×bb	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×h			×h			×h			×bb	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×j			×k			×g			×bb	
Dunlin *Calidris alpina alpina*		×l			×f			×g			×bb	
Grey Plover *Pluvialis squatarola*		×m			×f			×t			×bb	
Redshank *Tringa totanus*		×n			×n			×n			×bb	
Ringed Plover *Charadrius hiaticula*		×i			×f			×g			×bb	
Shelduck *Tadorna tadorna*		×o			×o			×o			×bb	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Great Crested Grebe *Podiceps cristatus*		×p			×f			×g			×bb	
Golden Plover *Pluvialis apricaria*		×e			×f			×g			×bb	
Ruff *Philomachus pugnax*		×h			×h			×h			×bb	
Dark-bellied Brent Goose *Branta bernicla bernicla*		×j			×k			×g			×bb	
Shelduck *Tadorna tadorna*		×o			×o			×o			×bb	
Ringed Plover *Charadrius hiaticula*		×i			×f			×g			×bb	

Name of European site: Medway Estuary SPA & Ramsar

Distance to Hornsea Project One: 227.5 km

European site features	Likely Effects of Project One											
Grey Plover *Pluvialis squatarola*		×m			×f			×t			×bb	
Dunlin *Calidris alpina alpina*		×l			×f			×g			×bb	
Avocet *Recurvirostra avosetta*		×d			×d			×d			×bb	
Redshank *Tringa totanus*		×n			×n			×n			×bb	
Curlew *Numenius arquata*		×q			×f			×g			×bb	
Cormorant *Phalacrocorax carbo*		×r			×s			×t			×bb	
Wigeon *Anas penelope*		×u			×v			×g			×bb	
Teal *Anas crecca*		×w			×f			×g			×bb	
Pintail *Anas acuta*		×h			×h			×h			×bb	
Shoveler *Anas clypeata*		×h			×h			×h			×bb	
Goldeneye *Bucephala clangula*		×x			×x			×x			×bb	
Red-breasted Merganser *Mergus serrator*		×y			×y			×y			×bb	
Lapwing *Vanellus vanellus*		×z			×aa			×g			×bb	
Black-tailed Godwit *Limosa limosa islandica*		×h			×h			×h			×bb	

Evidence supporting conclusions (Ref: Table A63 of Annex A):

a. Three little terns were recorded, all flying below 5 m.
b. Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
c. Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).
d. Only two avocets were recorded during two years of surveys.
e. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
f. Migrating golden plover may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
g. No golden plover were recorded using the development area and no displacement effects are predicted.
h. These species were not recorded during Project One surveys.
i. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
j. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
k. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
l. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
m. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
n. Only seven redshank were recorded during two years of surveys.
o. Only one shelduck was recorded during two years of surveys.
p. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.

q. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
r. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
s. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
t. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
u. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
v. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
w. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
x. Only one goldeneye was recorded during two years of surveys.
y. Only two red-breasted merganser were recorded during two years of surveys.
z. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
aa. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
bb. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A63**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 64: Swale Estuary SPA & Ramsar

Name of European site: Swale Estuary SPA & Ramsar												
Distance to Hornsea Project One: 235.8 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×a			×a			×a			×bb	
Marsh Harrier *Circus aeruginosus*		×b			×b			×b			×bb	
Mediterranean Gull *Larus melanocephalus*		×b			×b			×b			×bb	
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Avocet *Recurvirostra avosetta*		×a			×a			×a			×bb	
Bar-tailed Godwit *Limosa lapponica*		×c			×d			×e			×bb	
Golden Plover *Pluvialis apricaria*		×f			×d			×e			×bb	
Hen Harrier *Circus cyaneus*		×b			×b			×b			×bb	
Article 4.2 – Migratory (On passage)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Ringed Plover *Charadrius hiaticula*		×g			×d			×e			×bb	
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		×b			×b			×b			×bb	
Grey Plover *Pluvialis squatarola*		×h			×d			×e			×bb	
Knot *Calidris canutus*		×i			×d			×e			×bb	
Pintail *Anas acuta*		×b			×b			×b			×bb	
Redshank *Tringa totanus*		×j			×j			×j			×bb	
Shoveler *Anas clypeata*		×k			×k			×k			×bb	
Article 4.2 – Assemblage (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
White-fronted Goose *Anser albifrons albifrons*		×b			×b			×b			×bb	
Golden Plover *Pluvialis apricaria*		×f			×d			×e			×bb	
Bar-tailed Godwit *Limosa lapponica*		×c			×d			×e			×bb	
Pintail *Anas acuta*		×b			×b			×b			×bb	
Shoveler *Anas clypeata*		×k			×k			×k			×bb	

Name of European site: Swale Estuary SPA & Ramsar												
Distance to Hornsea Project One: 235.8 km												
European site features	**Likely Effects of Project One**											
Grey Plover *Pluvialis squatarola*		**×h**			**×d**			**×e**			**×bb**	
Knot *Calidris canutus*		**×i**			**×d**			**×e**			**×bb**	
Black-tailed Godwit *Limosa limosa islandica*		**×n**			**×n**			**×n**			**×bb**	
Redshank *Tringa totanus*		**×j**			**×j**			**×j**			**×bb**	
Avocet *Recurvirostra avosetta*		**×a**			**×a**			**×a**			**×bb**	
Cormorant *Phalacrocorax carbo*		**×l**			**×m**			**×n**			**×bb**	
Curlew *Numenius arquata*		**×o**			**×d**			**×e**			**×bb**	
Dark-bellied Brent Goose *Branta bernicla bernicla*		**×p**			**×q**			**×e**			**×bb**	
Shelduck *Tadorna tadorna*		**×r**			**×s**			**×s**			**×bb**	
Wigeon *Anas penelope*		**×t**			**×u**			**×e**			**×bb**	
Gadwall *Anas strepera*		**×v**			**×v**			**×v**			**×bb**	
Teal *Anas crecca*		**×w**			**×d**			**×e**			**×bb**	
Oystercatcher *Haematopus ostralegus*		**×x**			**×d**			**×e**			**×bb**	
Lapwing *Vanellus vanellus*		**×y**			**×z**			**×e**			**×bb**	
Dunlin *Calidris alpina alpina*		**×aa**			**×d**			**×e**			**×bb**	
Little Grebe *Tachybaptus ruficollis*		**×b**			**×b**			**×b**			**×bb**	

Evidence supporting conclusions (Ref: Table A64 of Annex A):

a. Only two avocets were recorded during two years of surveys.
b. These species were not recorded during Project One surveys.
c. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
d. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to the overall distance flown during migration.
e. These species were not recorded using the development area and no displacement effects are predicted.
f. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
g. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
h. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision..
i. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
j. Only seven redshank were recorded during two years of surveys.
k. Only four shoveler were recorded during two years of surveys.

l. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
m. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
n. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
o. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
p. A total of seven dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
q. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
r. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
s. Only one shelduck was recorded during two years of surveys.
t. A total of 19 wigeon were recorded during two years of surveys. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
u. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
v. Only one gadwall was recorded during two years of surveys.
w. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
x. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
y. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
z. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
aa. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
bb. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A64**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 65: Thanet Coast and Sandwich Bay SPA & Ramsar

Name of European site: Thanet Coast and Sandwich Bay SPA & Ramsar												
Distance to Hornsea Project One: 239.3 km												
European site features	**Likely Effects of Project One**											
Article 4.2 – Migratory (Winter)	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black-tailed Godwit *Limosa limosa islandica*		**×a**			**×b**			**×c**			**×d**	

Evidence supporting conclusions (Ref: Table A65 of Annex A):

a. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
b. Migrating turnstone may fly around the wind farm but the incremental increase in flight distance to or from the SPA is likely to be negligible.
c. No turnstones were recorded using the development area and no displacement effects are predicted.
d. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A65**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 66: Outer Thames Estuary SPA

Name of European site: Outer Thames Estuary SPA												
Distance to Hornsea Project One: 121.2 km												
European site features	**Likely Effects of Project One**											
Article 4.1 – Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver *Gavia stellata*		**×a**			**×b**			**×c**			**×d**	

Evidence supporting conclusions (Ref: Table A66 of Annex A):

- **a.** All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
- **b.** Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA which is 121.2 km away is negligible.
- **c.** Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently, any potential impacts will be negligible.
- **d.** In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A66**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 67: Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete

Name of European site: Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete												
Distance to Hornsea Project One: 430 km												
European site features	**Likely Effects of Project One**											
Breeding	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Shoveler		×a			×a			×a			×fff	
Gadwall		×b			×b			×b			×fff	
Dunlin		×c			×d			×e			×fff	
Ringed plover		×f			×d			×e			×fff	
Black tern		×g			×g			×g			×fff	
Snipe		×h			×h			×h			×fff	
Oystercatcher		×i			×d			×e			×fff	
Herring gull		×j			×k			×l			×fff	
Common gull		×m			×k			×l			×fff	
Lesser black-backed gull		×n			×k			×l			×fff	
Great black backed gull		×o			×k			×l			×fff	
Black-headed gull		×p			×k			×l			×fff	
Red-breasted merganser		×q			×q			×q			×fff	
Black-necked grebe		×r			×r			×r			×fff	
Avocet		×s			×s			×s			×fff	
Eider		×t			×u			×e			×fff	
Little tern		×v			×w			×l			×fff	
Common tern		×x			×y			×l			×fff	
Arctic tern		×z			×aa			×l			×fff	
Sandwich tern		×bb			×w			×l			×fff	
Shelduck		×cc			×cc			×cc			×fff	
Winter	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill		×dd			×ee			×ff			×fff	
Shoveler		×a			×a			×a			×fff	

Mallard		×gg			×d			×e			×fff	
Gadwall		×b			×b			×b			×fff	
Grey heron		×hh			×d			×e			×fff	
Turnstone		×ii			×d			×e			×fff	
Dunlin		×c			×d			×e			×fff	
Knot		×jj			×d			×e			×fff	
Fulmar		×kk			×ll			×mm			×fff	
Snipe		×h			×h			×h			×fff	
Red-throated diver		×nn			×d			×oo			×fff	
Oystercatcher		×i			×d			×m			×fff	
Herring gull		×j			×k			×l			×fff	
Common gull		×m			×k			×l			×fff	
Great black backed gull		×o			×k			×l			×fff	
Little gull		×pp			×qq			×rr			×fff	
Black headed gull		×p			×k			×l			×fff	
Common scoter		×ss			×tt			×e			×fff	
Grey plover		×uu			×d			×e			×fff	
Red-necked grebe		×r			×r			×r			×fff	
Avocet		×s			×s			×s			×fff	
Eider		×t			×u			×e			×fff	
Guillemot		×vv			×d			×ww			×fff	
Staging	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Shoveler		×a			×a			×a			×fff	
Mallard		×gg			×d			×e			×fff	
Gadwall		×b			×b			×b			×fff	
Grey heron		×hh			×d			×e			×fff	
Turnstone		×ii			×d			×e			×fff	
Dunlin		×c			×d			×e			×fff	
Knot		×jj			×d			×e			×fff	
Ringed plover		×f			×d			×e			×fff	

Snipe		×h			×h			×h			×fff	
Oystercatcher		×i			×d			×e			×fff	
Herring gull		×j			×k			×l			×fff	
Common gull		×m			×k			×l			×fff	
Lesser black-backed gull		×n			×k			×l			×fff	
Great black backed gull		×o			×k			×l			×fff	
Little gull		×pp			×qq			×rr			×fff	
Black-headed gull		×p			×k			×l			×fff	
Whimbrel		×xx			×d			×e			×fff	
Cormorant		×zz			×aaa			×bbb			×fff	
Golden plover		×ccc			×k			×e			×fff	
Grey plover		×uu			×d			×e			×fff	
Eider		×t			×u			×e			×fff	
Arctic tern		×z			×aa			×l			×fff	
Greenshank		×yy			×yy			×yy			×fff	
Lapwing		×ddd			×eee			×e			×fff	

Evidence supporting conclusions (Ref: Table A67 of Annex A):

a. Only four shoveler were recorded during two years of surveys.
b. Only one gadwall was recorded during two years of surveys.
c. A total of 23 dunlin were recorded in the Hornsea Project One. All were flying below 22.5 m and therefore not at risk of collision.
d. Migrating birds of these species may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible compared to overall distance flown during migration.
e. These species were not recorded using the development area and no displacement effects are predicted.
f. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
g. Only one black tern was recorded during two years of surveys.
h. Only two snipe were recorded during two years of surveys.
i. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.
j. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.
k. The SPA is outwith the mean maximum foraging range for these species during the breeding season and therefore no barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
l. Evidence from constructed offshore wind farms indicate that these species are not displaced by wind farms (Zucco *et al.* 2006; Petersen *et al.* 2006).
m. A total of 741 common gulls were recorded during the two years of surveys. Of which 93.3% were recorded flying below 22.5 m. Collision risk modelling predicts on average up to 6 collisions per year in Hornsea Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. However, collision risk modelling predicts a low number of mortalities that would not cause an adverse effect.

n. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. During the non-breeding period one collision may be of a bird from this site out of a population of 7,285 pairs (see Annex B).
o. A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in the Hornsea Project One.
p. A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from the proposed development and the low usage of the site indicates low risk of a significant impact
q. Only two red-breasted merganser were recorded during two years of surveys.
r. One black-necked grebe was recorded.
s. Only two avocets were recorded during two years of surveys.
t. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
u. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
v. Three little terns were recorded, all flying below 5 m.
w. These species are rarely recorded within the development area and no barrier effects have been reported for these species (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006.
x. Collision risk modelling predicts up to one common tern collision per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding birds from this SPA may disperse widely and some may occur in the Hornsea Project One. However, the predicted number of collisions is very low and there is a very low risk of a significant impact.
y. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
z. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
aa. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for Arctic tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
bb. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
cc. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
dd. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
ee. During migration razorbills will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
ff. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). However, the site is 430 km away and therefore at very low risk of displacement effects.
gg. A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.
hh. A total of 2 grey herons were recorded in the Hornsea survey.
ii. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
jj. A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
kk. Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.
ll. The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
mm. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
nn. All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
oo. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently, any potential impacts will be negligible.
pp. A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 430 km from the proposed development and therefore the risk of a significant effect is negligible.
qq. Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.

rr. No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).

ss. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.

tt. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.

uu. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.

vv. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

ww. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). However, the SPA is 430 km away and therefore the potential for a likely significant effect is very remote.

xx. Eleven out of a total of 49 whimbrel recorded were in the Hornsea Project One. 55.1% of all whimbrel recorded were flying above 22.5 m and therefore at potential risk of collision. However, the number of whimbrel recorded in the development zone was low and therefore at low risk of a significant effect.

yy. Only one greenshank was recorded during two years of surveys.

zz. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

aaa. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

bbb. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

ccc. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.

ddd. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.

eee. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.

fff. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A67**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 68: Östliche Deutsche Bucht (Eastern German Bight) SPA

Name of European site: Östliche Deutsche Bucht (Eastern German Bight) SPA

Distance to Hornsea Project One : 347 km

European site features	**Likely Effects of Project One**											
Species – Annex I	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver *Gavia stellate (Winter)*		**×a**			**×b**			**×c**			**×zz**	
Black-throated diver *Gavia arctica (Winter)*		**×d**			**×d**			**×d**			**×zz**	
Little gull *Hydrocoloeus minutus (Winter)*		**×e**			**×f**			**×g**			**×zz**	
Common tern *Sterna hirundo (Passage)*		**×h**			**×i**			**×j**			**×zz**	
Arctic tern *Sterna paradisaea (Passage)*		**×k**			**×l**			**×m**			**×zz**	
Sandwich tern *Sterna sandvicensis (Passage)*		**×n**			**×o**			**×p**			**×zz**	
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda (Winter)*		**×q**			**×r**			**×s**			**×zz**	
Herring gull *Larus argentatus (Winter)*		**×t**			**×u**			**×v**			**×zz**	
Common gull *Larus canus (Winter)*		**×w**			**×y**			**×z**			**×zz**	
Great black-backed gull *Larus marinus (Winter)*		**×aa**			**×bb**			**×cc**			**×zz**	
Common Scoter *Melanitta nigra (Winter)*		**×dd**			**×ee**			**×ff**			**×zz**	
Guillemot *Uria aalge* (*Winter*)		**×gg**			**×hh**			**×ii**			**×zz**	
Lesser black-backed gull *Larus fuscus (Passage)*		**×jj**			**×kk**			**×ll**			**×zz**	
Black-headed gull (*Passage*)		**×mm**			**×nn**			**×oo**			**×zz**	
Gannet *Morus bassanus* (*Passage*)		**×pp**			**×qq**			**×rr**			**×zz**	
Kittwake *Rissa tridactyla* (*Passage*)		**×ss**			**×tt**			**×uu**			**×zz**	
Great-crested grebe *Podiceps cristatus (Passge)*		**×vv**			**×ww**			**×yy**			**×zz**	

Evidence supporting conclusions (Ref: Table A68 of Annex A):

a. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL, 2006).
b. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
c. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use Hornsea Project One. Consequently any potential impacts will be negligible.
d. A total of 13 black-throated divers were recorded of which nine were within Project One.

- **e.** A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 347 km from the proposed development and therefore the risk of a significant effect is negligible.
- **f.** Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.
- **g.** No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.,* 2006, Barton *et al.,* 2010).
- **h.** A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
- **i.** No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **j.** Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.,* 2006, Pettersson, 2005).
- **k.** A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
- **l.** No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.,* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **m.** Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.,* 2006*,* Pettersson, 2005).
- **n.** One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact
- **o.** Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.,* 2006).
- **p.** Evidence from constructed offshore wind farms indicates that sandwich terns are not displaced by wind farms (e.g. Petersen *et al.,* 2006).
- **q.** A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
- **r.** The SPA is beyond the mean maximum foraging range for razorbill during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **s.** Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006). However, this SPA holds relatively few razorbill estimated as being 700 individuals and is 387 km away.
- **t.** A total of 590 herring gulls were recorded in Year 1 and 562 in Year 2; with peak numbers during the non-breeding season. Of those in flight 58.6% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely but the site is 347 km away and therefore birds are at very low risk of collision.
- **u.** During migration herring gulls will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **v.** Evidence from constructed offshore wind farms indicate that herring gulls are not displaced by wind farms (Petersen *et al*. 2006).
- **w.** A total of 741 common gulls were recorded during the two years of surveys. Of which 93.3% were recorded flying below 22.5 m. Collision risk modelling predicts on average up to six collisions per year in Hornsea Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. However, collision risk modelling predicts a low number of mortalities that would not cause an adverse effect.
- **y.** During migration common gulls will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown from an SPA 347 km away.
- **z.** Evidence from constructed offshore wind farms indicates that Gulls are not displaced by wind farms (Petersen *et al*. 2006).
- **aa.** A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in Project One.
- **bb.** During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown to or from the SPA.
- **cc.** Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al*. 2006).
- **dd.** A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
- **ee.** Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
- **ff.** There are a no records of common scoter using the Hornsea Project One and therefore no displacement impacts are predicted.
- **gg.** 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
- **hh.** During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

ii. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al*. 2006). However, birds associated with this SPA during the winter will not be impacted and therefore there is no significant effect.

jj. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from the proposed development indicates low risk of a significant impact.

kk. During migration lesser black-backed gulls will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in distance flown.

ll. Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al*. 2006).

mm. A total of 388 black-headed gulls were recorded. Of those in flight 99.7% were below 22.5 m and therefore at low risk of collision. The distance this SPA is from the proposed development and the low usage of the Hornsea Project One indicates low risk of a significant impact

nn. The SPA is 347 km away and black-headed gulls will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in energetic costs during migration.

oo. Evidence from constructed offshore wind farms indicates that black-headed gulls are not displaced by wind farms (Zucco *et al*. 2006).

pp. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average 183 adults may collide per year with Hornsea Project One. The SPA is 387 km from the Hornsea Project One and low risk.

qq. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.

rr. Evidence from constructed offshore wind farms indicates that kittiwakes are not displaced by wind farms (e.g. Petersen *et al*. 2006). The site is 387 km from the proposed development and therefore the risk of a potential for LSE is negligible.

ss. Collision risk modelling predicted on average up to 120 collisions per year (based on 98% avoidance rate). The site is 387 km from the proposed development and holds up to 230 gannets during passage (BFN 2012b). Therefore the risk of a LSE is negligible.

tt. If a barrier effect should occur the additional estimated distance of up to 36 km will be a small incremental increase in overall distance flown by this highly pelagic species.

uu. There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere.

vv. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.

ww. Migrating great-crested grebes may fly around the wind farm but the incremental increase in flight distance to or from the SPA is negligible.

yy. No great-crested grebes were recorded using the development area and no displacement effects are predicted.

zz. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A68**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 69: Sylter Auβenriff (Sylt Outer Reef) SPA

Name of European site: Sylter Auβenriff (Sylt Outer Reef) SPA												
Distance to Hornsea Project One : 354 km												
European site features	**Likely Effects of Project One**											
Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver *Gavia stellate (Winter)*		**×a**			**×b**			**×c**			**×q**	
Black-throated diver *Gavia arctica (Winter)*		**×d**			**×d**			**×d**			**×q**	
Little gull *Hydrocoloeus minutus (Migrant)*		**×e**			**×f**			**×g**			**×q**	
Common tern *Sterna hirundo (Migrant)*		**×h**			**×i**			**×j**			**×q**	
Arctic tern *Sterna paradisaea (Migrant)*		**×k**			**×l**			**×m**			**×q**	
Sandwich tern *Sterna sandvicensis (Migrant)*		**×n**			**×o**			**×p**			**×q**	

Evidence supporting conclusions (Ref: Table A69 of Annex A):

yy. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
zz. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
aaa. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use Hornsea Project One. Consequently any potential impacts will be negligible.
bbb. A total of 13 black-throated divers were recorded of which nine were within Hornsea Project One.
ccc. A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 354 km from the proposed development and therefore the risk of a significant effect is negligible.
ddd. Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.
eee. No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).
fff. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
ggg. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
hhh. Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
iii. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
jjj. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
kkk. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006*,* Pettersson 2005).
lll. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact
mmm. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
nnn. Evidence from constructed offshore wind farms indicates that Sandwich terns are not displaced by wind farms (e.g. Petersen *et al.* 2006).
ooo. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A68**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 70: Seevogelschutzgebiet Helgoland SPA

Name of European site: Seevogelschutzgebiet Helgoland SPA												
Distance to Hornsea Project One: 408 km												
European site features	**Likely Effects of Project One**											
Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda (BreedingWinter)*		**×a**			**×b**			**×c**			**×gg**	
Fulmar *Fulmarus glacialis (Winter)*		**×d**			**×e**			**×f**			**×gg**	
Red-throated diver *Gavia stellata (Winter)*		**×g**			**×h**			**×i**			**×gg**	
Black-throated diver *(Winter)*		**×j**			**×j**			**×j**			**×gg**	
Herring gull *Larus argentatus (Breeding)*		**×k**			**×b**			**×l**			**×gg**	
Common gull *Larus canus (Winter)*		**×m**			**×h**			**×l**			**×gg**	
Lesser black-backed gull *Larus fuscus (Breeding)*		**×n**			**×h**			**×l**			**×gg**	
Little gull *Hydrocoloeus minutus (Winter/Passage)*		**×o**			**×p**			**×l**			**×gg**	
Common Scoter *Melanitta nigra (Winter)*		**×q**			**×r**			**×s**			**×gg**	
Red-necked grebe *Podiceps grisegena (Winter)*		**×t**			**×t**			**×t**			**×gg**	
Kittiwake *Rissa tridactyla (Breeding/Winter)*		**×u**			**×h**			**×l**			**×gg**	
Eider *Somateria mollissima (Breeding/Winter)*		**×v**			**×w**			**×s**			**×gg**	
Common tern *Sterna hirundo (Passage)*		**×x**			**×h**			**×l**			**×gg**	
Arctic tern *Sterna paradisaea (Passage)*		**×y**			**×h**			**×l**			**×gg**	
Sandwich tern *Sterna sandvicensis (Passage)*		**×z**			**×ss**			**×l**			**×gg**	
Gannet *Morus bassanus (Passage)*		**×bb**			**×cc**			**×dd**			**×gg**	
Guillemot *Uria aalge (Winter)*		**×ee**			**×b**			**×ff**			**×gg**	

Evidence supporting conclusions (Ref: Table A70 of Annex A):

a. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
b. The SPA is beyond the mean maximum foraging range for these species during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
c. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). However, this SPA holds relatively few razorbill estimated as being 200 individuals outside the breeding season and is 408 km away.
d. Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.
e. The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
f. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.

g. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
h. Migrating birds of these species may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
i. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.
j. A total of 13 black-throated divers were recorded of which nine were within The Hornsea Project One.
k. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This SPA is 408 km away and therefore the risk of collision impacts are remote and no significant impacts will occur.
l. Evidence from constructed offshore wind farms indicate that these species are not displaced by wind farms (Zucco *et al.* 2006; Petersen *et al.* 2006).
m. A total of 741 common gulls were recorded during the two years of surveys. Of which 93.3% were recorded flying below 22.5 m. Collision risk modelling predicts on average up to 6 collisions per year in Hornsea Project One (at a 98% avoidance rate). Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. However, collision risk modelling predicts a low number of mortalities that would not cause an adverse effect.
n. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4 % were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. No collisions per year are predicted to occur from this colony (see Annex B).However, the distance this SPA is from the proposed development and the small breeding population of 37 pairs indicates low risk of a significant impact.
o. A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 408 km from the proposed development and therefore the risk of a significant effect is negligible.
p. Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.
q. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
r. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
s. There are a no records of common scoter using the Hornsea Project One and therefore no displacement impacts are predicted.
t. Only one red-necked grebe was recorded.
u. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.
v. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
w. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible
x. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is outwith the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
y. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
z. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
aa. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
bb. A total of 13,034 gannets were recorded; with peak numbers between August and November. Of those recorded in flight 91.9% were below rotor height and therefore not at risk of collision. The SPA is outwith the mean maximum foraging range but within the maximum range for gannet during the breeding season and therefore birds at this site may occur in the area but at a low risk of being impacted. Outwith the breeding season gannets from this SPA may disperse widely.
cc. If a barrier effect should occur the additional estimated distance of up to 36 km will be a small incremental increase in overall distance flown by this highly pelagic species.
dd. There is little evidence from constructed offshore wind farms on whether gannets may be displaced or not. However, should it occur the overall area of displacement would be relatively small for this widespread pelagic species and the survey results indicate that that the proposed development area is not proportionally of greater importance to gannet compared to elsewhere.
ee. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

ff. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). However, the SPA is 408 km away and therefore the potential for a likely significant effect is very remote.

gg. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A70**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213** ***et seq.*** for Collision Effects, **paragraphs 4.3.224** ***et seq.*** for Displacement Effects and **paragraphs 4.3.229** ***et seq.*** for Barrier Effects.

Stage 1 Matrix 71: Borkum-Riffgrund SPA

Name of European site: Borkum-Riffgrund SPA												
Distance to Hornsea Project One : 293 km												
European site features	**Likely Effects of Project One**											
Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver *Gavia stellata (Winter)*		**×a**			**×b**			**×c**			**×q**	
Black-throated diver *Gavia arctica (Winter)*		**×d**			**×d**			**×d**			**×q**	
Little gull *Hydrocoloeus minutus (Winter)*		**×e**			**×f**			**×g**			**×q**	
Common tern *Sterna hirundo (Migrant)*		**×h**			**×i**			**×j**			**×q**	
Arctic tern *Sterna paradisaea (Migrant)*		**×k**			**×l**			**×m**			**×q**	
Sandwich tern *Sterna sandvicensis (Migrant)*		**×n**			**×o**			**×p**			**×q**	

Evidence supporting conclusions (Ref: Table A71 of Annex A):

a. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
b. Migrating red-throated diver may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
c. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.
d. A total of 13 black-throated divers were recorded of which nine were within The Hornsea Project One.
e. A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 293 km from the proposed development and therefore the risk of a significant effect is negligible.
f. Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.
g. No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).
h. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is out with the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
i. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
j. Evidence from constructed offshore wind farms indicates that common terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
k. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
l. No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
m. Evidence from constructed offshore wind farms indicates that Arctic terns are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
n. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is out with the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
o. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
p. Evidence from constructed offshore wind farms indicates that Sandwich terns are not displaced by wind farms (e.g. Petersen *et al.* 2006).
q. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A71**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 72: Littoral Seino-Marin SPA

Name of European site: Littoral Seino-Marin SPA

Distance to Hornsea Project One : 460 km

European site features	**Likely Effects of Project One**											
Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver *Gavia stellata (Winter/Migrant)*		**×a**			**×b**			**×c**			**×ooo**	
Slavonian Grebe *Podiceps auritus (Winter/Assemblage)*		**×d**			**×d**			**×d**			**×ooo**	
Storm petrol *Hydrobates pelagicus (Migrant)*		**×e**			**×f**			**×g**			**×ooo**	
Leach's petrol *Oceanodroma leucorhoa (Migrant)*		**×h**			**×i**			**×j**			**×ooo**	
Little gull *Hydrocoloeus minutus (Winter/Migrant*		**×k**			**×b**			**×l**			**×ooo**	
Balearic shearwater *Puffinus mauretanicus (Migrant)*		**×m**			**×n**			**×o**			**×ooo**	
Little tern *Sternula albifrons (Migrant)*		**×p**			**×q**			**×r**			**×ooo**	
Common tern *Sterna hirundo (Migrant)*		**×s**			**×b**			**×t**			**×ooo**	
Arctic tern *Sterna paradisaea (Breeding/Migrant)*		**×u**			**×b**			**×t**			**×ooo**	
Sandwich tern *Sterna sandvicensis (Breeding)*		**×v**			**×w**			**×t**			**×ooo**	
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda (Winter)*		**×x**			**×b**			**×y**			**×ooo**	
Fulmar *Fulmarus glacialis (Winter)*		**×z**			**×aa**			**×bb**			**×ooo**	
Herring gull *Larus argentatus (Winter/Migrant)*		**×cc**			**×b**			**×t**			**×ooo**	
Lesser black-backed gull *Larus fuscus (Breeding/Migrant)*		**×dd**			**×b**			**×t**			**×ooo**	
Great black-backed gull *Larus marinus (Breeding/Winter/Migrant)*		**×ee**			**×b**			**×t**			**×ooo**	
Sabine's Gull *Xema sabini (Migrant)*		**×ff**			**×g**			**×hh**			**×ooo**	
Greylag Goose *Anser anser (Winter migrant/Assemblage)*		**×ii**			**×jj**			**×kk**			**×ooo**	
Common Scoter *Melanitta nigra (Winter)*		**×ll**			**×mm**			**×kk**			**×ooo**	
Red-breasted Merganser *Mergus serrator (Assemblage)*		**×nn**			**×nn**			**×nn**			**×ooo**	
Eider *Somateria mollissima (Winter)*		**×oo**			**×pp**			**×qq**			**×ooo**	
Great-crested grebe *Podiceps cristatus (Passge)*		**×rr**			**×ss**			**×kk**			**×ooo**	

Red-necked grebe *Podiceps grisegena (Winter)*		**×tt**			**×tt**			**×tt**			**×ooo**	
Black-necked grebe *Podiceps nigricollis (Winter)*		**×uu**			**×uu**			**×uu**			**×ooo**	
Common sandpiper *Actitis hypoleucos (Migrant)*		**×vv**			**×vv**			**×vv**			**×ooo**	
Cormorant *Phalacrocorax carbo (Breeding/Winter)*		**×ww**			**×xx**			**×yy**			**×ooo**	
Manx shearwater *Puffinus puffinus (Migrant)*		**×zz**			**×aaa**			**×bbb**			**×ooo**	
Kittiwake *Rissa tridactyla (Winter)*		**×ccc**			**×b**			**×t**			**×ooo**	
Arctic skua *Stercorarius parasiticus (Assemblage)*		**×ddd**			**×eee**			**×fff**			**×ooo**	
Pomarine skua *Stercorarius pomarinus (Migrant)*		**×ggg**			**×hhh**			**×iii**			**×ooo**	
Great skua *Stercorarius skua (Migrant/Assemblage)*		**×jjj**			**×kkk**			**×lll**			**×ooo**	
Guillemot *Uria aalge (Winter)*		**×mmm**			**×b**			**×nnn**			**×ooo**	

Evidence supporting conclusions (Ref: Table A72 of Annex A):

- **a.** All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
- **b.** Migrating birds from these species may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA, which is 460 km away, is negligible.
- **c.** Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently, any potential impacts will be negligible
- **d.** Only one Slavonian grebe was recorded flying below turbine height/Only one Slavonian grebe was recorded.
- **e.** Storm petrels are an uncommon to scarce migrant off the Yorkshire coast (Thomas, 2011). A total of 29 storm petrels were recorded across both years and all were recorded flying below 2.5 m and therefore not at risk of collision.
- **f.** There's no evidence of whether or not storm petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.
- **g.** There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence based on the low number of observations that the area is a favoured foraging location for this species.
- **h.** Leach's petrel is a scarce to rare migrant off the Yorkshire coast (Thomas 2011). Two Leach's petrels were recorded in Year 1 and three in Year 2. All were recorded flying below 2.5 m and therefore not at risk of collision.
- **i.** There's no evidence of whether or not Leach's petrels fly around offshore wind farms. However, the incremental increase in distance required should they do so is negligible compared to the distances this highly pelagic species flies to and from breeding or wintering grounds.
- **j.** There's no evidence of whether a displacement effect may occur or not. However, the total area avoided should they be displaced compared to the potential total foraging area is very small and there is no evidence, based on the low number of observations, that the area is a favoured foraging location for this species.
- **k.** A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 460 km from the proposed development and therefore the risk of a significant effect is negligible.
- **l.** No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).
- **m.** A total of five Balearic shearwaters were recorded. All were flying below 22.5 m in height and therefore not at risk of collision.
- **n.** There is no evidence from existing offshore wind farms as to whether wind farms cause a barrier to Balearic shearwaters. However, should they do so the additional distance of an estimated 36 km will cause a negligible increase in distance flown compared to the overall distance this pelagic species regularly flies.
- **o.** It is not known whether there will be a displacement effect. However only five birds were recorded and therefore there will be no adverse effect should displacement occur.
- **p.** Three little terns were recorded, all flying below 5 m.
- **q.** Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
- **r.** Evidence from constructed offshore wind farms indicates that little terns are not displaced by wind farms (e.g. Zucco *et al.* 2006).

s. Collision risk modelling predicts up to one common tern collision per year (at a 98% avoidance rate). The predicted number of collisions and the distance this SPA is from the proposed development make the risk of a significant impact negligible.
t. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
u. A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
v. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is out with the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
w. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
x. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
y. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). However, the site is 460 km away and therefore at very low risk of displacement effects.
z. Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.
aa. The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
bb. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
cc. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is out with the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Out with the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This SPA is 460 km away and therefore collision risk is very low and no significant impacts will occur.
dd. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from the proposed development and the small breeding population of five pairs, indicates low risk of a significant impact alone but may be increased in-combination with potential future developments.
ee. A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in the Hornsea Project One.
ff. Two Sabine's gull were recorded in the Hornsea Study Area in Year 1. No flight height data are available for Sabine's gull but the low usage of the site and the distance for the SPA indicate low risk of an adverse effect.
gg. There are no data on whether a barrier effect may occur on Sabine's gulls but the low usage of the site and the distance for the SPA indicate low risk of an adverse effect
hh. There are no data on whether a barrier effect may occur on Sabine's gulls but the low usage of the site and the distance for the SPA indicate low risk of an adverse effect.
ii. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
jj. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
kk. These species were not recorded using the development area and no displacement effects are predicted.
ll. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
mm. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
nn. Only two red-breasted merganser were recorded during two years of surveys.
oo. Two eider were recorded in the 10 km buffer area and outwith the Hornsea Project One Zones, both were flying below 20 m and therefore not at risk of collision. Therefore, there is a low risk of collision.
pp. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
qq. There are a no records of eiders using the area and therefore no displacement impacts are predicted.
rr. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
ss. Migrating great-crested grebes may fly around the wind farm but the incremental increase in flight distance to or from the SPA is negligible.
tt. One red-necked grebe was recorded outwith the Hornsea Project One.
uu. One black-necked grebe was recorded.

vv. One common sandpiper was recorded.

ww. Only 11 cormorants were recorded, of which three were within Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

xx. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

yy. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

zz. A total of 184 Manx shearwaters were recorded across both years in the Hornsea Study Area. All were flying below turbine height and therefore not at risk of collision.

aaa. There is no evidence from existing offshore wind farms as to whether they cause a barrier to Manx shearwaters. However, should they do so, the additional distance of an estimated 36 km will cause a negligible increase in distance flown compared to the overall distance this pelagic species regularly flies.

bbb. It is not known whether there will be a displacement effect. However, only 44 Manx shearwaters were recorded in the Hornsea Project One and the SPA is 460 km away.

ccc. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Screening (see HRA, **Annex A and B**) predicted no potential likely significant effect alone and/or in combination due to the low numbers affected, the distance of the site from Project One during the breeding season. Outside of the breeding season birds disperse widely.

ddd. A total of 127 Arctic skuas were recorded in flight, with 99.2% of flights recorded below 22.5 m. The SPA is outwith the maximum foraging range during the breeding season and therefore not at risk during this period. Outwith the breeding season Arctic skuas disperse widely and there is a very low risk of collision.

eee. Data from post-construction monitoring studies undertaken in Denmark indicate that Arctic skuas do not avoid entering wind farms, consequently there is not thought to be a significant barrier effect (Zucco *et al.* 2006).

fff. There are no data available from constructed wind farms to determine whether Arctic skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.

ggg. A total of 50 pomarine skuas were recorded in the Hornsea Study Area in Year 1. 85.7% were recorded flying below turbine height. The SPA is 460 km from the proposed development and the risk of collision for a pomarine skua from this SPA is negligible.

hhh. There are no data from post-construction monitoring studies to determine whether pomarine skuas avoid entering wind farms. However, should they do so the additional distance flown will not be significant compared to the overall distance flown to or from this SPA.

iii. There are no data available from constructed wind farms to determine whether pomarine skuas are displaced but the relatively low usage of the Hornsea Project One and the wide usage of other areas indicate that should displacement occur its effects are predicted to be negligible.

jjj. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates no mortalities associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.

kkk. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.

lll. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.

mmm. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

nnn. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). However, the SPA is 460 km away and therefore the potential for a likely significant effect is very remote.

ooo. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A72**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 73: Baie de Seine Occidentale SPA

Name of European site: Baie de Seine Occidentale SPA

Distance to Hornsea Project One : 534 km

European site features	**Likely Effects of Project One**											
Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Black tern *Chlidonias niger (Breeding)*		**×a**			**×a**			**×a**			**×mm**	
Red-throated diver *Gavia stellate (Winter)*		**×b**			**×c**			**×d**			**×mm**	
Slavonian Grebe *Podiceps auritus (Winter/Assemblage)*		**×e**			**×f**			**×f**			**×mm**	
Little gull *Hydrocoloeus minutus (Winter/Migrant)*		**×g**			**×h**			**×i**			**×mm**	
Little tern *Sternula albifrons (Migrant)*		**×j**			**×k**			**×l**			**×mm**	
Common tern *Sterna hirundo (Migrant)*		**×m**			**×c**			**×l**			**×mm**	
Arctic tern *Sterna paradisaea (Breeding/Migrant)*		**×n**			**×c**			**×l**			**×mm**	
Sandwich tern *Sterna sandvicensis (Breeding)*		**×o**			**×p**			**×l**			**×mm**	
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda (Winter)*		**×q**			**×c**			**×r**			**×mm**	
Turnstone *Arenaria interpres (Migrant – winter)*		**×s**			**×c**			**×t**			**×mm**	
Purple sandpiper *Calidris maritima (Winter)*		**×u**			**×u**			**×u**			**×mm**	
Fulmar *Fulmarus glacialis (Winter)*		**×v**			**×w**			**×x**			**×mm**	
Herring gull *Larus argentatus (Breeding/Winter)*		**×y**			**×c**			**×l**			**×mm**	
Great black-backed gull *Larus marinus (Breeding/Winter)*		**×z**			**×c**			**×l**			**×mm**	
Common Scoter *Melanitta nigra (Winter)*		**×aa**			**×bb**			**×t**			**×mm**	
Red-breasted Merganser *Mergus serrator (Assemblage)*		**×cc**			**×cc**			**×cc**			**×mm**	
Eider *Somateria mollissima (Winter)*		**×dd**			**×ee**			**×t**			**×mm**	
Great-crested grebe *Podiceps cristatus (Migrant)*		**×ff**			**×c**			**×t**			**×mm**	
Cormorant *Phalacrocorax carbo (Breeding/Winter)*		**×gg**			**×hh**			**×ii**			**×mm**	
Kittiwake *Rissa tridactyla (Winter)*		**×jj**			**×c**			**×l**			**×mm**	
Guillemot *Uria aalge (Winter)*		**×kk**			**×c**			**×ll**			**×mm**	

Evidence supporting conclusions (Ref: Table A73 of Annex A):

- **a.** Only one black tern was recorded during two years of surveys.
- **b.** All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
- **c.** Migrating birds of these species may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA, which is 534 km away, is negligible.
- **d.** Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use Project One. Consequently, any potential impacts are likely to be negligible.
- **e.** Only one Slavonian grebe was recorded flying below turbine height.
- **f.** Only one Slavonian grebe was recorded.
- **g.** A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is 534 km from the proposed development and therefore the risk of a significant effect is negligible.
- **h.** Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.
- **i.** No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).
- **j.** Three little terns were recorded, all flying below 5 m.
- **k.** Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
- **l.** Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006; Pettersson 2005)
- **m.** Collision risk modelling predicts up to one common tern collision per year (at a 98% avoidance rate). The predicted number of collisions and the distance this SPA is from the proposed development make the risk of a significant impact negligible.
- **n.** A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
- **o.** One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
- **p.** Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006
- **q.** A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
- **r.** Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). However, the site is 460 km away and therefore at very low risk of displacement effects.
- **s.** Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
- **t.** These species were not recorded using the development area and no displacement effects are predicted.
- **u.** Only one purple sandpiper was recorded during two years of surveys.
- **v.** Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.
- **w.** The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
- **x.** There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
- **y.** A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This site is 534 km away and no significant impacts will occur.
- **z.** A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is outwith the mean maximum foraging range for great black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding, numbers recorded were higher and birds from this SPA may disperse widely. Following breeding, great black-backed gulls disperse but remain largely within 100 km of their breeding colonies (Harris 1962) and are therefore unlikely to occur in the Hornsea Project One.
- **aa.** A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.
- **bb.** Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.
- **cc.** Only two red-breasted merganser were recorded during two years of surveys.
- **dd.** Two eider were recorded in the 10 km buffer area and outwith the Hornsea Project One Zones, both were flying below 20 m and therefore not at risk of collision. Therefore, there is a low risk of collision.

ee. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.

ff. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.

gg. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

hh. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

ii. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

jj. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is outwith the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Outwith the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.

kk. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

ll. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). However, the SPA is 534 km away and therefore the potential for a likely significant effect is very remote.

mm. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A73**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 74: Falaise du Bessin Occidental SPA

Name of European site: Falaise du Bessin Occidental SPA

Distance to Hornsea Project One: 540 km

European site features	**Likely Effects of Project One**											
Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	C	C	C	O	D	C	O	D
Red-throated diver *Gavia stellata*		**×a**			**×b**			**×c**			**×v**	
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Razorbill *Alca torda (Winter)*		**×d**			**×b**			**×e**			**×v**	
Fulmar *Fulmarus glacialis (Breeding/Winter)*		**×f**			**×g**			**×h**			**×v**	
Herring gull *Larus argentatus (Breeding)*		**×i**			**×b**			**×j**			**×v**	
Lesser black-backed gull *Larus fuscus (Breeding)*		**×k**			**×b**			**×j**			**×v**	
Red-breasted merganser *(Assemblage)*		**×l**			**×l**			**×l**			**×v**	
Cormorant *Phalacrocorax carbo (Winter)*		**×m**			**×n**			**×o**			**×v**	
Shag *Phalacrocorax aristotelis (Assemblage)*		**×p**			**×q**			**×r**			**×v**	
Kittiwake *Rissa tridactyla (Breeding)*		**×s**			**×b**			**×j**			**×v**	
Guillemot *Uria aalge (Winter)*		**×t**			**×b**			**×u**			**×v**	

Evidence supporting conclusions (Ref: Table A74 of Annex A):

a. All red-throated divers recorded in flight were flying below turbine height and evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
b. During migration, birds may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA, which is 540 km away, is negligible.
c. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently, any potential impacts will be negligible.
d. A total of 15,437 razorbills were recorded in Year 1 and 18,880 in Year 2; with peak numbers from July to October. Of those in flight all were below rotor height and therefore not at risk of collision.
e. Some evidence from constructed offshore wind farms indicates that razorbills may be displaced (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006). However, the site is 540 km away and therefore at very low risk of displacement effects.
f. Of those fulmar recorded in flight 99.8% were below rotor height and therefore not at risk of collision. Collision risk modelling predicted zero collisions.
g. The additional estimated distance of up to 36 km will, if a barrier effect occurs, be a small incremental increase in overall distance flown by this highly pelagic species.
h. There is little evidence from constructed offshore wind farms on whether fulmars may be displaced or not. However, should it occur the overall area displaced would be relatively small for this widespread pelagic species.
i. A total of 940 herring gulls were recorded in flight, of which 73.9% were below rotor height. Collision risk modelling predicts on average up to 63 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is out with the mean maximum foraging range for herring gull during the breeding season and therefore birds at this site are at low risk of being impacted. Out with the breeding season numbers recorded were higher and birds from this SPA may disperse widely. This SPA is 540 km away and no significant impacts will occur.
j. Evidence from constructed offshore wind farms indicate that these species are not displaced by wind farms (Petersen *et al.* 2006).
k. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being

impacted. Following breeding lesser black-backed gulls disperse away from their colonies. However, the distance this SPA is from the proposed development and the small breeding population of 35 pairs, indicates low risk of a significant impact alone but may be increased in-combination with potential future developments. No collisions are predicted to be on birds from this SPA (see Annex B).

l. Only two red-breasted merganser were recorded during two years of surveys.

m. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

n. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

o. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

p. The SPA is out with the maximum foraging range for shag during the breeding season and there were only five records of shags from two years of surveys. All birds were flying below 7.5 m. Evidence from existing offshore wind farms recorded 1.4% of flights as below 20 m (e.g. npower 2006). Therefore there is a low risk of collision.

q. There is no evidence as to whether a barrier effect may occur or not but the low usage of the site and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.

r. There are a no records of shags using the area and therefore no displacement impacts are predicted.

s. A total of 28,818 kittiwakes were recorded in Year 1 and 41,896 in Year 2; with peak numbers during July, August and September. Of those in flight 97.2% were below 22.5m. Collision risk modelling predicts on average up to 224 collisions per year in Hornsea Project One (at a 98% avoidance rate), of which 183 will be adults. The SPA is out with the maximum foraging range for kittiwake during the breeding season and therefore birds at this site are at low risk of being impacted. Out with the breeding season numbers recorded were lower but birds from this SPA may disperse widely. In-combination impacts with other future proposed developments may increase the risk of a significant impact.

t. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).

u. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). However, the SPA is 540 km away and therefore the potential for a likely significant effect is very remote.

v. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A74**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 75: Frisian Front SPA

Name of European site: Frisian Front SPA												
Distance to Hornsea Project One: 130 km												
European site features	**Likely Effects of Project One**											
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	C	C	C	O	D	C	O	D
Great skua *Catharacta skua (Migrant)*		**×a**			**×b**			**×c**			**×m**	
Great black-backed gull *Larus marinus (Migrant)*		**×d**			**×e**			**×f**			**×m**	
Lesser black-backed gull *Larus fuscus (Migrant)*		**×g**			**×h**			**×i**			**×m**	
Guillemot *Uria aalge (Migrant)*		**×j**			**×k**			**×l**			**×m**	

Evidence supporting conclusions (Ref: Table A75 of Annex A):

a. A total of 151 great skuas were recorded in flight. The majority (87.4%) were recorded flying below 22.5m. The low number of great skua recorded and their relatively low flight height indicate low collision risk. Collision risk modelling undertaken indicates one mortality per year associated with Project One. Furthermore, the distance this SPA is from the proposed development suggests a low likelihood of birds from this site interacting with the proposed development during the breeding season.
b. There are no data from any constructed wind farms to determine whether or not a barrier effect may occur for great skuas. Should it occur, the additional flight of up to 36 km would not cause a significant increase in energetic expenditure for a species that migrates from the North Atlantic to the Bay of Biscay and West Africa.
c. Great skuas are primarily an aerial species, only spending time on the sea surface when feeding, preening or during periods of calm weather. There are no data available from constructed wind farms to determine whether great skuas are displaced but the relatively low usage of the Hornsea Project One and the wider usage of other areas indicate that should displacement occur, its effects will be negligible.
d. A total of 4,906 great black-backed gulls were recorded in in flight; with peak numbers occurring in January. Of those in flight 72.0% were recorded below 22.5 m. Collision risk modelling predicts an average mortality rate of up to 374 collisions per year in Hornsea Project One (at a 98% avoidance rate). The SPA is selected for its migratory population of great black-backed gulls with an average population of 180 birds between August and September. (Derenberg *et al.* 2010). Birds occurring at the site may be from the wider North Sea population and there is low risk of birds from this site interacting with Project One.
e. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
f. Evidence from constructed offshore wind farms indicate that great black-backed gulls are not displaced by wind farms (Petersen *et al.* 2006).
g. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. Following breeding lesser black-backed gulls disperse away from their colonies and the SPA is a site for non-breeding migrating lesser black-backed gulls. The population is unknown (Deerenberg *et al.* 2010). The distance this SPA is from the proposed development and the small risk of collision, indicates low risk of a significant effect on birds from this SPA that will be part of the wider European population of more than 300,000 pairs (BLI 2013) many of which could occur in the SPA.
h. The SPA is out with the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in distance flown.
i. Evidence from constructed offshore wind farms indicates that lesser black-backed gulls are not significantly displaced by wind farms (e.g. Zucco *et al.* 2006; Petersen *et al.* 2006).
j. 46,403 guillemots were recorded in Year 1 and 47,632 in Year 2. Of those recorded in flight 99.9% were below 22.5 m. Collision risk modelling predicts less than one collision per year (at a 98% avoidance rate).
k. During migration guillemots will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
l. Some evidence from constructed offshore wind farms indicates that guillemots may be displaced (e.g. Petersen *et al.* 2006). However, the SPA is 130 km away and therefore the potential for a likely significant effect is very remote.
m. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A75**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects**.**

Stage 1 Matrix 76: Waddenzee (Wadden Sea) SPA

Name of European site: Waddenzee SPA												
Distance to Hornsea Project One: 417 km												
European site features	**Likely Effects of Project One**											
Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	C	C	C	O	D	C	O	D
Short-eared owl *Asio flammeus (Breeding)*		**×a**			**×b**			**×c**			**×zz**	
Barnacle goose *Branta leucopsis (Migrant – winter)*		**×d**			**×d**			**×d**			**×zz**	
Kentish plover *(Breeding)*		**×d**			**×d**			**×d**			**×zz**	
Black-tern *(Migrant – winter)*		**×e**			**×e**			**×e**			**×zz**	
Marsh harrier *Circus aeruginosus (Breeding)*		**×d**			**×d**			**×d**			**×zz**	
Hen harrier *Circus cyaneus (Breeding)*		**×d**			**×d**			**×d**			**×zz**	
Bewick's swan *Cygnus columbianus bewickii (Migrant – winter)*		**×d**			**×d**			**×d**			**×zz**	
Peregrine falcon *Falco peregrinus (Migrant – winter)*		**×d**			**×d**			**×d**			**×zz**	
Bar-tailed godwit *Limosa lapponica (Migrant – winter)*		**×f**			**×b**			**×c**			**×zz**	
Spoonbill *(Breeding)*		**×d**			**×d**			**×d**			**×zz**	
Golden plover *(Migrant – winter)*		**×g**			**×b**			**×c**			**×zz**	
Avocet *Recurvirostra avosetta (breeding)*		**×d**			**×d**			**×d**			**×zz**	
Little tern *Sterna albifrons (Breeding)*		**×h**			**×i**			**×j**			**×zz**	
Common tern *Sterna hirundo (breeding)*		**×k**			**×l**			**×j**			**×zz**	
Arctic tern *Sterna paradisaea (Breeding)*		**×m**			**×n**			**×j**			**×zz**	
Sandwich tern *Sterna sandvicensis (breeding)*		**×o**			**×p**			**×j**			**×zz**	
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	C	C	C	O	D	C	O	D
Pintail *Anas acuta (Migrant – winter)*		**×d**			**×d**			**×d**			**×zz**	
Shoveler *Anas clypeata (Migrant – winter)*		**×q**			**×q**			**×q**			**×zz**	
Teal *Anas crecca (Migrant – winter)*		**×r**			**×b**			**×c**			**×zz**	
Widgeon *Anas Penelope (Migrant)*		**×s**			**×t**			**×c**			**×zz**	
Mallard *Anas platyrhynchos (Migrant – winter)*		**×u**			**×b**			**×c**			**×zz**	
Gadwall *Anas strepera (Migrant – winter)*		**×v**			**×v**			**×v**			**×zz**	
Greylag Goose *Anser anser (Migrant – winter)*		**×w**			**×x**			**×c**			**×zz**	

Name of European site: Waddenzee SPA												
Distance to Hornsea Project One: 417 km												
Lesser white-fronted goose *Anser albifrons albifrons (Migrant – winter)*		×d			×d			×d			×zz	
Turnstone *Arenaria interpres (Migrant – winter)*		×y			×b			×c			×zz	
Scaup *Aythya marila (Migrant – winter)*		×d			×d			×d			×zz	
Brent goose *(Migrant – winter)*		×z			×aa			×c			×zz	
Goldeneye *Bucephala clangula (Migrant – winter)*		×bb			× bb			× bb			×zz	
Sanderling *Calidris alba (Migrant – winter)*		×cc			×cc			×cc			×zz	
Dunlin *Calidris alpina alpine (Migrant – winter)*		×dd			×b			×c			×zz	
Knot *Calidris canutus (Migrant – winter)*		×ee			×b			×c			×zz	
Curlew sandpiper *Calidris ferruginea (Migrant – winter)*		×d			×d			×d			×zz	
Ringed plover *Charadrius hiaticula (Breeding)*		×ff			×b			×c			×zz	
Oystercatcher *Haematopus ostralegus (Migrant – winter)*		×gg			× b			× c			×zz	
Lesser black-backed gull *Larus fuscus (Breeding)*		×hh			×ii			×j			×zz	
Black-tailed godwit *Limosa limosa islandica (Migrant – winter)*		×d			×d			×d			×zz	
Red-breasted merganser *(Migrant – winter)*		×jj			×jj			×jj			×zz	
Goosander *Mergus merganser (Migrant – winter)*		×kk			×kk			×kk			×zz	
Curlew *Numenius arquata (Migrant – winter)*		×ll			×b			×c			×zz	
Cormorant *Phalacrocorax carbo (Migrant – winter)*		×mm			×nn			×oo			×zz	
Lapwing *Vanellus vanellus (Migrant – winter)*		×pp			×qq			×c			×zz	
Grey Plover *Pluvialis squatarola (Migrant – winter)*		×rr			×b			×c			×zz	
Great-crested grebe *Podiceps cristatus (Migrant – winter)*		×ss			×b			×c			×zz	
Eider *Somateria mollissima (Breeding)*		×tt			×uu			×c			×zz	
Shelduck *Tadorna tadorna (Migrant – winter)*		×vv			×ww			×ww			×zz	
Spotted redshank *Tringa erythropus (Migrant – winter)*		×d			×d			×d			×zz	
Greenshank *Tringa nebularia (Migrant – winter)*		×xx			× xx			× xx			×zz	
Redshank *Tringa tetanus (Migrant – winter)*		×yy			× yy			× yy			×zz	

Evidence supporting conclusions (Ref: Table A76 of Annex A):

- **a.** Only two short-eared owls were recorded in the Hornsea Project in September and November of Year 1. One was flying at rotor height. The very low numbers recorded indicate that there is negligible risk of an effect.
- **b.** Migrating birds may fly around the wind farm but the incremental increase in flight distance to the SPA is likely to be negligible.
- **c.** These species were not recorded using the development area and no displacement effects are predicted.
- **d.** These species were not recorded during Project One surveys.
- **e.** Only one black tern was recorded during two years of surveys.
- **f.** A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
- **g.** A total of 15 golden plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision
- **h.** Three little terns were recorded, all flying below 5 m.
- **i.** Little terns were very rarely recorded within the development area and no barrier effects have been reported (e.g. Zucco *et al.* 2006).
- **j.** Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006).
- **k.** A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is out with the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
- **l.** No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is outwith the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **m.** A total of 634 Arctic terns were recorded with peak numbers during August and September. Of those recorded in flight all% were flying below 22.5m and therefore at very low risk of a significant impact.
- **n.** No barrier effects to Arctic terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
- **o.** One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
- **p.** Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
- **q.** Only four shoveler were recorded during two years of surveys.
- **r.** Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
- **s.** A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
- **t.** Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
- **u.** A total of ten mallard were recorded during two years of surveys. The low numbers recorded and reported relatively high levels of avoidance behaviour by wildfowl indicate very low risk of collision.
- **v.** Only one gadwall was recorded during two years of surveys.
- **w.** A total of 16 greylag geese were recorded out with Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.
- **x.** Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
- **y.** Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.
- **z.** A total of 7 dark-bellied brent geese were recorded, all but one were outwith Hornsea Project One during two years of surveys. Small numbers recorded and predicted relatively high avoidance rates reported by geese, low risk of collision. Collision risk modelling predicts one collision per year (APEM 2012).
- **aa.** Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.
- **bb.** Only one goldeneye was recorded during two years of surveys.
- **cc.** No sanderling were recorded.
- **dd.** A total of 23 dunlin were recorded in the Hornsea Project One area. All were flying below 22.5 m and therefore not at risk of collision.
- **ee.** A total of 21 knot were recorded all flying below 22.5 m and therefore not at risk of collision.
- **ff.** Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.
- **gg.** A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.

hh. A total of 1,299 lesser black-backed gulls were recorded in Year 1 and 1,342 during Year 2, with peak numbers occurring during the breeding season. Of those in flight, 81.4% were below 22.5 m and therefore at low risk of collision. The SPA is beyond the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore birds at this site are at low risk of being impacted. Following breeding lesser black-backed gulls disperse away from their colonies and an estimated four collisions per year are predicted to be on birds from this SPA. The breeding population is 19,000 pairs and therefore four collisions will be negligible.
ii. The SPA is out with the mean maximum foraging range for lesser black-backed gull during the breeding season and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in distance flown.
jj. Only two red-breasted merganser were recorded during two years of surveys.
kk. Three goosander were recorded outwith the Hornsea Project One in Year 2.
ll. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.
mm. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.
nn. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.
oo. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).
pp. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.
qq. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.
rr. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.
ss. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.
tt. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.
uu. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.
vv. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).
ww. Only one shelduck was recorded during two years of surveys.
xx. Only one greenshank was recorded during two years of surveys.
yy. Only seven redshank were recorded during two years of surveys.
zz. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A76**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 77: Voordelta SPA

Name of European site: Voordelta SPA												
Distance to Hornsea Project One: 235 km												
European site features	**Likely Effects of Project One**											
Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver *Gavia stellate (breeding)*		**×a**			**×b**			**×c**			**×qq**	
Little gull *Hydrocoloeus minutus (Migrant – winter)*		**×d**			**×e**			**×f**			**×qq**	
Bar-tailed godwit *Limosa lapponica (Migrant – winter)*		**×g**			**×b**			**×h**			**×qq**	
Spoonbill *Platalea leucorodia*		**×i**			**×i**			**×i**			**×qq**	
Slavonian Grebe *Podiceps auritus (Migrant – winter)*		**×i**			**×i**			**×i**			**×qq**	
Golden plover *(Migrant – winter)*		**×j**			**×b**			**×h**			**×qq**	
Avocet *Recurvirostra avosetta (breeding)*		**×i**			**×i**			**×i**			**×qq**	
Common tern *Sterna hirundo (breeding)*		**×k**			**×l**			**×m**			**×qq**	
Sandwich tern *Sterna sandvicensis (breeding)*		**×n**			**×o**			**×m**			**×qq**	
Non-Annex I Species	Collision			Barrier			Displacement			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Pintail *Anas acuta (Migrant – winter)*		**×i**			**×i**			**×i**			**×qq**	
Shoveler *Anas clypeata (Migrant – winter)*		**×p**			**×p**			**×p**			**×qq**	
Teal *Anas crecca (Migrant – winter)*		**×q**			**×b**			**×h**			**×qq**	
Widgeon *Anas Penelope (Migrant)*		**×r**			**×s**			**×h**			**×qq**	
Gadwall *Anas strepera (Migrant – winter)*		**×t**			**×t**			**×t**			**×qq**	
Greylag Goose *Anser anser (Migrant – winter)*		**×u**			**×v**			**×h**			**×qq**	
Turnstone *Arenaria interpres (Migrant – winter)*		**×w**			**×b**			**×h**			**×qq**	
Scaup *Aythya marila (Migrant – winter)*		**×i**			**×i**			**×i**			**×qq**	
Goldeneye *Bucephala clangula (Migrant – winter)*		**×x**			**×x**			**×x**			**×qq**	
Sanderling *Calidris alba (Migrant – winter)*		**×i**			**×i**			**×i**			**×qq**	
Dunlin *Calidris alpina alpine (Migrant – winter)*		**×y**			**×b**			**×h**			**×qq**	
Ringed plover *Charadrius hiaticula (Breeding)*		**×z**			**×b**			**×h**			**×qq**	
Oystercatcher *Haematopus ostralegus (Migrant – winter)*		**×aa**			**×b**			**×h**			**×qq**	
Common Scoter *Melanitta nigra (Breeding)*		**×bb**			**×cc**			**×h**			**×qq**	

Red-breasted Merganser *Mergus serrator (Migrant – winter)*		**×dd**			**×dd**			**×dd**			**×qq**	
Curlew *Numenius arquata (Migrant – winter)*		**×ee**			**×b**			**×h**			**×qq**	
Cormorant *Phalacrocorax carbo (Migrant – winter)*		**×ff**			**×gg**			**×hh**			**×qq**	
Lapwing *Podiceps cristatus (Migrant – winter)*		**×ii**			**×jj**			**×h**			**×qq**	
Grey Plover *Pluvialis squatarola (Migrant – winter)*		**×kk**			**×b**			**×h**			**×qq**	
Great-crested grebe *Podiceps cristatus (Migrant – winter)*		**×ll**			**×b**			**×h**			**×qq**	
Eider *Somateria mollissima (Breeding)*		**×mm**			**×nn**			**×h**			**×qq**	
Shelduck *Tadorna tadorna (Migrant – winter)*		**×oo**			**×oo**			**×oo**			**×qq**	
Redshank *Tringa tetanus (Migrant – winter)*		**×pp**			**×pp**			**×pp**			**×qq**	

Evidence supporting conclusions (Ref: Table A77 of Annex A):

a. Within the whole of the Hornsea Survey Area a total of 21 red-throated divers were recorded in Year 1 and 42 in Year 2. All were flying below turbine height. Evidence from other wind farms indicates that risk of collision is low with approximately 98% of flights below turbine height (e.g. LAL 2006).
b. Migrating birds may fly around the wind farm but the incremental increase in flight of up to 36 km to or from the SPA is negligible.
c. Red-throated divers may be displaced from offshore wind farms. However, only two red-throated divers were recorded using the development area and the water depths and location suggest that Divers will not regularly use the Hornsea Project One. Consequently any potential impacts will be negligible.
d. A total of 3,522 little gulls were recorded, with nearly all records during October. 98.9% were flying below 22.5 m. Collision risk modelling predicts that on average up to 10 collisions per year (based on a 98% avoidance rate) may occur. The SPA is [hold] km from the proposed development and therefore the risk of a significant effect is negligible.
e. Evidence from existing offshore wind farms indicates that there is no barrier effect on little gulls (e.g. Barton *et al.* 2010). However, if migrating little gulls do fly around the wind farm the incremental increase in flight of up to 36 km to or from the SPA is negligible.
f. No displacement effects have been reported for little gull with little gulls occurring within offshore wind farms (e.g. Zucco *et al.* 2006, Barton *et al.* 2010).
g. A total of 29 bar-tailed godwit were recorded in the Hornsea Zone and 10 km Buffer, of which one was in the Hornsea Project One. 82.8% of birds were recorded flying at rotor height and therefore at risk of collision. However, the number of bar-tailed godwit recorded was low and therefore at low risk of an effect.
h. These species were not recorded using the development area and no displacement effects are predicted.
i. These species were not recorded during Project One surveys.
j. A total of 15 golden plover plover were recorded in the Hornsea Project One and a further 133 in the whole study area. No golden plover were recorded flying above 22.5 m and therefore not at risk of collision. However, studies undertaken elsewhere indicate waders have a high avoidance rate (e.g. Petersen *et al.* 2006) and therefore at low risk of collision.
k. A total of 3,410 common terns were recorded; with peak numbers during August and September. Of those in flight 98.6% were below 22.5 m. Collision risk modelling predicts no collisions per year (at a 98% avoidance rate). The SPA is out with the maximum foraging range for common tern during the breeding season and therefore birds at this site are at low risk of being impacted.
l. No barrier effects on common terns have been recorded from constructed offshore wind farms (e.g. Zucco *et al.* 2006). The SPA is out with the mean maximum or maximum foraging range for common tern and therefore no regularly barrier effects will occur during this period. During migration birds will be able to fly around the proposed development estimated as being up to 36 km without causing a significant increase in overall distance flown.
m. Evidence from constructed offshore wind farms indicates that these species are not displaced by wind farms (e.g. Zucco *et al.* 2006, Pettersson 2005).
n. One sandwich tern was recorded in Year 1 and six in Year 2. The SPA is outwith the maximum foraging range for Sandwich tern during the breeding season and therefore there is a very low risk of a significant impact.
o. Sandwich terns are rarely recorded within the development area and no barrier effects have been reported for Sandwich terns (e.g. Petersen *et al.* 2006).
p. Only four shoveler were recorded during two years of surveys.
q. Teal were regularly recorded in small numbers throughout the development area with a total of 37 records in Year 1 and one in year 2. All birds were recorded flying below rotor height and therefore not at risk of collision.
r. A total of 19 wigeon were recorded during two years of surveys. The low numbers recorded and predicted high avoidance rates indicate low risk of collision. Collision risk modelling predicts up to 20 collisions per year (APEM 2012).
s. Wigeon migrate to the UK from Scandinavia and Russia and therefore the incremental increase in flight distance from flying around the Hornsea Project One will be very small.
t. Only one gadwall was recorded during two years of surveys.

u. A total of 16 greylag geese were recorded outwith Hornsea Project One during two years of surveys. Small numbers of greylag geese from Iceland and the north-western Scotland population occur in Yorkshire in winter (Thomas 2011). It is likely that birds recorded in the Study Area are from these populations so regular passage offshore is unlikely. All records were of birds flying below rotor height and therefore not at risk of collision.

v. Geese are known to fly around or over offshore wind farms and therefore at risk of a barrier effect. The incremental increase in distance flown of approximately 36 km is negligible compared to the overall distance flown during migration to and from their breeding and wintering grounds.

w. Four turnstone were recorded in the Hornsea Zone and 10 km buffer, flying below 2.5 m in height and therefore at low risk of collision.

x. Only one goldeneye was recorded during two years of surveys.

y. A total of 23 dunlin were recorded in the Hornsea Project One area. All were flying below 22.5 m and therefore not at risk of collision.

z. Four ringed plover were recorded in the study area in Year 1 and six in Year 2. All were flying below 22.5 m and therefore not at risk of collision.

aa. A total of 23 oystercatchers were recorded in the study area. All were flying below 12.5 m and therefore not at risk of collision.

bb. A total of 419 common scoter were recorded throughout the study area during two years of surveys. All but six birds were recorded in flight, of which 1.2% were flying above 20 m. Data from other offshore wind farms also suggests a relatively low flight height with 93% flying below turbine height (e.g. npower 2006). Therefore, there is a low risk of collision.

cc. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with common scoter flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by common scoter and the distance from the SPA indicate that impacts from any additional distance flown will be negligible compared to the overall distance flown during migration.

dd. Only two red-breasted merganser were recorded during two years of surveys.

ee. Only four curlew were recorded in the Hornsea development zone during Year 1 and 14 in Year 2. The low numbers recorded and predicted avoidance rates mean that the risk of a significant impact is very low.

ff. Only 11 cormorants were recorded, of which three were within the Hornsea Project One. One bird was flying at rotor height. Evidence from other offshore wind farms indicates that approximately 10% of cormorants fly at rotor height (e.g. npower 2006). Consequently, the risk of an impact is low.

gg. There is evidence of a barrier effect to cormorants from existing offshore wind farms (e.g. Zucco *et al.* 2006). However, the incremental increase in flight distance to or from the SPA is small compared to the overall distance flown during migration.

hh. Cormorants are not known to be displaced by offshore wind farms (e.g. Petersen *et al.* 2006).

ii. A total of 141 lapwing were recorded, of which 95.3% were flying above 22.5 m and therefore at risk of collision. However, the total number of lapwing recorded was relatively low and it is known that waders are able to avoid wind turbines (e.g. Petersen *et al.* 2006). Therefore the risk of an impact is low and will not be significant.

jj. A total of 148 lapwing were recorded. Any additional distance required to fly around the Hornsea Project One will be negligible relative to the overall distance migrated.

kk. One grey plover was recorded in the study area in Year 1 and three in Year 2. The low numbers recorded and predicted level of avoidance based on existing studies indicate little or no risk of collision.

ll. Two great-crested grebes were recorded within the Hornsea Survey Area flying below 22.5 m and therefore at low risk of collision.

mm. A total of nine eiders were recorded during two years of surveys. All but one were flying below 22.5 m and therefore not at risk of collision. Consequently, there is a low risk of collision.

nn. Evidence from constructed offshore wind farms indicates that there is the potential for a barrier effect with eider flying around wind farms (e.g. Petersen *et al.* 2006). If a barrier effect occurs the low usage of the site by eider and the distance from the SPA indicate that impacts from any additional distance flown will be negligible.

oo. Only one shelduck was recorded during two years of surveys. Collision risk modelling predicts up to four collisions per year (APEM 2012).

pp. Only seven redshank were recorded during two years of surveys.

qq. In-combination LSE informed by the footnotes above for the individual receptors as presented in **Annex A, Table A77**. Additional information to support the conclusions made with regard to the in-combination LSE screening is presented in the HRA report, **paragraphs 4.3.213 *et seq.*** for Collision Effects, **paragraphs 4.3.224 *et seq.*** for Displacement Effects and **paragraphs 4.3.229 *et seq.*** for Barrier Effects.

Stage 1 Matrix 78: Humber Estuary SAC and Ramsar

Name of European site: Humber Estuary SAC and Ramsar

Distance to Hornsea Project One: 0 km as the cable route crosses the site (102 km from Subzone 1)

European site features	**Likely Effects of Project One**											
Annex I qualifying features (habitats); see also footnote **h**.	Habitat extent			Water quality						In-combination		
	C	O	D	C	O	D				C	O	D
Estuaries	✓a	✗b	✗f	✓a		✗f				✓k		
Mudflats and sandflats not covered by seawater at low tide	✓a	✗b	✗f	✓a		✗f				✓k		
Sandbanks which are slightly covered by sea water all the time; see footnote **g**.												
Coastal lagoons; see footnote **g**.												
Salicornia and other annuals colonizing mud and sand	✓a	✗b	✗f	✓a		✗f				✓k		
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	✓c	✗b	✗f	✓a		✗f				✓k		
Embryonic shifting dunes	✓c	✗b	✗f	✓a		✗f				✓k		
Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')	✓c	✗b	✗f	✓a		✗f				✓k		
Fixed dunes with herbaceous vegetation ('grey dunes'); see footnote **g**.												
Dunes with *Hippophae rhamnoides*; see footnote **g**.												
Standing open water and canals (feature of Ramsar); see footnote **g**.												
Annex II qualifying features (fish): see also footnote **i**.	Disruption to migration						In-combination					
	C	O	D				C	O	D			
Sea lamprey *Petromyzon marinus*	✓d	✓e	✗f				✓k	✓k				
River lamprey *Lampetra fluviatilis*	✓d	✓e	✗f				✓k	✓k				
Annex II qualifying features (marine mammals)	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal *Halichoerus grypus*	✓j	✓j	✓j	✓j	✓j	✓j	✓j	✓j	✓j	✓k, l	✓ k, l	✓ k, l
Annex II species (other)												
Natterjack toad *Bufo calamita* (feature of Ramsar); see footnote **g**.												

Evidence supporting conclusions

a. LSE as these habitats occur at the Horseshoe Point landfall site and are likely to be directly affected by the proposed works (see **Table 4.10 of HRA**).

b. No cable maintenance (e.g. cable re-burial) is predicted within designated estuarine habitats of the Humber Estuary SAC (see **Section 2.4 of HRA**). Although access to the intertidal will be required during the operational phase (e.g. for cable inspection), no LSE from access during the operational phase is predicted as access to the intertidal will be gained along a permitted access route and will result in minimal disturbance to qualifying features (see **Table 4.10 and Section 2.4 of HRA**).

c. Potential for LSE as these habitats occur at the Horseshoe Point landfall site, though may not be directly affected by the proposed works **(see Table 4.10 of HRA).**

d. Potential for LSE as these species may occur in the vicinity of the cable laying operations (see **Table 4.10 of HRA**).

e. Potential for LSE as these species may occur in the vicinity of the operational cable, with potential for EMF related effects on migratory behaviour (see **Table 4.10 of HRA**).

f. No LSE during the decommissioning phase as cables are likely to remain in situ (see **Section 2.5 of HRA**).

g. These habitats (or for species, habitats supporting these species) were not recorded in the vicinity of Project One and therefore no likely significant effects are predicted on these features (see **Annex E**, **paragraphs E.12 et seq**. and **E.126 *et seq.***).

i. Although these species may occur in offshore areas of Project One (river lamprey remain within rivers and estuaries throughout their lives; **Maitland, 2003**), migration behaviour is not expected to be affected by construction, operation or decommissioning of offshore infrastructure due to the low abundances predicted in these areas and the large distance between the coastline and the offshore Project One area. As such, injury or behavioural impacts related to, for example, piling noise, plume effects or EMF in offshore areas have been screened out for further assessment (see HRA Report, **Section 4.3**).

j. Grey seal: Construction and operation of Project One may cause physical and/or behavioural disturbance of grey seal from increased potential of vessel traffic and strikes (both within the Humber Estuary and Offshore), suspended sediments, habitat/prey species loss, accidental pollution and EMF. All of these impacts are localised to Project One or within close proximity to this area e.g., piling noise for a 2,300 kJ hammer energy results in a temporal threshold shift (TTS) and subsequent behavioural response of fleeing/likely avoidance out to a range of 1.7 km (see **Volume 2: Chapter 4 Marine Mammals**). Tagging studies from the Donna Nook haul out site in the Humber Estuary SAC show trips between this site and Project One (in particular the export cable route and the southern boundary of Subzone 1) (see **Volume 2: Chapter 4 Marine Mammals**). Densities of grey seal averaged 0.043 animals per km^2 in the Hornsea Zone plus 10 km buffer, with a slightly lower density recorded in Subzone 1 plus 4 km buffer (0.038 animals per km2) (see **Volume 2: Chapter 4 Marine Mammals**). Given that grey seal from the SAC may occur in close proximity to Project One (both offshore and within the Humber Estuary), there is considered to be potential for a likely significant effect on the conservation objectives of grey seal from this site, either alone and/or in combination with other projects/plans (see HRA Report, **Section 4.3 and 4.4**).

k. Plans/projects with potential for LSE on qualifying features in-combination with Project One construction and components within the Humber Estuary include: Hornsea Project Two, Tetney to Saltfleet Tidal Flood Defence Scheme, Phillips 66 Tetney Sea Line Replacement Project and Able Marine Energy Park (AMEP) (see HRA **Table 4.13 and para 4.4.15 – 4.4.61**).

l. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see HRA **Table 4.5 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 79: River Derwent SAC

Name of European site: River Derwent SAC									
Distance to Hornsea Project One: 45 km (160 km from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I qualifying features (habitats)									
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; see footnote **g**.									
Annex II qualifying features	Disruption to migration			In-combination					
	C	O	D	C	O				D
Sea lamprey *Petromyzon marinus*; see footnote **d**.	**✓a**	**✓b**	**×c**	**✓f**	**✓f**				
River lamprey *Lampetra fluviatilis*; see footnote **e**.	**✓a**	**✓b**	**×c**	**✓f**	**✓f**				
Bullhead *Cottus gobio***.**	**×h**	**×h**		**×i**	**×i**				
Otter *Lutra lutra***.**	**×i**			**×i**					

Evidence supporting conclusions:

a. Potential for LSE as these species may occur in the vicinity of the cable laying operations (see **HRA Report, Table 4.10**).

b. Potential for LSE as these species may occur in the vicinity of the operational cable, with potential for EMF related effects on migratory behaviour (see **HRA Report, Table 4.10**).

c. No LSE during the decommissioning phase as cables are likely to remain in situ (see **HRA Report, Section 2.5**)**.**

d. River lamprey are remain within rivers and estuaries throughout their lives; (Maitland, 2003), and migration behaviour is not expected to be affected by construction, operation or decommissioning of offshore infrastructure due to the low abundances predicted in these areas and the large distance between the coastline and the offshore Project One area. As such, injury or behavioural impacts related to, for example, piling noise, plume effects or EMF in offshore areas have been screened out for further assessment (see **HRA Report, Section 4.3**).

e. Sea lamprey could potentially be indirectly affected by physical injury and/or behavioural disturbance from noise and increased suspended sediments in the water column from the installation of foundations/cables. However, given the migratory distribution of sea lamprey appears to preclude a significant presence within Project One area (see Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology), and that habitat seems only to be important in relation to their ability to reach silt and gravel beds spawning beds (Maitland, 2003), it is unlikely that there will be any adverse effects on this species or its conservation objectives for the Humber Estuary SAC from Project One offshore activities, alone or in-combination (HRA Report, **Section 4.3**).

f. Plans/projects with potential for LSE on qualifying features in-combination with Project One construction and components within the Humber Estuary include: Hornsea Project Two, Tetney to Saltfleet Tidal Flood Defence Scheme, Phillips 66 Tetney Sea Line Replacement Project and Able Marine Energy Park (AMEP) (see **HRA Report, Table 4.13 and para 4.4.15 – 4.4.61**).

g. Annex I habitats have been screened out for Project One offshore activities, as this site as it is 45 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

h. Physical and/or behavioural disturbance: Bullhead fish do not occur in salt water. The site is inland and approximately 45 km away from the offshore Project One components and therefore no potential for LSEs (**HRA Report, Section 4.3**).

i. Physical and/or behavioural disturbance: Otter may utilise coastal habitats, and this species is generally a primary qualifying feature of several river SACs that flow into the North Sea (e.g., River Derwent) as well as additionally being a qualifying feature of some coastal SACs (e.g., The Wash and North Norfolk Coast). Coastal / landfall works within the export cable corridor could have the potential to cause disturbance to otter populations. However, Project One, including the export cable corridor, is at considerable distance (45 km away). Therefore, no direct or indirect disturbance effects leading to a likely significant effect would be anticipated on the conservation objectives for this species, and consequently the SAC (**HRA Report, Section 4.3**).

Stage 1 Matrix 80: Moray Firth SAC

Name of European site: Moray Firth SAC									
Distance to Hornsea Project One: 491 km (521 km from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I Habitats	Injury/disturbance			Collision risk			Changes in prey species		
All Annex I habitats, see footnote **a.**									
Annex II Species	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Bottlenose dolphin (*Tursiops truncatus*)	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site because it is 491 km away from Project One. The numerical plume dispersion modelling for the fate of fine sediments (see the Environmental Statement, Volume 2 Chapter 1: Marine Processes) has shown that the majority of sediment to be disturbed comprises coarse material, which will be deposited near to the site. Annex I habitats present within this SAC are therefore located outside the potential zone of influence for impacts associated with elevated suspended sediments, sediment deposition, release of potential contaminants and nutrients above background levels. The habitats are also located outside the zone of influence for impacts associated with scour effects and EMF. The production of a Code of Construction Practice (CoCP) and Environmental Management Plan (EMP) will further reduce the risk of releasing pollutants, including accidental release. Therefore, no likely significant effect is anticipated on the conservation objectives for Annex I habitats and consequently this site (see **HRA Report, Section 4.3, para 4.3.44**).

b. Potential impact pathways have been identified for bottlenose dolphin for physical injury/disturbance (from underwater noise), increased risk of collision with vessels and changes in prey species distribution/abundance during construction, operation and decommissioning. Bottlenose dolphin from the Moray Firth SAC are known to occur along the east coast of Scotland but no confirmed identifications of bottlenose dolphin elsewhere in the North Sea have been linked with the Moray Firth population (SMRU, 2012). There is no evidence from surveys (see Environmental Statement Volume 2, Chapter 4: Marine Mammals) to indicate that bottlenose dolphin occur in significant numbers or with any regularity within Project One. Only one sighting of three individuals was recorded during the two year survey, which indicates that Project One is not frequently used by this species. Therefore, there is no potential for LSEs for bottlenose dolphin and for this reason this species is screened out of further assessment.

Stage 1 Matrix 81: Firth of Tay and Eden Estuary SAC

Name of European site: Firth of Tay and Eden Estuary SAC									
Distance to Hornsea Project One: 340 km (390 km from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I Habitats									
All Annex I habitats, see footnote **a**.									
Annex II Species	Injury/disturbance			In-combination effects					
	C	O	D	C	O	D			
Harbour seal (*Phoca vitulina*)	**×b**	**×b**		**×b**	**×b**				

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 340 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Harbour seal: The construction and operation of Project One may cause physical and/or behavioural disturbance of harbour seal from increased potential of vessel traffic and strikes, suspended sediments, habitat/prey species loss, accidential pollution and EMF. All of these impacts are localised to Project One or within close proximity to this area e.g. piling noise for a 2,300 kJ hammer energy results in a temporal threshold shift (TTS) and subsequent behavioural response of fleeing/likely avoidance out to a range of 1.7 km (see the Environmental Statement Volume 2, Chapter 4: Marine Mammals). Tagging studies of harbour seal from the Forth Tay and Eden Estuary SAC indicate that harbour seal from this SAC show a very high degree of site fidelity, with all harbour seal tagged travelling relatively locally to forage and returning to the SAC to haul out. On a few occasions individual harbour seal travelled up the Forth and along the south Fife coastline, hauling out at various places along the coast (Sparling *et al.,* 2011). Tagging of harbour seal in the UK suggests that harbour seal generally tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). Harbour seal hauled out in The Greater Wash region, were found to travel between 75 and 120 km offshore to assumed foraging locations (SMRU, 2011) as reported in the Environmental Statement Volume 2, Chapter 4: Marine Mammals. As this site is located 340 km away from Project One, it is located beyond any potential for direct and indirect effects on harbour seal on foraging trips from this site, and therefore no LSEs are anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

Stage 1 Matrix 82: Berwickshire and North Northumberland Coast SAC

Name of European site: Berwickshire and North Northumberland Coast SAC												
Distance to Hornsea Project One: 208 km (258 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal (*Halichoerus grypus*)	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b,c**	✓**b,c**	✓**b,c**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 208 km away from Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: Construction and operation of Project One may cause physical and/or behavioural disturbance of grey seal from increased potential of piling noise during turbine and associated infrastructure installation, vessel traffic and strikes, suspended sediments, habitat/prey species loss, accidential pollution and EMF. All of these impacts are localised to Project One or within close proximity to this area e.g. piling noise for a 2,300 kJ hammer energy results in a temporal threshold shift (TTS) and subsequent behavioural response of fleeing/likely avoidance out to a range of 1.7 km (see the Environmental Statement Volume 2, Chapter 4: Marine Mammals). Tagging studies of grey seal from the Berwickshire and North Northumberland Coast SAC indicate that they occur widely across the North Sea and could occur in the potential area of impact from the Project One development (Sparling *et al*., 2011). Similarly, tagging studies from the Donna Nook haul out site in the Humber Estuary SAC, also show trips between the Humber Estuary SAC and Berwickshire and North Northumberland Coast SAC, and the Humber Estuary SAC and Project One, (in particular the export cable route and the southern boundary of Subzone 1), (see the Environmental Statement Volume 2, Chapter 4: Marine Mammals). Densities of grey seal averaged 0.043 animals per km^2 in the Hornsea Zone plus 10 km buffer, with a slightly lower density recorded in Subzone 1 plus 4 km buffer (0.038 animals per km^2). SMRU estimates of at sea density were 0.4 to 2 animals per km^2 (see the Environmental Statement Volume 2, Chapter 4: Marine Mammals). Given that grey seal from this SAC may travel in close proximity to Project One, there is considered to be potential LSEs on the conservation objectives of grey seal from this site, either alone and/or in combination with other projects/plans (HRA Report, **Section 4.3** and **Section 4.5**).

Stage 1 Matrix 83: Flamborough Head SAC

Name of European site: Flamborough Head SAC									
Distance to Hornsea Project One: 47 km (111 km from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I Habitats									
All Annex I habitats, see footnote **a**.									

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 47 km away from the closest point of Project One (i.e., the export cable route and Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

Stage 1 Matrix 84: Dogger Bank cSAC

Name of European site: Dogger Bank cSAC									
Distance to Hornsea Project One: 35 km									
European site features	**Likely Effects of Project One**								
Annex I Habitats									
All Annex I habitats are screened out of further assessment see footnote **a**.									

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 35 km away from the closest point of Project One (i.e., the export cable route and Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

Stage 1 Matrix 85: The Wash and North Norfolk Coast SAC

Name of European site: The Wash and North Norfolk Coast SAC												
Distance to Hornsea Project One: 40 km (94 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats are screened out of further assessment, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**
Otter, see footnote **c**.												

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 40 km away from the closest point of Project One (i.e., the export cable route) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Harbour seal: the construction and operation of Project One may cause physical and/or behavioural disturbance of harbour seal from piling noise during turbine and associated infrastructure installation, increased potential of vessel traffic and strikes, suspended sediments, habitat/prey species loss, accidential pollution and EMF. All of these impacts are localised to Project One or within close proximity to this area e.g. piling noise for a 2300 kJ hammer energy results in a temporal threshold shift (TTS) and subsequent behavioural response of fleeing/likely avoidance out to a range of 1.7 km (see the Environmental Statement Volume 2, Chapter 4: Marine Mammals). Tagging of harbour seal in the UK suggests that harbour seal generally tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). Harbour seal hauled out in The Greater Wash region (which encompasses the North Norfolk and Lincolnshire coastlines), were found to travel between 75 and 120 km offshore to assumed foraging locations (SMRU, 2011) as reported in the Environmental Statement Volume 2, Chapter 4: Marine Mammals. The Wash and North Norfolk Coast SAC holds 7% of the UK population of harbour seal with 2,829 counted there in 2009. The tagging studies of harbour seal from the SAC (as described above) indicate that individuals from this site do occur within Project One, in particular, across the export cable route corridor and southern boundary of Subzone 1. Densities within the study area were found to be low, with 0.028 animals per km^2 estimated for the Hornsea Zone plus buffer and 0.12 animals per km^2 estimated for Subzone 1 plus buffer, based on the site specific data. The SMRU data showed higher densities with 0.4 to 2 animals per km^2 estimated within the study area. Therefore, there is considered to be potential LSEs from Project One alone or in-combination with other plans/projects (**HRA Report, Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Otter may utilise coastal habitats, and this species is generally a primary qualifying feature of several river SACs that flow into the North Sea (e.g., River Derwent) as well as additionally being a qualifying feature of some coastal SACs (e.g., The Wash and North Norfolk Coast). Coastal / landfall works within the export cable corridor could have the potential to cause disturbance to otter populations. However, Project One, including the export cable corridor, is at considerable distance (40 km away). Therefore, no direct or indirect disturbance effects leading to a likely significant effect would be anticipated on the conservation objectives for this species, and consequently the SAC.

Stage 1 Matrix 86: Haisborough, Hammond and Winterton cSAC

Name of European site: Haisborough, Hammond and Winterton cSAC									
Distance to Hornsea Project One: 80 km (88 from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I Habitats									
All Annex I habitats, see footnote **a**.									

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats (for this site, 'Sandbanks not covered by seawater at all times' and 'Reefs') could potentially be affected by habitat loss, increase in suspended sediments, sediment bound contaminants and smothering. However, only the Annex I sandbanks are within one tidal excursion of Project One, with the Annex I *Sabellaria* reef within this cSAC located over 40 km to the south of Project One (Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology). Therefore, no likely significant effect is anticipated on the conservation objectives for Annex I reefs. For Annex I sandbanks, direct habitat loss/disturbance, smothering from suspended sediments, release of contaminants, accidental pollution release and EMF, which are effects localised to Project One, are anticipated on this Annex I habitat as a result of the construction and operation of Project One (see **HRA Report, Section 4.3, para 4.3.44**, and the Environmental Statement Volume 2, Chapter 1, Marine Processes and Chapter 2: Benthic Subtidal and Intertidal Ecology). Changes in sediment transport and wave regime have the potential to alter the structure and function of Annex I sandbanks, and this potential effect has also been assessed (Volume 2, Chapter 1: Marine Processes). This potential effect is associated with the presence of the wind turbines and not with the export or inter-array cabling. The Annex I sandbanks within this cSAC are located 10 km to the south of Subzone 1. The wave modelling results suggest that a small reduction in wave climate will occur under high frequency low intensity wave events, and under such conditions a slow growth of bank crest level may be observed for some of the shallow banks within the Norfolk offshore sandbank system due to the operational presence of Project One. However, under more severe storm conditions the wave modelling indicates that the wave climate remains largely unaffected by structure-induced wave scattering, and it will be these events that most influence offshore sandbank behaviour and stability, therefore any changes in bank crest levels under high frequency low intensity wave events will be masked by storm events (Volume 2: Chapter 1 Marine Processes). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

Stage 1 Matrix 87: North Norfolk Sandbanks and Saturn Reef cSAC

Name of European site: North Norfolk Sandbanks and Saturn Reef cSAC									
Distance to Hornsea Project One: 1.8 km (10 km from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I Habitats									
Annex I habitats, see footnote **a**.									

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats (for this site, ‘Sandbanks not covered by seawater at all times’ and ‘Reefs’) could potentially be affected by habitat loss, increase in suspended sediments, sediment bound contaminants and smothering. However, only the Annex I sandbanks are within one tidal excursion of Project One, with the Annex I Sabellaria reef within the cSAC located over 40 km to the south of Project One (see Environmental Statement Volume 2, Chapter 2: Benthic Subtidal and Intertidal Ecology). For Annex I sandbanks, potential effects include suspended sediments, changes in sediment transport and wave regime, release of contaminants from disturbed sediments and accidential pollution release. No direct habitat loss/disturbance is anticipated, nor is EMF, which is localised to Project One, anticipated to have an effect on this Annex I habitat (see Environmenta Statement Volume 2, Chapter 1: Marine Processes and Chapter 2: Benthic Subtidal and Intertidal Ecology). Wave modelling results indicate that the wave climate remains largely unaffected by structure-induced wave scattering, and it will be these events that most influence offshore sandbank behaviour and stability, therefore any changes in bank crest levels under high frequency low intensity wave events will be masked by storm events (Environmental Statement Volume 2, Chapter 1: Marine Processes). Therefore, no LSE is anticipated on the conservation objectives for Annex I reefs or sandbanks (**HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

Stage 1 Matrix 88: Inner Dowsing, Race Bank and North Ridge cSAC

Name of European site: Inner Dowsing, Race Bank and North Ridge cSAC									
Distance to Hornsea Project One: 12 km (71 km from Subzone 1)									
European site features	**Likely Effects of Project One**								
Annex I Habitats									
All Annex I habitats, see footnote **a**.									

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 12 km away from the closest point of Project One (i.e., the export cable), (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

Stage 1 Matrix 89: SBZ 1 / ZPS 1 (Belgium) SCI

Name of European site: SBZ 1 / ZPS 1 SCI

Distance to Hornsea Project One: 276 km

European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a.**												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad and sea lamprey, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise (*Phocoena phocoena*)	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 276 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 276 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 276 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 276 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 276 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 276 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 90: SBZ 2 / ZPS 2 (Belgium) SCI

Name of European site: SBZ 2 / ZPS 2 SCI												
Distance to Hornsea Project One: 276 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad and sea lamprey, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 276 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 276 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 276 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 276 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 276 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 276 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 91: SBZ 3 / ZPS 3 (Belgium) SCI

Name of European site: SBZ 3 / ZPS 3 SCI												
Distance to Hornsea Project One: 276 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad and sea lamprey, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 276 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 276 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 276 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 276 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 276 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 276 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 92: Vlakte van de Raan (Belgium) pSCI

Name of European site: Vlakte van de Raan pSCI

Distance to Hornsea Project One: 271 km

European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad and sea lamprey, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 271 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 271 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (APEM 2012 and 2013), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 271 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 271 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 271 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 271 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 93: NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)

Name of European site: NTP S-H Wattenmeer und angrenzende Küstengebiete SCI

Distance to Hornsea Project One: 386 km

European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Sea and river lamprey, see footnote **b**.												
Grey seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour porpoise	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e,f**	**✓e,f**	**✓e,f**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 386 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 386 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 386 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour seal: As this site is located 386 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour porpoise: Although this site is located approximately 386 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

f. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 94: Doggerbank (German Dogger Bank) SCI (Germany)

Name of European site: Doggerbank (German Dogger Bank) SCI												
Distance to Hornsea Project One: 210 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour porpoise	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e,f**	**✓e,f**	**✓e,f**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 210 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 210 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (APEM 2012 and 2013), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Grey seal: As this site is located approximately 210 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour seal: As this site is located 210 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour porpoise: Although this site is located approximately 210 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

f. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 95: Östliche Deutsche Bucht SCI (Germany)

Name of European site: Östliche Deutsche Bucht SCI

Distance to Hornsea Project One: 347 km

European site features	Likely Effects of Project One											
Annex I Habitats												
All Annex I habitats, footnote **a**.												
Annex I Migratory Species												
All Annex I migratory bird species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
River lamprey, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 347 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 347 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 347 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 347 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 347 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 386 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 96: Sylter Außenriff SCI (Germany)

Name of European site: Sylter Außenriff SCI

Distance to Hornsea Project One: 293 km

European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
River lamprey, see footnote **c.**												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 293 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 293 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 293 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 293 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 293 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 293 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 97: Steingrund SCI (Germany)

Name of European site: Steingrund SCI												
Distance to Hornsea Project One: 378 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour porpoise	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e,f**	**✓e,f**	**✓e,f**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 378 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 378 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Grey seal: As this site is located approximately 378 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour seal: As this site is located 378 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour porpoise: Although this site is located approximately 378 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

f. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 98: Helgoland mit Helgoländer Felssockel SCI (Germany)

Name of European site: Helgoland mit Helgoländer Felssockel SCI												
Distance to Hornsea Project One: 367 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats are screened out of further assessment, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 367 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 367 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 367 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 367 km from Subzone 1, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 99: Hamburgisches Wattenmeer SCI (Germany)

Name of European site: Hamburgisches Wattenmeer SCI												
Distance to Hornsea Project One: 393 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twaite shad, sea and river lamprey, see footnote **b**.												
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 393 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 393 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

b. Grey seal: As this site is located approximately 393 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 393 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour porpoise: Although this site is located approximately 393 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

f. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 100: Unterelbe SCI (Germany)

Name of European site: Unterelbe SCI												
Distance to Hornsea Project One: 424 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twaite shad, sea river lamprey, Atlantic salmon, see footnote **b**.												
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 424 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 424 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

c. Harbour seal: As this site is located 424 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 424 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 101: Borkum-Riffgrund SAC (Germany)

Name of European site: Borkum-Riffgrund SAC (Germany)												
Distance to Hornsea Project One: 254 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twaite shad, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 254 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 254 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 254 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 254 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 254 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 254 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 102: Nationalpark Niedersächsisches Wattenmeer SCI (Germany)

Name of European site: Nationalpark Niedersächsisches Wattenmeer SCI

Distance to Hornsea Project One: 287 km

European site features	Likely Effects of Project One											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 287 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 287 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 287 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 287 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 103: Venø, Venø Sund SAC (Denmark)

Name of European site: Venø, Venø Sund SAC												
Distance to Hornsea Project One: 501 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 501 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 501 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Harbour seal: Tagging of harbour seal in the UK suggests that harbour seal generally tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). Harbour seal hauled out in The Greater Wash region (which encompassed the North Norfolk and Lincolnshire coastlines), were found to travel between 75 and 120 km offshore to assumed foraging locations, athough some were recorded travelling as far as 220 km (SMRU, 2011) as reported in the Volume 2: Chapter 4 Marine Mammals. As this SAC is located 501 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, and therefore no likely significant effects is anticipated on the conservation objectives for this species and consequently this site.

Stage 1 Matrix 104: Dråby Vig SAC (Denmark)

Name of European site: Dråby Vig SAC												
Distance to Hornsea Project One: 534 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species												
Twaite shad, see footnote **c**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	C	O	D	C	C	O	D	C
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Otter	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 534 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 534 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 534 km away from Project One, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Harbour seal: As this site is located 534 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Otter may utilise coastal habitats, however Project One, including the the export cable corridor, is at considerable distance (534 km away). Therefore, no direct or indirect disturbance effects leading to a likely significant effect would be anticipated on the conservation objectives for this species, and consequently the SAC.

Stage 1 Matrix 105: Løgstør Bredning, Vejlerne og Bulbjerg SAC (Denmark)

Name of European site: Løgstør Bredning, Vejlerne og Bulbjerg SAC

Distance to Hornsea Project One: 539 km

European site features	Likely Effects of Project One											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species												
Sea lamprey, see footnote **c**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Otter	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 539 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 539 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 539 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Harbour seal: As this site is located 539 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Otter may utilise coastal habitats, however Project One, including the the export cable corridor, is at considerable distance (539 km away). Therefore, no direct or indirect disturbance effects leading to a likely significant effect would be anticipated on the conservation objectives for this species, and consequently the SAC.

Stage 1 Matrix 106: Gule Rev SAC (Denmark)

Name of European site: Gule Rev SAC

Distance to Hornsea Project One: 517 km

European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			Injury/Disturbance		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**✓b**	**✓b**	**✓b**	**✓b**	**✓b**	**✓b**	**✓b**	**✓b**	**✓b**	**✓b,c**	**✓b,c**	**✓b,c**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 517 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Harbour porpoise: Although this site is located approximately 517 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

c. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 107: Sydlige Nordsø SAC (Denmark)

Name of European site: Sydlige Nordsø SAC												
Distance to Hornsea Project One: 347 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 347 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 347 km away from the closest point of Project One (i.e. Project One), it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 347 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 347 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 108: Estuaires Et Littoral Picards (baies de Somme et d'Authie) pSCI (France)

Name of European site: Estuaires Et Littoral Picards (baies de Somme et d'Authie) pSCI												
Distance to Hornsea Project One: 353 km (384 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
River lamprey, see footnote **b**.												
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 353 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 353 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

c. Harbour seal: As this site is located 353 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

Stage 1 Matrix 109: Estuaire de la Seine pSCI (France)

Name of European site: Estuaire de la Seine pSCI												
Distance to Hornsea Project One: 442 km (490 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Atlantic salmon and river lamprey, see footnote **b**.												
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 442 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 442 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

c. Harbour seal: As this site is located 442 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

Stage 1 Matrix 110: Rècifs et landes de la Hague pSCI (France)

Name of European site: Rècifs et landes de la Hague pSCI												
Distance to Hornsea Project One: 440 km (513 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Bottlenose dolphin	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 440 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Bottlenose dolphin: As this site is located approximately 440 km away from Project One and due to the low numbers recorded in the vicinity of Project One, no LSEs are anticipated on this species or the conservation objectives of this site.

Stage 1 Matrix 111: Rècifs et marais arrière-littoraux du Cap Lèvi à la Pointe de Saire pSCI (France)

Name of European site: Rècifs et marais arrière-littoraux du Cap Lèvi à la Pointe de Saire pSCI												
Distance to Hornsea Project One: 428 km (495 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 428 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Harbour seal: As this site is located 428 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

Stage 1 Matrix 112: Banc et récifs de Surtainville pSCI (France)

Name of European site: Banc et récifs de Surtainville pSCI												
Distance to Hornsea Project One: 469 km (541 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Bottlenose dolphin	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 469 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Bottlenose dolphin: As this site is located approximately 469 km away from Project One and due to the low numbers recorded in the vicinity of Project One, no LSEs are anticipated on this species or the conservation objectives of this site.

Stage 1 Matrix 113: Anse de Vauville pSCI (France)

Name of European site: Anse de Vauville pSCI												
Distance to Hornsea Project One: 452 km (524 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Bottlenose dolphin	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 452 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Bottlenose dolphin: As this site is located approximately 452 km away from Project One and due to the low numbers recorded in the vicinity of Project One, no LSEs are anticipated on this species or the conservation objectives of this site.

Stage 1 Matrix 114: Baie de Seine occidentale SCI (France)

Name of European site: Baie de Seine occidentale SCI (France)												
Distance to Hornsea Project One: 443 km (509 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Bottlenose dolphin	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 443 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Harbour seal: As this site is located 443 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Bottlenose dolphin: As this site is located approximately 443 km away from Project One and due to the low numbers recorded in the vicinity of Project One, no LSEs are anticipated on this species or the conservation objectives of this site.

Stage 1 Matrix 115: Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)

Name of European site: Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI												
Distance to Hornsea Project One: 299 km (325 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×c**	**×c**	**×c**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 299 km away from the closest point of Project One (i.e. Subzone 1) (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 299 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 299 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 299 km from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 116: Bancs des Flandres pSCI (France)

Name of European site: Bancs des Flandres pSCI												
Distance to Hornsea Project One: 263 km (279 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 263 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 263 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 263 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 263 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 117: Recifs Gris-nez Blanc-nez pSCI (France)

Name of European site: Recifs Gris-nez Blanc-nez pSCI												
Distance to Hornsea Project One: 288 km (315 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 288 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 288 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 288 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 288 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 118: Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)

Name of European site: Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI												
Distance to Hornsea Project One: 288 km (320 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 288 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 288 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 288 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 288 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 119: Baie de canche et couloir des trois estuaires pSCI (France)

Name of European site: Baie de canche et couloir des trois estuaires pSCI												
Distance to Hornsea Project One: 331 km (361 km from Subzone 1)												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour porpoise	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d**	**✓d,e**	**✓d,e**	**✓d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 331 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: As this site is located approximately 331 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seal: As this site is located 331 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoise: Although this site is located approximately 331 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 120: Doggersbank (Dutch Dogger Bank) pSCI (Netherlands)

Name of European site: Doggersbank (Dutch Dogger Bank) pSCI

Distance to Hornsea Project One: 64 km

European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b,e**	✓**b,e**	✓**b,e**
Harbour seal	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c,e**	✓**c,e**	✓**c,e**
Harbour porpoise	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d,e**	✓**d,e**	✓**d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 64 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: The construction and operation of Project One may cause physical and/or behavioural disturbance of harbour seal from piling noise during turbine and associated infrastructure installation, increased potential of vessel traffic and strikes, suspended sediments, habitat/prey species loss, accidential pollution and EMF. All of these impacts are localised to Project One or within close proximity to this area e.g. piling noise for a 2,300 kJ hammer energy results in a temporal threshold shift (TTS) and subsequent behavioural response of fleeing/likely avoidance out to a range of 1.7 km (see Volume 2: Chapter 4 Marine Mammals). Given that most foraging ranges for grey seal have generally been recorded as up to 145 km from their haul-out sites (Thompson *et al.*, 1996), grey seal from Dutch Dogger Bank may travel in close proximity to Project One. Therefore, there is potential for LSEs on this species from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seals occur predominantly in nearshore waters but do occur on the Dutch Dogger Bank. Tagging of harbour seal in the UK suggests that harbour seal generally tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). As this site is located only 64 km away from Project One, there is potential for harbour seals originating from this SAC to occur in the proposed development area. Therefore, there is potential for LSEs on this species from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoises occur on the Klaverbank and were frequently recorded during Year 1 surveys. The species is recognised as being highly mobile, occurring widely across the North Sea. Noise modelling indicates potential displacement or behavioural impacts up to 38 km from the sound source. It is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**). Based on the values of electromagnetic fields likely to occur from cables and the likely sensitivity of porpoises, there may be a very localised effect on harbour porpoise within the vicinity of the inter-array and export cables, with potential responses such as temporary changes in swimming direction or slight deviation from a transit route. EMF, however, is not anticipated to lead to a likely significant effect on this species or adversely affect the conservation objectives for this site.

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 121: Klaverbank pSCI (Netherlands)

Name of European site: Klaverbank pSCI												
Distance to Hornsea Project One: 44 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b**	✓**b,e**	✓**b,e**	✓**b,e**
Harbour seal	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c**	✓**c,e**	✓**c,e**	✓**c,e**
Harbour porpoise	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d**	✓**d,e**	✓**d,e**	✓**d,e**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 44 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Grey seal: The construction and operation of Project One may cause physical and/or behavioural disturbance of harbour seal from piling noise during turbine and associated infrastructure installation, increased potential of vessel traffic and strikes, suspended sediments, habitat/prey species loss, accidental pollution and EMF. All of these impacts are localised to Project One or within close proximity to this area e.g. piling noise for a 2,300 kJ hammer energy results in a temporal threshold shift (TTS) and subsequent behavioural response of fleeing/likely avoidance out to a range of 1.7 km (see Volume 2: Chapter 4 Marine Mammals). Given that most foraging ranges for grey seal have generally been recorded as up to 145 km from their haul-out sites (Thompson *et al.*, 1996), grey seal from Klaverbank may travel in close proximity to Project One. Therefore, there is potential for LSEs on this species from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

c. Harbour seals occur predominantly in nearshore waters but do occur on the Klaverbank. Tagging of harbour seal in the UK suggests that harbour seal generally tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). As this site is located only 44 km away from Project One, there is potential for harbour seals originating from this SAC to occur in the proposed development area. Therefore, there is potential for LSEs on this species from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour porpoises occur on the Klaverbank and were frequently recorded during Year 1 surveys. The species is recognised as being highly mobile, occurring widely across the North Sea. Noise modelling indicates potential displacement or behavioural impacts up to 38 km from the sound source. It is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**). Based on the values of electromagnetic fields likely to occur from cables and the likely sensitivity of porpoises, there may be a very localised effect on harbour porpoise within the vicinity of the inter-array and export cables, with potential responses such as temporary changes in swimming direction or slight deviation from a transit route. EMF, however, is not anticipated to lead to a likely significant effect on this species or adversely affect the conservation objectives for this site.

e. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 122: Vlakte van de Raan SAC (Netherlands)

Name of European site: Vlakte van de Raan SAC												
Distance to Hornsea Project One: 259 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution/abundance			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad, sea and river lamprey, see footnote **b**.												
Grey seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour porpoise	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e,f**	**✓e,f**	**✓e,f**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 259 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 259 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

c. Grey seal: As this site is located approximately 259 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour seal: As this site is located 259 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour porpoise: Although this site is located approximately 259 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

f. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 123: Noordzeekustzone SAC (Netherlands)

Name of European site: Noordzeekustzone SAC

Distance to Hornsea Project One: 179 km

European site features	Likely Effects of Project One											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex I Migratory Species												
All Annex I migratory species, see footnote **b**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey speciesdistribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad, sea and river lamprey, see footnote **c**.												
Grey seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour seal	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**	**×e**
Harbour porpoise	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f**	**✓f,g**	**✓f,g**	**✓f,g**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 179 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Collision, barrier, displacement: As the site is located approximately 179 km away from Project One and due to the reasons highlighted in Section 4.3, Environmental Statement Volume 2, Chapter 5: Ornithology and the findings of the collision risk modelling (**APEM 2012 and 2013**), no LSEs are predicted on Annex I migratory bird species and the conservation objectives for this site.

c. Annex II migratory fish species: As the site is located approximately 179 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

d. Grey seal: As this site is located approximately 179 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour seal: As this site is located 179 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

f. Harbour porpoise: Although this site is located approximately 179 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

g. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 124: Noordzeekustzone II pSCI (Netherlands)

Name of European site: Noordzeekustzone II pSCI												
Distance to Hornsea Project One: 180 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey speciesdistribution/abundance			Injury/Disturbance		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad, allis shad, sea and river lamprey, see footnote **b**.												
Grey seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**
Harbour porpoise	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e**	**✓e, f**	**✓e, f**	**✓e, f**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 180 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 180 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

c. Grey seal: As this site is located approximately 180 km away from Project One, it is located beyond the foraging distance (i.e., 145 km) for grey seal and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour seal: As this site is located 180 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, (based on a maximum foraging distance of 120 km), and therefore, there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

e. Harbour porpoise: Although this site is located approximately 180 km away from Project One, it is highly likely that harbour porpoise within this site form part of the overall mobile southern North Sea population. Therefore, as a precautionary measure, the potential for LSEs cannot be ruled out and this species is screened in for further assessment due to physical injury, behavioural disturbance and changes to prey species availability from Project One offshore activities, alone or in-combination with other plans/projects (HRA Report, **Table 4.7**), which could have implications for the conservation objectives of this species within this site for which it is a designated feature (HRA Report, **Section 4.3** and **Section 4.5**).

f. Plans/projects with potential for LSE on marine mammals in-combination with Project One offshore activities include: Triton Knoll, Race Bank, Dudgeon, Dogger Bank Creyke Beck A and B, East Anglia One, Galloper, London Array Phase II, Kentish Flats Extension and the Blyth Demonstration Site which are within 250 km, and Moray Firth Project One, Neart na Gaoithe, Beatrice and the Aberdeen European Offshore Wind Deployment Centre, Hornsea Project Two (all due to overlap in the construction phases) (see **HRA Table 4.7 and Section 5.3, para 5.3.1 onwards**).

Stage 1 Matrix 124: Waddenzee (Wadden Sea) SCI (Netherlands)

Name of European site: Waddenzee (Wadden Sea) SCI												
Distance to Hornsea Project One: 189 km												
European site features	**Likely Effects of Project One**											
Annex I Habitats												
All Annex I habitats, see footnote **a**.												
Annex II Species	Injury/Disturbance			Collision risk			Change in prey speciesdistribution/abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Twait shad, sea and river lamprey, see footnote **b**.												
Grey seal	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**
Harbour seal	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**	**×d**

Evidence supporting conclusions (Ref: HRA Report, Section 4.3):

a. Annex I habitats have been screened out for this Natura 2000 site as it is 189 km away from the closest point of Project One (see Matrix 79: Moray Firth SAC; and **HRA Report, Section 4.3, para 4.3.44**). Therefore, no LSEs are anticipated on the conservation objectives for Annex I habitats and consequently this site.

b. Annex II migratory fish species: As the site is located approximately 189 km away from Subzone 1, it is beyond potential range of effects from Project One offshore activities. Due to the reasons highlighted in HRA Report (**Section 4.3**) and the Environmental Statement Volume 2, Chapter 3: Fish and Shellfish Ecology, no LSEs are anticipated on these features or the conservation objectives for this site.

c. Grey seal: This site has been considered for grey seal based on advice received by the Dutch Rijkswaterstaat during Phase 4 Consultation. Counts of grey seal, in particular, are undergoing exponential rates of increase in Dutch colonies, including those in the Wadden Sea SAC. Tracking studies have revealed that this is, in part, attributable to immigration from, and movement between, UK colonies, particularly those on the west coast of Scotland (Brasseur *et al.,* 2010). Telemetry data collected between 2005 and 2004 showed that of eleven seals tagged, three crossed the North Sea to UK waters and haul-out sites in the Moray Firth, Farne Islands and Orkney (Brasseur *et al.,* 2010). None of these tracks, however, passed through Project One, and as such it is not considered likely that the areas in the vicinity of Project One are important for individuals originating from these colonies. Similar tracking studies of harbour seal in the Wadden Sea in 2002/2003 showed that, although some individuals make foraging trips to UK waters, on the whole, the at-sea distribution of this species is concentrated on the waters of Wadden Sea. Therefore, as no connectivity to Project One has been demonstrated and this site is located approximately 189 km away from Subzone 1 (beyond the foraging distance (i.e., 145 km) for grey seal), there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

d. Harbour seal: This site has been considered for harbour seal, based on advice received by the Dutch Rijkswaterstaat during Phase 4 Consultation. Tagging of harbour seal in the UK suggests that harbour seal generally tend to forage within 40 or 50 km of their haul-out sites (SCOS, 2011). Harbour seal hauled out in The Greater Wash region (which encompassed the North Norfolk and Lincolnshire coastlines), were found to travel between 75 and 120 km offshore to assumed foraging locations (SMRU, 2011) as reported in the Environmental Statement Volume 2, Chapter 4: Marine Mammals. As this site is located 189 km away from Project One, it is located beyond any potential for direct, and indirect effects on harbour seal on foraging trips from this site, and therefore there are no LSEs anticipated from Project One alone or in-combination with other plans/projects (HRA Report, **Table 4.7**) on the conservation objectives for this species and consequently this site (HRA Report, **Section 4.3** and **Section 4.5**).

Stage 2: Effects on Integrity

Where Likely Significant Effects have been identified from the above process, an assessment has been made on whether this would lead to an adverse effect on the integrity of the European site. This assessment is presented in the matrices below.

Potential Impacts
Potential impacts upon the European site(s)† which are considered within the submitted Habitats Regulations Assessment report (SMart Wind, 2013) are provided in the table below. Impacts have been grouped where appropriate for ease of presentation.

Table 2: Impacts considered within the integrity matrices

Designation	Impacts in submission information	Presented in integrity matrices as	Integrity Matrix
SPA			
The Humber Estuary SPA/Ramsar	Extent: Temporary habitat loss due to cable laying operations in the intertidal and construction of HVDC converter/HVAC substation.	Habitat extent	Matrix 1
	Disturbance and displacement: Temporary noise, vibration and visual disturbance due to activities associated with cable laying and construction of HVDC converter/HVAC substation.	Disturbance and displacement	
	Indirect effects: Temporary reduction or redistribution in prey items due to disturbance caused by installation activities, or a change in water quality due to increase in suspended sediments.	Indirect effects	
Coquet Island SPA	As above for Humber Estuary SPA/Ramsar		Matrix 2
Farne Islands SPA	As above for Humber Estuary SPA/Ramsar		Matrix 3
Flamborough Head and Bempton Cliffs SPA & Ramsar	Birds: Collisions with rotating turbine blades may result in direct mortality.	Collision	Matrix 4
	Birds: Displacement from physical presence of wind turbines during the operational and maintenance phase may result in effective habitat loss and reduction in survival or fitness rates.	Displacement	
Forth Islands SPA	As for Flamborough Head and Bempton Cliffs SPA and Ramsar		Matrix 5
SAC / SCI			
Humber Estuary SAC	Annex I habitat: Temporary habitat loss during cable laying operations in the intertidal.	Habitat Extent	Matrix 6
	Annex I habitat: Temporary increase in suspended sediments, resuspension of sediment bound contaminants and smothering during cable laying.	Water quality	
	Annex II fish species: Temporary increase in suspended sediments during cable laying in the intertidal. Annex II fish species: Disruption of migratory pathways, or creation of artificial barriers during cable laying operations and operational phase (i.e. EMF).	Disruption to migration	
	Marine Mammals: Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.	Injury/Disturbance	
	Marine Mammals: Behavioural disturbance from underwater noise from vessel noise and other activities.		
	Marine Mammals: Physical injury from increased risk of collision with vessels.	Collision risk	
	Marine Mammals: Change in prey (fish) species distribution and/or abundance (indirect effect).	Change in prey species distribution/abundance	

† As defined in Advice Note 10.

Designation	Impacts in submission information	Presented in integrity matrices as	Integrity Matrix
River Derwent SAC	Annex II fish species: Temporary increase in suspended sediments during cable laying in the Humber Estuary. Annex II fish species: Disruption of migratory pathways, or creation of artificial barriers during cable laying operations and operational phase (i.e. EMF).	Disruption to migration	Matrix 7
Berwickshire and North Northumberland Coast SAC	Marine Mammals: Physical injury and/or behavioural disturbance from underwater noise impacts during construction piling of foundations and other construction activities.	Injury/Disturbance	Matrix 8
	Marine Mammals: Behavioural disturbance from underwater noise from vessel noise and other activities.		
	Marine Mammals: Physical injury from increased risk of collision with vessels.	Collision risk	
	Marine Mammals: Change in prey (fish) species distribution and/or abundance (indirect effect).	Change in prey species distribution/abundance	
The Wash and North Norfolk Coast SAC	As for Berwickshire and North Northumberland Coast SAC		Matrix 9
SBZ 1 / ZPS 1 (Belgium) SPA/SCI	As for Berwickshire and North Northumberland Coast SAC		Matrix 10
SBZ 2 / ZPS 2 (Belgium) SPA/SCI	As for Berwickshire and North Northumberland Coast SAC		Matrix 11
SBZ 3 / ZPS 3 (Belgium) SPA/SCI	As for Berwickshire and North Northumberland Coast SAC		Matrix 12
Vlakte van de Raan pSCI (Belgium)	As for Berwickshire and North Northumberland Coast SAC		Matrix 13
NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 14
Doggerbank SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 15
Östliche Deutsche SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 16
Sylter Außenriff SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 17
Steingrund SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 18
Helgoland mit Helgoländer Felssockel SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 19
Hamburgisches Wattenmeer SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 20
Unterelbe SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 21
Borkum-Riffgrund SAC (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 22
Nationalpark Niedersächsisches Wattenmeer SCI (Germany)	As for Berwickshire and North Northumberland Coast SAC		Matrix 23
Gule Rev SAC (Denmark)	As for Berwickshire and North Northumberland Coast SAC		Matrix 24
Sydlige Nordsø SAC (Denmark)	As for Berwickshire and North Northumberland Coast SAC		Matrix 25
Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)	As for Berwickshire and North Northumberland Coast SAC		Matrix 26
Bancs des Flandres pSCI (France)	As for Berwickshire and North Northumberland Coast SAC		Matrix 27
Recifs Gris-nez Blanc-nez pSCI (France)	As for Berwickshire and North Northumberland Coast SAC		Matrix 28
Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)	As for Berwickshire and North Northumberland Coast SAC		Matrix 29
Baie de canche et couloir des trois estuaries pSCI (France)	As for Berwickshire and North Northumberland Coast SAC		Matrix 30
Doggersbank pSCI (Netherlands)	As for Berwickshire and North Northumberland Coast SAC		Matrix 31
Klaverbank pSCI (Netherlands)	As for Berwickshire and North Northumberland Coast SAC		Matrix 32
Vlakte van de Raan SAC (Netherlands)	As for Berwickshire and North Northumberland Coast SAC		Matrix 33
Noordzeekustzone SAC (Netherlands)	As for Berwickshire and North Northumberland Coast SAC		Matrix 34
Noordzeekustzone II pSCI (Netherlands)	As for Berwickshire and North Northumberland Coast SAC		Matrix 35

Effects on Integrity

Likely Significant effects have been identified for the following European Sites:

SPAs
The Humber Estuary SPA
Coquet Island SPA
Farne Islands SPA
Flamborough Head and Bempton Cliffs SPA & Ramsar
Forth Islands SPA

SACs/SCIs
Humber Estuary SAC
River Derwent SAC
Berwickshire and North Northumberland Coast SAC
The Wash and North Norfolk Coast SAC
SBZ 1 / ZPS 1 (Belgium) SPA/SCI
SBZ 2 / ZPS 2 (Belgium) SPA/SCI
SBZ 3 / ZPS 3 (Belgium) SPA/SCI
Vlakte van de Raan pSCI (Belgium)
NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)
Doggerbank SCI (Germany)
Östliche Deutsche SCI (Germany)
Sylter Außenriff SCI (Germany)
Steingrund SCI (Germany)
Helgoland mit Helgoländer Felssockel SCI (Germany)
Hamburgisches Wattenmeer SCI (Germany)
Unterelbe SCI (Germany)
Borkum-Riffgrund SAC (Germany)
Nationalpark Niedersächsisches Wattenmeer SCI (Germany)
Gule Rev SAC (Denmark)
Sydlige Nordsø SAC (Denmark)
Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)
Bancs des Flandres pSCI (France)
Recifs Gris-nez Blanc-nez pSCI (France)
Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)
Baie de canche et couloir des trois estuaries pSCI (France)
Doggersbank pSCI (Netherlands)
Klaverbank pSCI (Netherlands)
Vlakte van de Raan SAC (Netherlands)
Noordzeekustzone SAC (Netherlands)
Noordzeekustzone II pSCI (Netherlands)

Evidence for the conclusions reached on integrity is detailed within the footnotes to the matrices below.

Matrix Key

✓ = Adverse effect on integrity cannot be excluded **✕ = Adverse effect on integrity can be excluded**

C = construction O = operation D = decommissioning

Stage 2 Matrix 1: The Humber Estuary SPA

Name of European site: The Humber Estuary SPA												
Distance to Hornsea Project One: 0 km at nearest point (102 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
	Habitat extent			Disturbance and displacement			Indirect effects			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Bar-tailed godwit – Wintering and on passage	**×a**			**×b**			**×l**			**×m, n, o**		
Golden plover – Wintering	**×a**			**×c**			**×l**			**×m, n, o**		
Dunlin – Over winter and on passage	**×a**			**×d**			**×l**			**×m, n, o**		
Knot – Over winter and on passage	**×a**			**×e**			**×l**			**×m, n, o**		
Redshank – Over winter and on passage	**×a**			**×f**			**×l**			**×m, n, o**		
Dark-bellied brent goose – Over winter (assemblage)	**×a**			**×g**			**×l**			**×m, n, o**		
Sanderling – Over winter and on passage (assemblage)	**×a**			**×h**			**×l**			**×m, n, o**		
Ringed plover – Over winter and on passage (assemblage)	**×a**			**×i**			**×l**			**×m, n, o**		
Oystercatcher – Over winter (assemblage)	**×a**			**×j**			**×l**			**×m, n, o**		
Grey plover – Over winter (assemblage)	**×a**			**×k**			**×l**			**×m, n, o**		

Evidence supporting conclusions:

a. In relation to the relevant conservation objectives, the extent and distribution of supporting habitats will not be significantly affected, being minimal with the vast majority of habitat loss will be reversible within a short period. As a result, the numbers or distribution of qualifying species will not be affected by habitat loss. It can therefore be concluded no conservation objectives are expected to be compromised by habitat loss, and consequently there will be no adverse effects on the integrity of the Humber Estuary SPA as a result of temporary habitat loss during cable installation at the landfall site (**see HRA, para 6.3.5 *et seq.***). To provide further confidence, mitigation measures have been proposed to reduce habitat loss and increase recovery rates within the Salicornia and other annuals colonising mud and sand Annex I habitat and other Annex I habitats following cable installation (**see HRA, Section 6.4: Mitigation Measures**).

b. Bar-tailed godwits are likely to be present in numbers within the area around the cable landfall site from mid-September to early May. The species was recorded over winter and observed widely across the mudflats near the cable landfall site during low and rising tides. It appears that a low tide roost of up to 800 birds may be present in winter, representing 29% of the cited Humber Estuary SPA population, or 13% of the most recent WeBS core count population for the Humber Estuary. Numbers present during each survey did, however, vary considerably despite similar tidal states, suggesting that alternative habitat is available within the estuary if required. In the Firth of Forth, studies have shown that bar-tailed godwits ranged more widely than most other species (Symonds et al, 1984), reflecting their flexibility in habitat choice (estuarine mudflats). Although in a worst-case situation a significant number of SPA birds may be displaced if within around 100 m from human movements (as predicted from Smit and Visser, 1993), the distribution of individuals within the survey area suggests that birds may require moving only short distances across mudflats, away from where the restricted work area would be, and that a roost site would be maintained in the area. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.*** and **6.3.60 *et seq.*** and **Section 6.4: Mitigation Measures**).

c. Golden plovers are likely to be found mainly in the vicinity of Horseshoe Point from September to November with peak numbers up to 8,000 individuals on autumn passage representing 26% of the cited and 16% of the current Humber Estuary SPA populations respectively. Numbers were however very low for the remainder of the year. The saltmarsh area is likely to form part of a feeding site and high tide roost for the species during autumn passage, with the majority of records being close to land. In a worst-case situation a significant number of roosting or feeding SPA birds may be displaced if within 100 m from human movements (as predicted from Smit and Visser, 1993). The species is widely distributed within the Humber Estuary and the population is in favourable conservation status, suggesting that no particular locality is of significant importance within the context of the Humber Estuary SPA. Although significantly large numbers were recorded locally, golden plover does not appear to be particularly vulnerable to disturbance and key habitats for this species (i.e. saltmarsh habitats) are not within the area of effect (i.e. approximately 100 m from human movements/cable laying operations). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the limited effects on preferred habitats for this species and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.62 *et seq.* and Section 6.4: Mitigation Measures**).

d. Dunlin are likely to be present between September and May, with peaks in October and early April on passage. It is likely that up to 2,000-3,000 dunlin (>10% of the Humber Estuary SPA population) use the mudflats close to the cable landfall survey area, particularly during autumn passage from late October, as determined from survey results and consultation with NE. Birds were recorded throughout the survey area, although predominantly above mean high water mark on muddy substrates, suggesting that some individuals may be displaced by construction activities. The dunlin is widespread around the Humber at low water, and may form large roosting flocks at high water, although many birds remain along the tideline. Burton et al. (2002a) suggested that construction work may have affected dunlin on a studied estuarine site, while Burton et al. (2002b) demonstrated that numbers of dunlin were significantly lower where a footpath was close to a count section, although such an effect was recorded only up to 25 m from the source of disturbance. Cutts and Allen (1999) have recorded variable responses to human disturbance on the Humber, with minimum approach distances to construction activity being between 100 m and 200 m, although in some cases up to 50 m. Birds are then put to flight, with movements downshore or onto adjacent mudflats up to 500 m away, with a gradual return to the area of construction. The widespread availability of potential alternative habitat (i.e. with a maximum of 1.68% of intertidal habitats within the Humber Estuary SPA being affected) across the estuary suggests that any birds displaced would likely find suitable sites elsewhere without any significant impacts (particularly as a small species, as per Stillman et al. 2005), although the species has declined nationally and locally since the Humber Estuary SPA citation date (potentially due to a reduction in suitable habitat). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.67 *et seq.* and Section 6.4: Mitigation Measures**).

e. Knot are likely to arrive on site from September, peaking in November and remaining until early April. Surveys at the cable landfall site in 2011/12 recorded a peak count of 3,000 birds in November, which equates to 10% of the cited Humber Estuary SPA population, or around 8% of the current Humber Estuary SPA population, although NE has advised that up to 10,000 birds may be present. Birds were located widely within the survey area, although some of the largest flocks were to be found well below mean high water mark at low tide. It is therefore possible that large numbers of birds may be affected by construction activities, however the small species is highly mobile between feeding and roosting areas on the Humber, in response to weather conditions, tidal conditions or disturbance (Allen et al. 2003). As such, it does not necessarily follow that displacement would result in a reduction in numbers, with alternative habitat undoubtedly available (i.e. with a maximum of 1.68% of intertidal habitats within the Humber Estuary SPA being affected) for the period of disturbance. In addition, although a possible high tide roost site may be present in the vicinity of the convergence corridor, similar roost sites were also recorded at a number of other locations within the Horseshoe Point survey area. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.71 *et seq.* and Section 6.4: Mitigation Measures**).

f. Redshank are particularly vulnerable to severe weather conditions as they take small prey items in relation to body size, and so must spend longer periods feeding during severe weather (Mitchell et al. 2000). Displacement effects may therefore also be particularly acute for the species if feeding time is reduced, especially in bad weather. Results from Smit and Visser (1993) suggest that birds may be displaced up to around 120 m, the furthest of the species studied by the authors. Redshank may be found on site throughout the year though much less frequently during summer. There is a peak on passage in the Humber in September and October, and again in April corresponding with the spring passage of what are presumed to be Icelandic birds. Small numbers of breeding birds may be present on saltmarshes through summer. At Horseshoe Point, numbers did indeed peak during October, but were much smaller on spring passage and throughout summer. Although the species is widespread across the Humber Estuary, they have a preference for muddy river channels and saltmarsh (Allen et al. 2003), with saltmarshes at Tetney and Grainthorpe Haven and Donna Nook providing important roost sites (Cruickshanks et al. 2010). Numbers were relatively low in the vicinity of the cable landfall site, as during surveys in 2011/12, a peak flock size of 87 individuals was recorded in October 2011 representing 1.2% of the cited passage Humber Estuary SPA population. Although this is a sensitive species, with a declining population in the SPA, it appears that, although some birds may be displaced within the vicinity of construction works, the numbers are likely to represent less than 1% of the Humber Estuary SPA population. In addition, effects on this species' preferred habitats (e.g. saltmarsh) are not within the area of disturbance effects for this species. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the low number of birds expected to be affected and available alternative habitat, as well as the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.74 *et seq.* and Section 6.4: Mitigation Measures**).

g. Dark-bellied brent geese are likely to be present in the Humber Estuary SPA on passage from October and November, and peak in December to February with numbers falling rapidly by March (Allen et al. 2003). During surveys in 2011/12 at the cable landfall site, a peak of 835 individuals was recorded at low tide in March 2012 with similar numbers in January, representing 40% of the cited Humber Estuary SPA population and around 18% of the likely current population, which has greatly increased. The effects of disturbance on brent geese within estuarine sites are less reported than for waders, however, numbers of brent geese were found to decrease with increased proximity to a footpath access point on weekends, when use was likely to have been greatest (Burton et al., 2002a), suggesting that construction disturbance may be an issue. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat and the commitment to avoid works within the periods of the year when this species is present in significant numbers (i.e. all works to be undertaken between April and

September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.79 *et seq.* and Section 6.4: Mitigation Measures**).

h. Sanderlings are potentially present within the Humber Estuary SPA most of the year, but peak numbers coincide with spring and autumn passage. During surveys in 2011/12 at the cable landfall site, a peak of 150 birds was however recorded in January 2012, which represents 31% of the cited wintering Humber Estuary SPA population, or 18% of the passage population. Numbers substantially declined in summer, with the species absent across the estuary during most surveys. WeBS core counts recorded a peak of 158 birds in May 2010 in the Tetney to Horseshoe Point sector. Sanderling are largely restricted to the outer southern shore of the Humber Estuary, and so habitat may be limited. Negative effects on sanderling, as a result of reduced time spent feeding due to human presence has been recorded by Burger and Gochfeld (1991) although the species can feed through the night and so more time can be devoted to feeding outside periods of disturbance. Additionally, the species tends to feed at the water's edge, and so will likely be further away from construction activities, and according to Stillman et al. (2005), should be more likely to survive as a smaller species. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the low numbers of birds likely to be affected and the available alternative habitat, as well as the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.84 *et seq.* and Section 6.4: Mitigation Measures**).

i. Ringed plover may be present on site throughout the year, although numbers are likely to peak during migration periods. Autumn migration is from mid-July to early October, and spring migration is from late April to early June. Cable landfall site surveys in 2011/12 recorded ringed plovers on the majority of surveys, with a peak of 120 birds in mid-September representing 7% of the cited Humber Estuary SPA passage population. Most records of ringed plover were above mean high water mark on the muddy substrates suggesting a probable roost site. NE reported that there is normally a concentration of roosting ringed plover close to the shore, directly to the north of the cable landfall site in May, although a peak of only 37 birds was recorded during cable landfall surveys in May 2012. A relatively high count of 778 birds was however recorded within the Horseshoe Point WeBS core count sector in May 2010, representing 44% of the cited Humber Estuary SPA passage population and 31% of the most recent Humber Estuary population. Cutts and Allen (1999) recorded a dispersal of birds due to construction activity alongside dunlin, with similar responses predicted, i.e. at distances of 100 m to 200 m, with a gradual return to the area of construction. Survey results therefore suggest that the site is of relatively high importance, probably during passage movements in autumn and spring and if works were to take place during these periods, roosting may be disturbed. There is evidence for alternative roost sites outside the area of effect (i.e. approximately 100-200 m from human movements/cable laying operations) at Horseshoe Point, though it is not clear whether alternative habitat is available as in the adjacent Grainthorpe Haven WeBS sector where the species was recorded in much lower numbers. Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative habitat at Horseshoe Point and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.86 *et seq.* and Section 6.4: Mitigation Measures**).

j. Southerly passage of oystercatcher may occur in the Humber Estuary between July and September, with a large influx during September. Overall numbers may decrease slightly through the winter. A small summering and breeding population remains throughout summer. The area between Horseshoe Point and Grainthorpe has been identified as an important feeding area during much of the year within the context of the Humber Estuary SPA. In addition, birds tend to establish high tide roosts close to key feeding areas (Catley, 2000). Near to the cable landfall site, oystercatchers roost in creeks mid-estuary in low, turning tides, and at low tide roost size can reach up to around 3,000 individuals (November 2011 and February 2012), representing much of the cited Humber Estuary SPA population (>94%). During winter, birds were generally concentrated on the mudflats on low and rising tides, some 1 km or more from the shoreline. It is therefore possible that significant numbers could be disturbed by construction activities. Oystercatcher feeding rates have been recorded as being reduced due to human disturbance (Goss-Custard and Verboven, 1993) although this was compensated by shifting to other areas and habituation. Fitzpatrick and Bouchez (1998) found that arrival times of oystercatcher at their low water feeding sites were delayed as a result of human presence, with earlier departures when disturbed. Stillman et al. (2005) reported however, that oystercatcher survival rates are likely to be higher than other similarly-sized waders as they consume larger prey items. Although high peak numbers of oystercatcher were recorded within the context of the Humber SPA, the preferred habitats for these species (i.e. creeks and cockle beds to the south of the convergence corridor) will largely be outside the area of effect (i.e. approximately 100-200 m from human movements/cable laying operations). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance (which will largely be away from key habitat for this species) and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.91 *et seq.* and Section 6.4: Mitigation Measures**).

k. Grey plover numbers within the Humber Estuary SPA rapidly build up through August to a September/October peak, and thereafter steadily decline. Numbers build up rapidly from March to May as birds arrive on spring passage, on the same scale as the autumn migration. Cable landfall surveys in 2011/12 recorded a peak of 885 birds on spring passage in April during rising tide, which is 52% of the cited Humber Estuary SPA population, and 31% of the likely current population. Birds were located on the muddy substrate mainly below mean high water, although the saltmarshes may provide an important communal roost site in the wider Tetney Marshes area (Cruickshanks et al. 2010). The species was absent on surveys from mid-June until September around Horseshoe Point, with a smaller autumn passage (peak of 231 birds in October). Cutts et al. (2009) identified the species as being particularly sensitive to roosting disturbance, with the overlapping WeBS sectors at Horseshoe Point being important within the estuary. In contrast to cable route surveys, the species was almost entirely absent during low tide counts from April to July inclusive in the two overlapping WeBS sectors (Mander and Cutts, 2005). Although there is relatively little work directly on this species, (Smit & Visser, 1993; Burton et al. 2002) it has been recorded that grey plover is territorial in winter (Turpie 1995). Reaction distances may however be similar to golden plover, where in a worst-case situation a significant number of roosting or feeding birds may be displaced if within 100 m from human movements (as predicted from Smit and Visser, 1993). Although the Humber Estuary SPA population is in relatively favourable conservation status, due to the high peak numbers within the context of the Humber Estuary SPA population, and this species has low thresholds for habituation during passage periods, it is possible that a significant number of roosting or feeding passage birds may be disturbed and leave the Humber Estuary SPA altogether (Cutts et al., 2009) during cable laying operations. The predicted area of effect is, however, relatively limited (i.e. approximately 100 m from human movements/cable laying operations) and although high tide roost sites may be present within the convergence corridor, alternative habitats were recorded within the survey area outside the predicted area of effect (i.e. to the north of the convergence corridor and within the saltmarsh habitat to the south). Given the temporary nature of the disturbance from cable laying activities, the limited spatial extent of disturbance, the available alternative roosting habitat at Horseshoe Point and the commitment to avoid works within the most sensitive periods of the year (i.e. all works to be undertaken between April and September), it is concluded that there will not be an adverse effect on this feature or its conservation objectives (**see HRA paragraphs 6.3.27 *et seq.* and 6.3.95 *et seq.* and Section 6.4: Mitigation Measures**).

l. In relation to the relevant conservation objectives the extent, distribution and function of supporting habitats will only be briefly affected in the local area, and will not result in the significant redistribution or reduction of populations occurring within the Humber Estuary SPA. As such no conservation objectives are predicted to be compromised as a result of indirect disturbance (i.e. via impacts on prey species), and so the integrity of the Humber Estuary SPA will be unaffected. Effects related to reductions in water quality are also not expected to lead to adverse effects on qualifying features with effects predicted to be short-term and areas affected are likely to be very small compared to available alternative habitat and prey items within these habitats. The potential for any discharges associated with construction activities will also be minimised through the implementation of good working and management practices as detailed in the CoCP (**see HRA paragraphs 6.3.104 *et seq.* and Section 6.4: Mitigation Measures**).

m. Habitat loss is predicted to occur as a result of the AMEP development plans, the Tetney to Saltfleet Tidal Flood Defence Scheme, the Phillips 66 Tetney Sea Line Replacement project and Hornsea Project Two, though the proportion of estuarine habitats affected is small in the context of the available habitats within the SAC/SPA (i.e. 0.75% of the total estuarine habitat). The majority of this is temporary habitat loss/disturbance, with the affected habitats expected to recovery quickly following disturbance. Any long term habitat loss (as a result of the AMEP development) will be mitigated through a habitat creation scheme. In-combination effects on habitat extent are therefore not predicted to result in an adverse effect on ornithological features of the SPA (**see HRA paragraphs 6.3.128 *et seq.***).

n. Due to the limited area of effect associated with Hornsea Project One and Project Two and accounting for the anticipated completion dates for the Tetney flood defence project (i.e. at least 2 years before the start of Project One and Two cable installation) and the Phillips 66 Tetney sea line replacement project (due to be completed by 2015) in advance of the start of Project One and Project Two cable installation, adverse effects are not expected for Project One in combination with other projects. A commitment for Project One restricting cable installation activities to avoid the most sensitive period, will also help to ensure that disturbance related adverse effects on populations of the Humber Estuary SPA will not occur (**see HRA paragraphs 6.3.133 *et seq.* and Section 6.4: Mitigation Measures**).

o. In-combination disturbance to prey items is likely to be highly localised with the area affected predicted to be small in the context of the Humber Estuary SAC/SPA, with other prey items available during the construction phase in similar habitats both at Horseshoe Point and in the wider SPA. In addition, effects are expected to be reversible with recovery time for prey species expected to be fast. As such, no in-combination effects on prey availability are likely to occur. In-combination effects of disturbance or water quality changes for prey species are most likely to occur when construction phases of projects are coincidental. Although the nature and extent of any discharges associated with construction activities are difficult to predict with any accuracy, it is unlikely that individuals from most species will be adversely affected to a level that will significantly affect the populations within the relevant SPAs, with overall areas affected likely to be very small compared to available alternative habitat, even in-combination with other projects. This is particularly likely to be the case when best practice and mitigation measures are considered for other projects (which are likely to be conditions of consent) which will minimise the risk of any in-combination discharge events and it can be reasonably concluded that no in-combination adverse effects are likely to occur (see **HRA paragraphs 6.3.143 et seq. and Section 6.4: Mitigation Measures**).

Stage 2 Matrix 2: Coquet Island SPA

Name of European site: Coquet Island SPA												
Distance to Hornsea Project One: 260 km												
European site features	**Adverse effect on integrity**											
	Habitat extent			Disturbance and displacement			Indirect effects			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common tern – Breeding	**×a**			**×b**			**×c**			**×d, e, f**		

Evidence supporting conclusions:

a. In relation to the relevant conservation objectives, the extent and distribution of habitats within the Humber Estuary which support this qualifying feature of the Coquet Island SPA will not be significantly affected, with habitat loss/disturbance being minimal with the vast majority of habitat loss will be reversible within a short period. As a result, the numbers or distribution of qualifying species will not be affected by habitat loss. It can therefore be concluded that unmitigated, no conservation objectives are expected to be compromised by habitat loss, and consequently there will be no adverse effects on the integrity of the Coquet Island SPA as a result of temporary habitat loss during cable installation at the landfall site (**see HRA, para 6.3.5 *et seq.***). To provide further confidence, mitigation measures have been proposed to reduce habitat loss and increase recovery rates within the Salicornia and other annuals colonising mud and sand Annex I habitat and other Annex I habitats following cable installation (**see HRA, Section 6.4: Mitigation Measures**).

b. Very low peak counts were recorded at Horseshoe Point (within the Humber Estuary) in 2011-12, however it is acknowledged that the use of the intertidal area by terns between July and September may be sporadic, and often most frequent in congregations from dusk onwards, which may be missed by surveys. Although the local area may still on occasion act as a roost site in late summer, it appears that the species' presence would be brief and intermittent between April and September. Most impacts may therefore take place during the post-breeding season, after juveniles have fledged, and so impacts on productivity are unlikely. With evidence suggesting that low tide roosts occur at dusk and into the night, disturbance will be negligible as this is outside the hours of planned intertidal works in Phase 2. No adverse effects on common tern are therefore predicted as a result of Project One cable laying within the Humber Estuary and along the onshore export cable route (**see HRA paragraphs 6.3.100 *et seq.*)**.

c. In relation to the relevant conservation objectives, the extent, distribution and function of habitats within the Humber Estuary which support this qualifying species of the Coquet Island SPA will only be briefly affected in the local area, and will not result in the significant redistribution or reduction of the population. As such no conservation objectives are predicted to be compromised as a result of indirect disturbance (i.e. via impacts on prey species), and so the integrity of the Coquet Island SPA will be unaffected. Effects related to reductions in water quality are also not expected to lead to adverse effects on qualifying features with effects predicted to be short-term and areas affected are likely to be very small compared to available alternative habitat and prey items within these habitats. The potential for any discharges associated with construction activities will also be minimised through the implementation of good working and management practices as detailed in the CoCP (**see HRA paragraphs 6.3.104 *et seq.* and Section 6.4: Mitigation Measures**).

d. Habitat loss is predicted to occur as a result of the AMEP development plans, the Tetney to Saltfleet Tidal Flood Defence Scheme, the Phillips 66 Tetney Sea Line Replacement project and Hornsea Project Two, though the proportion of estuarine habitats affected is small in the context of the available habitats within the SAC/SPA (i.e. 0.74% of the total estuarine habitat). The majority of this is temporary habitat loss/disturbance, with the affected habitats expected to recovery quickly following disturbance. Any long term habitat loss (as a result of the AMEP development) will be mitigated through a habitat creation scheme. In-combination effects on the extent of habitats within the Humber Estuary supporting this feature of the Coquet Island SPA are therefore not predicted to result in an adverse effect on ornithological features of the SPA (**see HRA paragraphs 6.3.128 *et seq.***).

e. Due to the limited area of effect associated with Hornsea Project One and Project Two and accounting for the anticipated completion dates for the Tetney flood defence project (i.e. at least 2 years before the start of Project One and Two cable installation) and the Phillips 66 Tetney sea line replacement project (due to be completed by 2015) in advance of the start of Project One and Project Two cable installation, adverse effects are not expected for Project One in combination with other projects. A commitment for Project Oneto restrict cable installation activities to avoid the most sensitive period, will also help to ensure that disturbance related adverse effects on populations of the Coquet Island SPA will not occur (**see HRA paragraphs 6.3.133 *et seq.* and Section 6.4: Mitigation Measures**).

f. In-combination disturbance to prey items is likely to be highly localised with the area affected predicted to be small, with other prey items available during the construction phase in similar habitats both at Horseshoe Point and in the wider area. In addition, effects are expected to be reversible with recovery time for prey species expected to be fast. As such, no in-combination effects on prey availability are likely to occur. In-combination effects of disturbance or water quality changes for prey species are most likely to occur when construction phases of projects are coincidental. Although the nature and extent of any discharges associated with construction activities are difficult to predict with any accuracy, it is unlikely that individuals from most species will be adversely affected to a level that will significantly affect the populations within the relevant SPAs, with overall areas affected likely to be very small compared to available alternative habitat, even in-combination with other projects. This is particularly likely to be the case when best practice and mitigation measures are considered for other projects (which are likely to be conditions of consent) which will minimise the risk of any in-combination discharge events and it can be reasonably concluded that no in-combination adverse effects are likely to occur (see **HRA paragraphs 6.3.143 et seq. and Section 6.4: Mitigation Measures**).

Stage 2 Matrix 3: Farne Islands SPA

Name of European site: Farne Islands SPA												
Distance to Hornsea Project One: 285 km												
European site features	**Adverse effect on integrity**											
	Habitat extent			Disturbance and displacement			Indirect effects			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D
Common tern – Breeding	**×a**			**×b**			**×c**			**×d, e, f**		

Evidence supporting conclusions:

a. In relation to the relevant conservation objectives, the extent and distribution of habitats within the Humber Estuary which support this qualifying feature of the Farne Islands SPA will not be significantly affected, with habitat loss/disturbance being minimal with the vast majority of habitat loss will be reversible within a short period. As a result, the numbers or distribution of qualifying species will not be affected by habitat loss. It can therefore be concluded that unmitigated, no conservation objectives are expected to be compromised by habitat loss, and consequently there will be no adverse effects on the integrity of the Farne Islands SPA as a result of temporary habitat loss during cable installation at the landfall site (**see HRA, para 6.3.5 *et seq.***). To provide further confidence, mitigation measures have been proposed to reduce habitat loss and increase recovery rates within the Salicornia and other annuals colonising mud and sand Annex I habitat and other Annex I habitats following cable installation (**see HRA, Section 6.4: Mitigation Measures**).

b. Very low peak counts were recorded at Horseshoe Point (within the Humber Estuary) in 2011-12, however it is acknowledged that the use of the intertidal area by terns between July and September may be sporadic, and often most frequent in congregations from dusk onwards, which may be missed by surveys. Although the local area may still on occasion act as a roost site in late summer, it appears that the species' presence would be brief and intermittent between April and September. Most impacts may therefore take place during the post-breeding season, after juveniles have fledged, and so impacts on productivity are unlikely. With evidence suggesting that low tide roosts occur at dusk and into the night, disturbance will be negligible as this is outside the hours of planned intertidal works in Phase 2. No adverse effects on common tern are therefore predicted as a result of Project One cable laying within the Humber Estuary and along the onshore export cable route (**see HRA paragraphs 6.3.100 *et seq.*)**.

c. In relation to the relevant conservation objectives, the extent, distribution and function of habitats within the Humber Estuary which support this qualifying species of the Farne Islands SPA will only be briefly affected in the local area, and will not result in the significant redistribution or reduction of the population. As such no conservation objectives are predicted to be compromised as a result of indirect disturbance (i.e. via impacts on prey species), and so the integrity of the Farne Islands SPA will be unaffected. Effects related to reductions in water quality are also not expected to lead to adverse effects on qualifying features with effects predicted to be short-term and areas affected are likely to be very small compared to available alternative habitat and prey items within these habitats. The potential for any discharges associated with construction activities will also be minimised through the implementation of good working and management practices as detailed in the CoCP (**see HRA paragraphs 6.3.104 *et seq.* and Section 6.4: Mitigation Measures**).

d. Habitat loss is predicted to occur as a result of the AMEP development plans, the Tetney to Saltfleet Tidal Flood Defence Scheme, the Phillips 66 Tetney Sea Line Replacement project and Hornsea Project Two, though the proportion of estuarine habitats affected is small in the context of the available habitats within the SAC/SPA (i.e. 0.74% of the total estuarine habitat). The majority of this is temporary habitat loss/disturbance, with the affected habitats expected to recovery quickly following disturbance. Any long term habitat loss (as a result of the AMEP development) will be mitigated through a habitat creation scheme. In-combination effects on the extent of habitats within the Humber Estuary supporting this feature of the Farne Islands SPA are therefore not predicted to result in an adverse effect on ornithological features of the SPA (**see HRA paragraphs 6.3.128 *et seq.***).

e. Due to the limited area of effect associated with Hornsea Project One and Project Two and accounting for the anticipated completion dates for the Tetney flood defence project (i.e. at least 2 years before the start of Project One and Two cable installation) and the Phillips 66 Tetney sea line replacement project (due to be completed by 2015) in advance of the start of Project One and Project Two cable installation, adverse effects are not expected for Project One in combination with other projects. A commitment for Project Oneto restrict cable installation activities to avoid the most sensitive period, will help to ensure that disturbance related adverse effects on populations of the Farne Islands SPA will not occur (**see HRA paragraphs 6.3.133 *et seq.* and Section 6.4: Mitigation Measures**).

f. In-combination disturbance to prey items is likely to be highly localised with the area affected predicted to be small, with other prey items available during the construction phase in similar habitats both at Horseshoe Point and in the wider area. In addition, effects are expected to be reversible with recovery time for prey species expected to be fast. As such, no in-combination effects on prey availability are likely to occur. In-combination effects of disturbance or water quality changes for prey species are most likely to occur when construction phases of projects are coincidental. Although the nature and extent of any discharges associated with construction activities are difficult to predict with any accuracy, it is unlikely that individuals from most species will be adversely affected to a level that will significantly affect the populations within the relevant SPAs, with overall areas affected likely to be very small compared to available alternative habitat, even in-combination with other projects. This is particularly likely to be the case when best practice and mitigation measures are considered for other projects (which are likely to be conditions of consent) which will minimise the risk of any in-combination discharge events and it can be reasonably concluded that no in-combination adverse effects are likely to occur (**see HRA paragraphs 6.3.143 *et seq.* and Section 6.4: Mitigation Measures**).

Stage 2 Matrix 4: Flamborough Head and Bempton Cliffs SPA & Ramsar

Name of European site: Flamborough Head and Bempton Cliffs SPA & Ramsar												
Distance to Hornsea Project One: 117 km												
European site features	**Adverse effect on integrity**											
Article 4.2 – Migratory (Breeding)	Collision						Displacement			In-combination		
	C	O	D				C	O	D	C	O	D
Kittiwake *Rissa tridactyla*		×a						×b			×c,d	
Article 4.2 – Assemblage	Collision						Displacement			In-combination		
	C	O	D				C	O	D	C	O	D
Puffin *Fratercula arctica*								×e			×f	
Razorbill *Alca torda*								×g			×h	
Guillemot *Uria aalge*								×i			×j	
Herring Gull *Larus argentatus*		×k									×l	
Gannet *Morus bassanus*		×m						×n			×o,p	
Kittiwake *Rissa tridactyla*		×a						×b			×c,d	
Fulmar *Fulmaris glacialis*								×q			×r	

Evidence supporting conclusions

a. Collision **–** Although the conservation objectives of the SPA are currently not being met, based on the relatively small numbers of kittiwakes predicted to be impacted (0.02% of the population), and the small contribution the predicted impacts will make on the overall decline, it is predicted that the potential annual impact on kittiwakes from Project One alone will not affect the integrity of the site. This conclusion is supported by population modelling of the SPA population (see paragraphs **5.4.58 – 5.4.69** of the HRA).

b. Displacement – Although the conservation objectives of the SPA are currently not being met, based on the relatively small numbers of kittiwakes predicted to be impacted (0.02% of the population, and an increase in baseline mortality of 0.09%), and the small contribution the predicted impacts will make on the overall decline, it is predicted that the potential annual impact on kittiwakes from Project One alone will not affect the integrity of the site. This conclusion is supported by population modelling of the SPA population (see paragraphs **5.4.58 – 5.4.69** of the HRA). (see paragraphs **5.4.70 – 5.4.77** of HRA).

c. Collision – The conservation objectives of the Flamborough Head and Bempton Cliffs SPA site are not currently being met. However, based on the results from the PBR modelling and supplementary PVA modelling, it is predicted that the potential impact on kittiwakes in-combination with Tier 1-3 offshore wind farms will not affect the integrity of the site (see paragraphs **5.5.67 – 5.5.90** of the HRA).

d. Displacement – The conservation objectives of the Flamborough Head and Bempton Cliffs SPA site are not currently being met. However, based on the results from the PBR modelling and supplementary PVA modelling, it is predicted that the potential impact on kittiwakes in-combination with Tier 1-3 offshore wind farms will not affect the integrity of the site (see paragraphs **5.5.91 – 5.5.101** of HRA).

e. Displacement – Over a year an estimated three adult puffins may be impacted as a result of mortality from displacement from the Flamborough Head and Bempton Cliffs SPA. The potential increase in mortality arising from displacement effects from Project One alone on puffins from Flamborough Head and Bempton Cliffs SPA is 0.3% of the total breeding SPA population, and an increase in baseline mortality by 6.1%. PBR modelling undertaken on puffins from Flamborough Head and Bempton Cliffs SPA indicates that the loss of more than 7.6 puffins per year would be unsustainable (**Annex J** of HRA). This is based on a precautionary recovery factor of 0.2, reserved for populations of high concern. The estimated loss of three puffins per year from the SPA is below the level at which an unsustainable population loss is predicted to occur. The level of impact predicted on puffins from the SPA due to displacement effects will therefore not affect the conservation status of the species, or the conservation objectives of the site and therefore there will not be an adverse effect on the integrity of the SPA (see paragraphs **5.4.142 – 5.4.161** of the HRA).

f. Displacement – only a small number of losses will be attributable to the Flamborough Head and Bempton Cliffs SPA population, with most coming from the larger populations further north. The level of impact predicted will not affect the conservation status of the species, nor the conservation objectives of the site and therefore there will be no adverse effect on the integrity of the SPA. This conclusion is supported by population modelling of the SPA population (see paragraphs **5.5.131 – 5.5.139** of the HRA).

g. Displacement – A PBR model has been created to estimate the level of removal each year of adult razorbills from the Flamborough Head and Bempton Cliffs SPA population before it becomes unsustainable (**Annex J** of HRA). Using the most recent population data available, and a recovery factor of 0.5 (considered precautionary since the population appears to be stable at least), then a loss of 607 birds would be required before this happens. The predicted mortality rate of 79 adult razorbills due to displacement from Project One would therefore fall well below this threshold, and so it is clear that there is no risk to the population as a result of displacement from Project One. As such, the level of impact predicted will not affect the conservation status of the species, or the conservation objectives of the site, and therefore there will be no adverse effect on the integrity of the SPA (see paragraphs **5.4.115 – 5.4.141** of the HRA).

h. Displacement – The level of impact predicted will not affect the conservation status of the species, nor the conservation objectives of the site and therefore there will be no adverse effect on the integrity of the SPA, due to Project One either alone or in-combination. This conclusion is supported by population modelling of the SPA population (see paragraphs **5.5.119 – 5.5.130** of the HRA).

i. Displacement – The potential increase in mortality arising from displacement effects from Project One alone on guillemots from Flamborough Head and Bempton Cliffs SPA is 0.15% of the total breeding population, and an increase in baseline mortality by 1.3%. A PBR model has been created to estimate the level of removal each year of adult guillemots from the Flamborough Head and Bempton Cliffs SPA population before it becomes unsustainable (Annex J). Using the most recent population data available, and a recovery factor of 0.4 (considered precautionary since the population appears to be stable at least), then a loss of 1,293 birds would be required before this happens. The predicted mortality rate of 127 adult guillemots due to displacement from Project One would therefore fall well below this threshold, and so it is clear that there is no risk to the population as a result of displacement from Project One. As such, the level of impact predicted will not affect the conservation status of the species, or the conservation objectives of the site, and therefore there will be no adverse effect on the integrity of the SPA (see paragraphs **5.4.90 – 5.4.114** of the HRA).

j. Displacement – The level of impact predicted will not affect the conservation status of the species, nor the conservation objectives of the site and therefore there will be no adverse effect on the integrity of the SPA from Project One, either alone or in-combination. This conclusion is supported by population modelling of the SPA population (see paragraphs **5.5.103 – 5.5.118** of the HRA).

k. Collision – The Flamborough Head and Bempton Cliffs SPA is beyond the maximum foraging range of this species during the breeding period and therefore the likelihood is that neither of the estimated two collisions of breeding adults per year will be from this SPA. During the non-breeding period an estimated seven adult herring gulls possibly from SPAs may be impacted. Based on the relative sizes of the SPA breeding populations, no herring gulls from the Flamborough Head and Bempton Cliffs SPA are predicted to collide with Project One. Consequently, no adult herring gulls from the Flamborough Head and Bempton Cliffs SPA are predicted to be impacted by Project One. It is predicted that the potential annual impact on herring gulls from Project One alone will not affect the integrity of the site (see paragraphs **5.4.79 – 5.4.89** of the HRA).

l. Collision – No impacts on herring gulls from the Flamborough Head and Bempton Cliffs SPA are predicted likely to occur due to Project One and therefore there will be no in-combination impacts (see paragraph **5.5.102 of HRA**).

m. Collision – The population of gannet at the Flamborough Head and Bempton Cliffs SPA is increasing and the potential increase in mortality arising from collision impacts from Project One alone is below that predicted to cause a decline in the gannet breeding population. Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA (see paragraphs **5.4.34 – 5.4.41** of HRA).

n. Displacement – Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA (see paragraphs **5.4.42 – 5.4.52** of the HRA).

o. Collision – The population of gannet at the Flamborough Head and Bempton Cliffs SPA is increasing and the potential increase in mortality arising from collision impacts from Project One alone and in-combination on gannets from Flamborough Head and Bempton Cliffs SPA is below that predicted to cause a decline in the gannet breeding population. Based on site specific data and results from population modelling the level of impact predicted will not adversely affect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA (see paragraphs **5.5.22 – 5.5.51** of the HRA).

p. Displacement – The population of gannet at the Flamborough Head and Bempton Cliffs SPA is increasing and the potential increase in mortality arising from displacement impacts from Subzone 1 alone and in-combination with other projects (i.e. including those with no estimates) on gannets from Flamborough Head and Bempton Cliffs SPA is likely to be relatively small compared to the total breeding population. Based on site specific data and results from population modelling the level of impact predicted will not adversely effect the conservation status of the species, nor the conservation objectives of the site and therefore, it is predicted, that there will be no effect on the integrity of the SPA (see paragraphs **5.5.52 – 5.5.66** of the HRA).

q. Displacement – The total breeding population of fulmar at Flamborough Head and Bempton Cliffs SPA is 1,447 pairs (2008 - 2011 count (JNCC & NE, 2013)). The potential loss of four adult fulmars per year is 0.1% of the breeding population. The level of impact predicted will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA (see paragraphs **5.4.6 – 5.4.25** of the HRA).

r. Displacement – Tier 1 projects: No quantitative assessments of displacement to fulmar were carried out for any other Tier 1 projects, but where displacement was considered to be a potential impact for the species, the level of significance was determined to be negligible or minor adverse. Despite relatively high fulmar peak counts for Project One in comparison with other sites (e.g. a peak of 129 individuals reported at London Array, one of the larger Tier 1 sites, compared to 948 for Project One), the predicted mortality rates from displacement were low (up to four adult deaths during the breeding season and one during the winter). This indicates that for other smaller Tier 1 projects, mortality is likely to be even lower. Tier 2: Again, only a qualitative assessment was possible for Tier 2 projects, and the levels of significance predicted were also negligible or minor adverse, with the higher value likely to be more of a reflection of the species' conservation status rather than vulnerability to displacement. Tier 3: Mortality rates calculated from preliminary population estimates from Project Two, predicted five deaths during the breeding season, and one death during winter. Assuming around two thirds of birds are adults, then when combined with Project One results, a total mortality of seven adult birds during the breeding season would represent 0.2% of the Flamborough Head and Bempton Cliffs SPA population. Although it is acknowledged that a quantitative assessment has not been possible for the large majority of projects, the predicted levels of significance in each Enivronmental Statement chapter suggest that displacement effects are not a significant impact for fulmar. The level of impact that is therefore likely from all Tier 1-3 projects combined will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA (see paragraphs **5.5.16 – 5.5.21** of the HRA).

Stage 2 Matrix 5: Forth Islands SPA

Name of European site: Forth Islands SPA												
Distance to Hornsea Project One: 363 km												
European site features	**Adverse effect on integrity**											
Article 4.2 – Migratory Species	Collision						Displacement			In-combination		
	C	O	D				C	O	D	C	O	D
Gannet *Morus bassanus*		**×a**						**×b**			**×a,b**	
Article 4.2 – Assemblage	Collision						Displacement			In-combination		
	C	O	D				C	O	D	C	O	D
Gannet *Morus bassanus*		**×a**						**×b**			**×a,b**	

Evidence supporting conclusions

a. Collision – The potential loss of 10 gannets per year from a breeding population of 110,974 individuals is 0.009% of the population, and an increase in baseline mortality by 0.1%. Population Viability Analysis undertaken on gannets indicates that the breeding population within the Forth Islands SPA may be able to sustain an increase in annual mortality of up to 2,000 birds per year without a high risk of a population decline (**WWT, 2011**). The population is in favourable conservation status (**SNH, 2012**) and therefore the predicted small increase in adult mortality is not expected to cause an adverse effect on the integrity of the site population or affect the conservation objectives of the site due to Project One alone or in combination with other plans and projects (see paragraphs **5.4.116 – 5.4.173** and paragraphs **5.5.141 – 5.5.149** of HRA).

b. Displacement – The estimated loss of one adult gannet per year from displacement effects is less than 0.001% of the SPA breeding population. The level of impact estimated will not affect the conservation status of the species and/or the conservation objectives of the site and therefore there will be no effect on the integrity of the SPA due to Project One alone or in combination with other plans and projects (see paragraphs **5.4.174 – 5.4.178** and paragraphs **5.5.150 – 5.5.158** of HRA).

Stage 2 Matrix 6: Humber Estuary SAC

Name of European site: Humber Estuary SAC												
Distance to Hornsea Project One: 0 km (102 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex I Habitats	Habitat Extent			Water quality						In-combination effects		
	C	O	D	C	O	D				C	O	D
Estuaries	×a			×a						×a		
Mudflats and sandflats not covered by seawater at low tide	×b			×b						×b		
Salicornia and other annuals colonizing mud and sand	×c			×c						×c		
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	×d			×d						×d		
Embryonic shifting dunes	×e			×e						×e		
Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')	×e			×e						×e		
Annex II species (fish)	Disruption to migration									In-combination effects		
	C	C	D							C	O	D
Sea lamprey	×f	×f								×f	×f	
River lamprey	×f	×f								×f	×f	
Annex II species (marine mammals)	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	×g	×g	×g	×g	×g	×g	×g	×g	×g	×g	×g	×g

Evidence supporting conclusions:

a. No adverse effect on the integrity of the Humber Estuary SAC as a result of cable installation, either alone or in-combination with other plans and projects. A small proportion of the extent of this habitat within the Humber Estuary SAC (0.47%) is predicted to be temporarily affected (i.e., temporary habitat loss/disturbance) by cable installation. All habitats affected are predicted to recover quickly following disturbance, with no long term effects anticipated. Effects on water quality and the hydrodynamic regime of the estuary are also not expected to be adversely affected, with any potential effects (e.g. increased suspended sediment concentrations) likely to be limited both spatially and temporally, with no long term effects on this feature. Similarly, potential water quality effects as a result of fuel spillages would be minimised through the use of good working practices (i.e. the implementation of a Code of Construction Practices, or CoCP). In-combination effects are also not predicted to result in an adverse effect on this habitat feature, with the majority of the in-combination habitat loss being short lived (i.e., temporary habitat loss) and any long term habitat loss (i.e. as a result of the AMEP development) mitigated by the creation of intertidal habitats. No adverse effects on this feature are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects (see **HRA, paragraph 6.2.1 *et seq.* and 6.2.28 *et seq.***).

b. No adverse effect on the integrity of the Humber Estuary SAC as a result of cable installation, either alone or in-combination with other plans and projects. A small proportion of the extent of this habitat within the Humber Estuary SAC (1.68%) is predicted to be temporarily affected by installation of Project One export cables. Recovery of this habitat and its associated communities is expected to occur quickly following cable burial, with no long term effects anticipated. Potential water quality effects as a result of fuel spillages would be minimised through the use of good working practices (i.e. the implementation of a Code of Construction Practices). In-combination effects are not predicted to result in an adverse effect on this habitat feature, with the majority of the in-combination habitat loss being short lived (i.e. temporary habitat loss) and any long term habitat loss (i.e. as a result of the AMEP development) mitigated by the creation of intertidal habitats. No adverse effects on this feature are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects (see **HRA, paragraph 6.2.1 *et seq.*, 6.2.12 *et seq.* and 6.2.28 *et seq.***).

c. No adverse effect on the integrity of the Humber Estuary SAC as a result of cable installation, either alone or in-combination with other plans and projects. Although a relatively large proportion of the extent of this habitat within the Humber Estuary SAC is predicted to be affected by cable installation from Project One (i.e., approximately 7.8%), recovery of this habitat and its component species is expected to be fast, with full recovery expected within 1 year. It is also likely that the baseline used to estimate the area of this habitat within the SAC is an underestimate. Measures will be employed to reduce the area of this habitat affected (i.e. working within the convergence corridor only within this habitat) and also increase the recovery rate of this habitat (i.e. by smoothing of disturbed sediment to encourage seed capture). Pre and post construction monitoring will also be undertaken to assess the success of the mitigation measures employed. Potential for water quality effects as a result of fuel spillages would be minimised through the use of good working practices (i.e. CoCP). In-combination effects on this habitat are expected as a result of cable installation for Hornsea Project Two. This will result in further loss of this habitat, though the area affected by repeat disturbance from Project One and Project Two is likely to be limited to access routes, and recovery rates following cable installation would be expected to be rapid. Although an area of this habitat may be affected in the short term, due to the expected high recovery rates and the measures employed to encourage recolonisation, no adverse effects on this feature are predicted as a result of Hornsea Project One either alone or in-combination with other projects (see **HRA, paragraph 6.2.1 *et seq.,* 6.2.15 *et seq.* and 6.2.28 *et seq.***).

d. No adverse effect on the integrity of the Humber Estuary SAC as a result of cable installation, either alone or in-combination with other plans and projects. Based on the area of saltmarsh habitat mapped at Horseshoe Point in 2011 and assuming all cable laying operations will occur within the convergence route corridor, cable laying during Project One will not result in any loss of this Annex I habitat feature. Indirect effects (e.g. sediment deposition or fuel spillages) on saltmarsh habitats are also not expected to occur as a result of cable installation activities as plume modelling showed that sedimentation would not be expected in these habitats and the potential for fuel spillages would be minimised through the use of good working practices (i.e. CoCP). Adverse effects in combination with other project are also not predicted as only a small proportion of this habitat would be affected (i.e. loss of <0.001 of this habitat within the SAC), with none of this loss coming from Project One or Project Two (see **HRA, paragraph 6.2.1 *et seq.,* 6.2.15 *et seq.* and 6.2.28 *et seq.***).

e. No adverse effect on the integrity of the Humber Estuary SAC as a result of cable installation, either alone or in-combination with other plans and projects. A small proportion of the extent of these habitats within the Humber Estuary SAC (0.03%) is predicted to be affected by access arrangements to the intertidal. In-combination effects are predicted to increase this proportion slightly, though the area affected is likely to be small and all habitats will be reinstated following completion of development works (i.e. for Project One and other projects considered in-combination, including future access arrangements at Horseshoe Point). Measures to reduce ground pressures in the vicinity of these habitats are to be considered prior to cable installation in order to aid natural recovery of these habitats. Fencing off of these habitats to prevent further disturbance will also aid recovery and the speed and success of natural regeneration will be also be monitored post cable burial operations. Potential for fuel spillages would be minimised through the use of good working practices (i.e. CoCP). No adverse effects on this feature are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects (see **HRA, paragraph 6.2.23 *et seq.* and 6.2.28 *et seq.***).

f. No adverse effect on the integrity of the Humber Estuary SAC as a result of cable installation, either alone or in-combination with other plans and projects. Installation of export cables for Project One is not predicted to create artificial barriers to lamprey species (i.e. through sediment plume effects during construction or EMF during operation) on migration to spawning grounds in the rivers flowing to the Humber Estuary, including the River Derwent SAC. In-combination effects on migration are also not expected from other projects in the Humber Estuary (e.g. throught habitat loss, plume effects or underwater noise disturbance). No adverse effects on this feature are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects (see **HRA, paragraph 6.2.42 *et seq.* and 6.2.57 *et seq.***).

g. Grey seal: No adverse effect on the integrity of the Humber Estuary SAC and Ramsar site as a result of cable installation or risk of collision between cable laying vessels and grey seal, either alone or in-combination with other plans and projects (see **HRA, paragraph 6.2.52 *et seq.* and 6.2.60**). Installation of export cables for Project One is not predicted to affect accessibility of the Donna Nook breeding site to adult seals in the Humber Estuary SAC and Ramsar site. The offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance) are also not predicted to affect grey seal conservation objectives for the Humber Estuary SAC and Ramsar site. The zone of noise disturbance for grey seal does not extend as far as the Donna Nook breeding site, which lies over 100 km from Subzone 1, and and accessibility for adult seals to this breeding site is not predicted to be affected. Furthermore, due to grey seal exploiting a range of prey resources and ranging widely to forage, effects will be localised and unlikely to result in a significant effect on prey species. There may also be a potential for the operational offshore wind farm to provide benefits to fish and shellfish may also indirectly benefit grey seal populations. Given the large extent of available alternative foraging habitat outside of areas of disturbance, the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered, and the small numbers of the Humber Estuary SAC grey seal population affected; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for grey seal at a population level or as a feature of the Humber Estuary SAC. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.21 to 7.2.25 and 7.4.1**).

Stage 2 Matrix 7: River Derwent SAC

Name of European site: River Derwent SAC									
Distance to Project One: 45 km (160 km from Subzone 1)									
European site features	**Adverse effect on integrity**								
Annex II species (fish)	Disruption to migration						In-combination effects		
	C	O	D			D	C	O	D
Sea lamprey *Petromyzon marinus*	**×a**	**×a**					**×a**	**×a**	
River lamprey *Lampetra fluviatilis*	**×a**	**×a**					**×a**	**×a**	

Evidence supporting conclusions:

a. No adverse effect on the integrity of the River Derwent SAC as a result of cable installation, either alone or in-combination with other plans and projects. Installation of export cables for Project One is not predicted to create artificial barriers to lamprey species (i.e. through sediment plume effects during construction or EMF during operation) on migration to spawning grounds in the rivers flowing to the Humber Estuary, including the River Derwent SAC. In-combination effects on migration are also not expected from other projects in the Humber Estuary (e.g. throught habitat loss, plume effects or underwater noise disturbance). No adverse effects on this feature are therefore predicted as a result of Hornsea Project One either alone or in-combination with other projects (see **HRA, paragraph 6.2.42 *et seq* and 6.2.57 *et seq.***).

Stage 2 Matrix 8: Berwickshire and North Northumberland Coast SAC

Name of European site: Berwickshire and North Northumberland Coast SAC												
Distance to Hornsea Project One: 208 km (258 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Grey seal: No adverse effect on the integrity of the Berwickshire and North Northumberland Coast SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. The Berwickshire and North Northumberland Coast SAC is situated 208 km from Project One and significantly beyond the zone of potential direct impact. The distance of Project One from the SAC and results of grey seal tagging studies indicate a very low risk of any grey seal from this SAC occurring within the Subzone 1 or the zone of potential impact as identified by the underwater noise modelling. Furthermore, due to grey seal exploiting a range of prey resources and ranging widely to forage, effects will be localised and unlikely to result in a significant effect on prey species. Potential beneficial effects of the operational offshore wind farm to fish and shellfish may also indirectly benefit grey seal populations. Given the distance of the SAC to Project One, the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered, the large extent of available alternative foraging habitat outside of areas of disturbance and the small numbers of grey seal affected; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for grey seal at a population level or as a feature of the Berwickshire and North Northumberland Coast SAC. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.21 to 7.2.25 and 7.4.3**).

Stage 2 Matrix 9: The Wash and North Norfolk Coast SAC

Name of European site: The Wash and North Norfolk Coast SAC												
Distance to Hornsea Project One: 40 km (94 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a

Evidence supporting conclusions

a. Harbour seal: No adverse effect on the integrity of The Wash and North Norfolk Coast SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. The SAC lies 94 km from Subzone 1 and 40 km from Project One and significantly beyond the zone of potential direct impact identified by the underwater noise modelling. Due to harbour seal exploiting a range of prey resources able to range up to 120 km from haul-outs, effects will be localised and unlikely to result in a significant effect on prey species. Potential beneficial effects of the operational offshore wind farm to fish and shellfish may also indirectly benefit harbour seal populations. Given the distance of the SAC to Project One, the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered, the large extent of available alternative foraging habitat and the small numbers of harbour seal affected; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for harbour seal at a population level or as a feature of The Wash and North Norfolk Coast SAC. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.26 to 7.2.29 and 7.4.4**).

Stage 2 Matrix 10: SBZ 1 / ZPS 1 (Belgium) SCI

Name of European site: SBZ 1 / ZPS 1 SCI												
Distance to Hornsea Project One: 276 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the SBZ 1 / ZPS 1 SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the SBZ 1 / ZPS 1 SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 11: SBZ 2 / ZPS 2 (Belgium) SCI

Name of European site: SBZ 2 / ZPS 2 SCI												
Distance to Hornsea Project One: 276 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the SBZ 2 / ZPS 2 SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the SBZ 2 / ZPS 2 SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 12: SBZ 3 / ZPS 3 (Belgium) SCI

Name of European site: SBZ 3 / ZPS 3 SCI												
Distance to Hornsea Project One: 276 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the SBZ 3 / ZPS 3 SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192** Error! Reference source not found.***et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the SBZ 3 / ZPS 3 SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 13: Vlakte van de Raan (Belgium) pSCI

Name of European site: Vlakte van de Raan pSCI												
Distance to Hornsea Project One: 271 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Vlakte van de Raan pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Vlakte van de Raan pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 14: NTP S-H Wattenmeer und angrenzende Küstengebiete SCI (Germany)

Name of European site: NTP S-H Wattenmeer und angrenzende Küstengebiete SCI

Distance to Hornsea Project One: 386 km

European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the NTP S-H Wattenmeer und angrenzende Küstengebiete SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192** ***et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the NTP S-H Wattenmeer und angrenzende Küstengebiete SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 15: Doggerbank SCI (Germany)

Name of European site: German Dogger bank (Doggerbank) SCI												
Distance to Hornsea Project One: 209 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the German Dogger bank (Doggerbank) SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the German Dogger bank (Doggerbank) SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 16: Östliche Deutsche Bucht SCI (Germany)

Name of European site: Östliche Deutsche Bucht SCI												
Distance to Hornsea Project One: 347 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Östliche Deutsche Bucht SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Östliche Deutsche Bucht SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 17: Sylter Außenriff SCI (Germany)

Name of European site: Sylter Außenriff SCI												
Distance to Hornsea Project One: 293 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Sylter Außenriff SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Sylter Außenriff SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 18: Steingrund SCI (Germany)

Name of European site: Steingrund SCI												
Distance to Hornsea Project One: 378 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Steingrund SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Steingrund SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 19: Helgoland mit Helgoländer Felssockel SCI (Germany)

Name of European site: Helgoland mit Helgoländer Felssockel SCI												
Distance to Hornsea Project One: 367 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Helgoland mit Helgoländer Felssockel SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Helgoland mit Helgoländer Felssockel SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 20: Hamburgisches Wattenmeer SCI (Germany)

Name of European site: Hamburgisches Wattenmeer SCI												
Distance to Hornsea Project One: 393 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Hamburgisches Wattenmeer SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Hamburgisches Wattenmeer SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 21: Unterelbe SCI (Germany)

Name of European site: Unterelbe SCI												
Distance to Hornsea Project One: 424 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Unterelbe SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Unterelbe SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 22: Borkum-Riffgrund SAC (Germany)

Name of European site: Borkum-Riffgrund SAC												
Distance to Hornsea Project One: 254 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Borkum-Riffgrund SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Borkum-Riffgrund SAC. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 23: Nationalpark Niedersächsisches Wattenmeer SCI (Germany)

Name of European site: Nationalpark Niedersächsisches Wattenmeer SCI												
Distance to Hornsea Project One: 287 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Nationalpark Niedersächsisches Wattenmeer SCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Nationalpark Niedersächsisches Wattenmeer SCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 24: Gule Rev SAC (Denmark)

Name of European site: Gule Rev SAC												
Distance to Hornsea Project One: 517 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Gule Rev SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Gule Rev SAC. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 25: Sydlige Nordsø SAC (Denmark)

Name of European site: Sydlige Nordsø SAC												
Distance to Hornsea Project One: 347 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Sydlige Nordsø SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Sydlige Nordsø SAC. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 1 Matrix 26: Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI (France)

Name of European site: Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI												
Distance to Hornsea Project One: 299 km (325 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Falaises du Cran aux oeufs et du cap gris-nez, dunes du chatelet, marais de tardinghen et dunes de wissant pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 27: Bancs des Flandres pSCI (France)

Name of European site: Bancs des Flandres pSCI												
Distance to Hornsea Project One: 263 km (279 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Bancs des Flandres pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Bancs des Flandres pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 28: Recifs Gris-nez Blanc-nez pSCI (France)

Name of European site: Recifs Gris-nez Blanc-nez pSCI												
Distance to Hornsea Project One: 288 km (315 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Recifs Gris-nez Blanc-nez pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Recifs Gris-nez Blanc-nez pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 29: Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI (France)

Name of European site: Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI

Distance to Hornsea Project One: 288 km (320 km from Subzone 1)

European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Ridens et dunes hydrauliques du detroit du pas-de-calais pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 30: Baie de canche et couloir des trois estuaires pSCI (France)

Name of European site: Baie de canche et couloir des trois estuaires pSCI												
Distance to Hornsea Project One: 331 km (361 km from Subzone 1)												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Baie de canche et couloir des trois estuaires pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Baie de canche et couloir des trois estuaires pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 31: Doggersbank (Dutch Dogger Bank) pSCI (Netherlands)

Name of European site: Doggersbank (Dutch Dogger Bank) pSCI

Distance to Hornsea Project One: 64 km

European site features	Adverse effect on integrity											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Harbour seal	×b	×b	×b	×b	×b	×b	×b	×b	×b	×b	×b	×b
Harbour porpoise	×c	×c	×c	×c	×c	×c	×c	×c	×c	×c	×c	×c

Evidence supporting conclusions

a. Grey seal: No adverse effect on the integrity of the Dutch Dogger Bank pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Grey seal is a feature of the Dutch Dogger Bank pSCI and animals from these sites may occur within the Project One offshore wind farm areas, either en-route or actively using the sites for foraging and other activities. However, tagging studies of grey seals in the Netherlands indicate that there is relatively low usage of the area compared to nearshore Dutch waters (Jak *et al.,* 2009). Given the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the large extent of available alternative foraging habitat outside areas of disturbance; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for grey seal at a population level or consequently as a feature of the Dutch Dogger Bank pSCI. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.21 to 7.2.25 and 7.4.5**).

b. Harbour seal: No adverse effect on the integrity of the Dutch Dogger Bank pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Harbour seal is a qualifying feature of the Dutch Dogger Bank pSCI and the results from tagging studies undertaken on harbour seals in the Netherlands indicate that harbour seals generally forage within coastal waters up to some tens of kilometres away from the haulout sites (Brasseur, Reijnders and Meesters, 2006). Therefore, whilst it is possible that harbour seal from this site may occur within Project One, either on-route or actively using the site for foraging and other activities, due to the highly localised nature of the predicted impacts, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the large extent of available alternative foraging habitat outside areas of disturbance; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for harbour seal at a population level or consequently as a feature of the Dutch Dogger Bank pSCI. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.26 to 7.2.29 and 7.4.5**).

c. Harbour porpoise: No adverse effect on the integrity of the Doggersbank (Dutch Dogger Bank) pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Doggersbank (Dutch Dogger Bank) pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 32: Klaverbank pSCI (Netherlands)

Name of European site: Klaverbank pSCI												
Distance to Hornsea Project One: 44 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**
Harbour seal	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**	**×b**
Harbour porpoise	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**	**×c**

Evidence supporting conclusions

a. Grey seal: No adverse effect on the integrity of the Dutch Dogger Bank pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Grey seal is a feature of the Dutch Dogger Bank pSCI and animals from these sites may occur within the Project One offshore wind farm areas, either en-route or actively using the sites for foraging and other activities. However, tagging studies of grey seals in the Netherlands indicate that there is relatively low usage of the area compared to nearshore Dutch waters (Jak *et al.,* 2009). Given the highly localised nature of the predicted impacts and intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the large extent of available alternative foraging habitat outside areas of disturbance; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for grey seal at a population level or consequently as a feature of the Dutch Dogger Bank pSCI. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.21 to 7.2.25 and 7.4.5**).

b. Harbour seal: No adverse effect on the integrity of the Dutch Dogger Bank pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Harbour seal is a qualifying feature of the Dutch Dogger Bank pSCI and the results from tagging studies undertaken on harbour seals in the Netherlands indicate that harbour seals generally forage within coastal waters up to some tens of kilometres away from the haulout sites (Brasseur, Reijnders and Meesters, 2006). Therefore, whilst it is possible that harbour seal from this site may occur within Project One, either on-route or actively using the site for foraging and other activities, due to the highly localised nature of the predicted impacts, the intermittent vessel activity over the construction/operation/decommissioning phases for all projects considered and the large extent of available alternative foraging habitat outside areas of disturbance; it is therefore concluded that there will be no adverse effects from Project One, alone or in-combination with other plans and projects, for harbour seal at a population level or consequently as a feature of the Dutch Dogger Bank pSCI. Although no adverse effect on conservation objectives have been concluded, due to the uncertainties highlighted regarding ducted propellers, the Developer commits to following best practice in line with latest JNCC guidance (JNCC, 2012), the detail of which will be established through consultation on the MMMP with statutory advisors (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.26 to 7.2.29 and 7.4.5**).

c. Harbour porpoise: No adverse effect on the integrity of the Klaverbank pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Klaverbank pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 33: Vlakte van de Raan SAC (Netherlands)

Name of European site: Vlakte van de Raan SAC												
Distance to Hornsea Project One: 259 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Vlakte van de Raan SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Vlakte van de Raan SAC. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 34: Noordzeekustzone SAC (Netherlands)

Name of European site: Noordzeekustzone SAC												
Distance to Hornsea Project One: 179 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Noordzeekustzone SAC as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Noordzeekustzone SAC. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

Stage 2 Matrix 35: Noordzeekustzone II pSCI (Netherlands)

Name of European site: Noordzeekustzone II pSCI												
Distance to Hornsea Project One: 180 km												
European site features	**Adverse effect on integrity**											
Annex II Species	Injury/Disturbance			Collision risk			Change in prey species distribution / abundance			In-combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**	**×a**

Evidence supporting conclusions

a. Harbour porpoise: No adverse effect on the integrity of the Noordzeekustzone II pSCI as a result of the offshore components of Project One, (i.e., piling activities, vessel noise, increased risk of vessel collision and indirect effects causing changes in prey species distribution and/or abundance), either alone or in-combination with other plans and projects. Due to the distance to Subzone 1 from this site, the local spatial extent and intermittent nature of the impacts, the highly mobile and wide ranging nature of harbour porpoise coupled with their ability to exploit a wide range of prey species, and empirical evidence indicating movement of animals back to the area of impact following cessation of the activity (see **HRA Report paragraph 5.2.192 *et seq.***), therefore no adverse effects are predicted on harbour porpoise at a southern North Sea population level or consequently as a feature of the Noordzeekustzone II pSCI. Potential impacts associated with Project One construction piling will be further managed through the use of soft start procedures and an approved MMMP (see **HRA Report, Section 5.2, 5.3 and 5.4; and paragraphs 7.2.29 to 7.2.32, 7.4.7**).

References

Allen, J. Boyes, S. Burdon, D. Cutts, N. Hawthorne, E. Hemingway, K. Jarvis, S. Jennings, K. Mander, L. Murby, P. Proctor, N. Thomson, S. and Waters, R. (2003) *The Humber Estuary: A comprehensive review of its nature conservation interest.* English Nature Report Number 547, Peterborough.

APEM (2012) *Migration modelling and collision risk modelling in relation to Hornsea Subzone 1 Development*.

APEM (2013) *Seabird Migration Modelling and Collision Risk Modelling in Relation to Hornsea Subzone 1 Development*. Draft Final Report, May 2013. APEM Ref: 412552.

Barton, C. Pollock, C & Harding, N. (2010) *Arklow Bank Seabird and Marine Monitoring Programme*. Year 9 Final report. A report to Airtricity.

BLI (Birdlife International) (2013). Lesser black-backed gull. http://www.birdlife.org/datazone/userfiles/file/Species/BirdsInEuropeII/BiE2004Sp3231.pdf Accessed April 2013.

BOW (2007) *Results from Walney Island Bird Survey, Autumn 2007*. Appendix to Barrow Offshore Wind Farm – First post construction monitoring report. BOWind, NIRAS A/S, Aarhus, Denmark.

Brasseur, S. Reijnders, E. Meesters, E. (2006) *Baseline data on harbour seals Phoca vitulina, in relation to the intended wind farm site OWEZ, in the Netherlands*. Report No. OWEZ R 252 20061020. Wageningen IMARES Institute for Marine Resources & Ecosystem Studies. Report commissioned by NoordzeeWind.

Brasseur, S, Petel, T, P. Meesters, G.A.E. Dijkman, E. & Reijnders, P. (2010) *Grey Seals*. IMARES. LNV. Noordzewind.

Catley, G. (2000) *Humber Estuary wetland bird survey*. Twelve months of high and low tide counts September 1998 to August 1999. Peterborough: English Nature Research Reports, No. 339.

Deerenberg, C. Teal, L.R. Beare, D. van der Wal, J.T. (2010) *Pre-assessment of the impact of fisheries on the conservation objectives of Dutch marine protected areas*. FIMPAS project. Report number C071/10.

Goss-Custard, J. D. & Verboven, N. (1993). *Disturbance and feeding shorebirds on the Exe estuary*. Wader Study Group Bulletin, 68, 59–66.

M. P. Harris (1962) Recoveries of ringed Great Black- backed Gulls, *Bird Study*, 9:4, 192-197

LAL (2006). *London Array Environmental Statement*. London Array Limited.

Maitland, P.S. (2003) *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Mitchell, C.R. & Hearn, R.D. (2004) *Pink-footed Goose Anser brachyrhynchus (Greenland/Iceland population) In Britain 1960/61 – 1999/2000.* Waterbird Review Series, The Wildfowl & Wetlands trust/Joint Nature Conservation Committee, Slimbridge.

Npower (2006) *Gwynt y Mor Offshore Wind Farm Environmental Statement*.

Petersen, I.K. Christensen, T.K. Kahlert, J. Deshom, M. & Fox, A.D. (2006) *Final results of Bird Studies at the offshore wind farms at Nysted and Horns rev, Denmark.* NERI Report. Commissioned by DONG Energy and Vattenfall A/S.

Petersen, I.K. (2005): Bird numbers and distributions in the Horns Rev offshore wind farm area. Annual status report 2004. - NERI Report, Commisioned by Elsam Engineering A/. 34 pp.

SCOS (2011) *SCOS Main Advice: Scientific Advice on Matters Related to the Management of Seal Populations:* 2011.

SMart Wind (2013*) Habitats Regulations Assessment Report, Hornsea Offshore Wind Farm, Project One.*

Smit, C.J. & Visser, G.J.M. (1993) *Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area*. Wader Study Group Bulletin, 68, 6-19.

Sea Mammal Research Unit (SMRU) (2011) *Summary of seal count and telemetry data from the Humber area*. Report to SMart Wind. 14th October 2011.

SMRU (2012) *Advice on Populations of cetaceans that might be involved in significant interactions with offshore energy development*. Marine Scotland WORK PACKAGE C2. Preliminary Answers.

Sparling, C. Russell, D. Lane, E. Grellier, K. Lonergan, M. Matthiopoulous, J. and Thompson, D. (2011) *Baseline seal information for the FTOWDG area. SMRU report to Forth Tay Offshore Wind Farm Developers Group.*

Stillman, R.A. West, A.D. Goss-Custard, J. McGrorty, S. Frost, N. Morrisey, D.J. Kenny, A.J. & Drewitt, A.L. (2005) *Predicting site quality for shorebird communities: a case study on the Humber estuary, UK*. Mar Ecol Prog Ser 305: 203-217.

Thaxter C.B., Lascelles B., Sugar K., Cook A.S.C.P., Roos S., Bolton M., Langton R.H.W. and Burton N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas.

Thomas, C. (2011) *Yorkshire Bird Report 2009*. Yorkshire Naturalists Union.

Thompson, D., Bexton, S., Brownlow, A., Wood, D., Patterson, T., Pye, K., Lonergan, M. and Milne, R. (2010) Report on recent seal mortalities in UK waters caused by extensive lacerations. SMRU Report. Available from: http://www.smru.st-and.ac.uk/documents/366.pdf.

WWT (2007a) *Movements of East Anglian wintering Pink-footed Geese*. Report to Natural England, March 2007.

Zucco, C. Wende, W. Merck, T. Kochling, I. Koppel, J. (2006) *Ecological research on Offshore Wind Farms: International Exchange of Experiences. Part B: Literature Review of Ecological Impacts.* BfN-Skripten 186.