REPORT

Boston Alternative Energy Facility – Environmental Statement

Appendix 17.1 Habitats Regulations Assessment (Tracked)

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A17 Habitats Regulations Assessment

A17.1 Introduction

A17.1.1 The Conservation of Habitats and Species Regulations 2017 (as amended) ('the 2017 Regulations') transposed the land and marine aspects of the Habitats Directive (Council Directive 92/43/EEC) and certain elements of the Wild Birds Directive (Directive 2009/147/EC) (known as the Nature Directives).

A17.1.2 The 2017 Regulations are amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 ('the 2019 Regulations'), which came into force on 31 December 2020. The 2019 Regulations make relatively minor changes to the 2017 Regulations, mostly involving transferring functions from the European Commission to the appropriate authorities in England and Wales.

A17.1.3 One of the changes introduced by the 2019 Regulations is that Special Areas of Conservation (SAC) and Special Protection Areas (SPA) in the UK no longer form part of the EU's Natura 2000 ecological network. Under the 2019 Regulations, a 'national site network' on land and at sea has been created which includes existing SACs and SPAs and new SACs and SPAs designated under the 2019 Regulations. Any references to Natura 2000 in the 2017 Regulations and in guidance now refers to the new national site network.

A17.1.4 Ramsar sites do not form part of the national site network but remain protected in the same way as SACs and SPAs. For the purpose of this Habitats Regulations Assessment (HRA), component sites of the national site network (including Ramsar sites) are referred to in general as 'protected sites'.

A17.1.5 In accordance with Section 63 of the 2017 Regulations (as amended), appropriate assessment is required for any plan or project, not connected with the management of a site within the national site network, which is likely to have a significant effect on the site, either alone or in-combination with other plans and projects.

A17.1.6 This appendix provides the information to support an HRA for the proposed Boston Alternative Energy Facility (known as the Facility). Specifically, it sets out the following:

- An overview of the HRA process;
- The protected sites considered relevant to the HRA;

- The qualifying features and conservation objectives of the relevant protected sites;
- Identification of pathways and impacts considered in this HRA (based on the preliminary impact assessment and consultation with Natural England and Marine Management Organisation (MMO) which are detailed further in **Chapter 17 Marine and Coastal Ecology** and within Appendix A17.1.3 within this HRA);
- Screening of potential impacts; and
- Appropriate assessment for impacts screened into the assessment.

A17.2 The HRA Process

A17.2.1 The HRA process helps meet the requirements of Article 6(3) of the Habitats Directive which states that any plan or project, that is not directly connected with or necessary to the management of a protected site, but would be *likely to have a significant effect* (LSE) on such a site, either on its own or in-combination with other plans or projects, will be subject to an *appropriate assessment* of its implications for the site in view of its conservation objectives.

A17.2.2 According to the Waddenzee judgement (Judgement of 7.9.2004 – Case C-127/02), an appropriate assessment will be required if a likely significant effect cannot be excluded on the basis of objective information. The Sweetman Opinion (Opinion of Advocate General 22.10.2012 – Case C-258/11) states that the question is simply whether the plan or project concerned is capable of having an effect.

A17.2.3 The HRA process (in its entirety) follows a four-staged approach, as detailed in the Planning Inspectorate's Advice Note 10 (Planning Inspectorate 2017) (also see **Plate A17-1**):

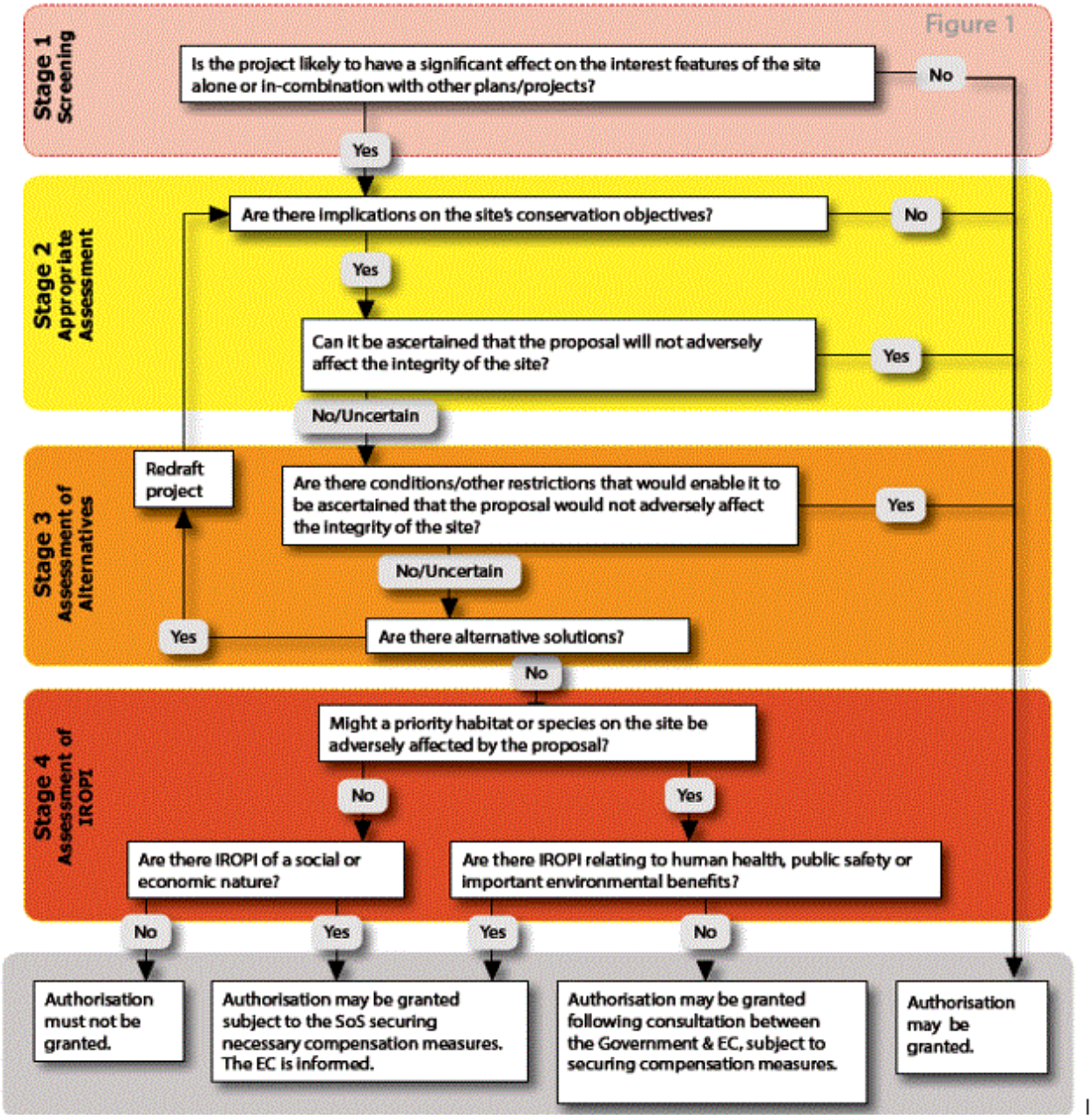

Plate A17-1 The HRA Process (Planning Inspectorate, 2017)

1) **Screening/Likely Significant Effect (LSE) assessment**: The process of identifying potentially relevant protected sites, and whether the Facility is likely to have a significant effect on the qualifying features of the site, either alone or in-combination with other plans and projects. If it is concluded at this stage that there is no potential for LSE, there is no requirement to carry out subsequent stages of the HRA.

2) **Appropriate Assessment**: Where a LSE for a protected site(s) cannot be ruled out, either alone or in-combination with other plans and projects, assessment of the potential effects on the integrity of the site(s), again either alone or in-combination

with other plans and projects, in view of its qualifying features and conservation objectives is required. Where an adverse effect on integrity cannot be excluded, an assessment of mitigation options is carried out and mitigation measures (where available) are proposed to address the effects. If, after taking account of mitigation, an adverse effect on integrity cannot be excluded, the HRA must progress to Stages 3 and 4.

3) **Assessment of Alternative Solutions**: Identifying and examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have a lesser effect on the site(s).

4) **Imperative reasons of overriding public interest (IROPI)**: Where no alternative solution exists, the next stage of the process is to assess whether the development is necessary for IROPI and, if so, the identification of compensatory measures needed to maintain the overall coherence of the designated site network.

A17.3 Baseline Information for Protected Sites

A17.3.1 Based on the preliminary findings of **Chapter 17 Marine and Coastal Ecology**, and in accordance with comments provided in the Scoping Opinion, it is concluded that the following protected sites (as shown on **Figure 17.1**) require further assessment within the HRA process:

- The Wash SPA (site code UK9008021).
- The Wash and North Norfolk Coast SAC (site code UK0017075).
- The Wash Ramsar site (site number 395).

A17.3.2 The following sub-sections provide details on the qualifying features and conservation objectives of the above protected sites.

The Greater Wash SPA

A17.3.3 The Greater Wash SPA is seaward of The Wash SPA and is designated for offshore non-breeding species (red-throated diver, little gull and common scoter) and the foraging grounds of breeding terns (common tern, little tern and sandwich tern). Effects on the qualifying features of the Greater Wash SPA would be restricted to those that could potentially arise from an increase in vessel traffic, within the area that these species occur, attributed to the proposed Facility. However, in the context of the *c.*77,500 vessel-transits per year in the Outer Wash (further information on which is provided in **paragraph A17.6.30**), the addition of a predicted 580 further vessel transits within the same navigation routes as a result of the operation of the proposed Facility would represent an

increase of just 0.75 %. Such a minor increase in magnitude would not be expected to result in any significant effects on the qualifying features over and above those under baseline conditions. This site is therefore not considered further in this report.

The Wash SPA

A17.3.4 The Wash SPA has been designated for the qualifying features shown within **Table A17-1**. The table also includes the sensitivities of the features to pressures arising from vessel movements and anchorage, as per Natural England's Advice on Operations for the site (Natural England, 2020a).

Table A17-1 Qualifying features of The Wash SPA, and their sensitivity to pressures from vessel movement and anchorage, as per Natural England's Advice on Operations (Natural England, 2020a). All Sensitivities are Low Risk Unless Otherwise Stated in Brackets.

Qualifying feature	Above-water noise (medium-high risk)	Collision above water	Collision below water	Changes in suspended sediment solids	Introduction of light	Litter	Introduction or spread of invasive species	Contamination	Visual disturbance (medium-high risk)
Bar-tailed godwit (*Limosa lapponica*), Non-breeding	✓	✓	×	×	✓	×	×	✓	✓
Bewick's swan (*Cygnus columbianus bewickii*), Non-breeding	No interaction of concern between the feature and the pressures arising from vessel movements from the Facility.								
Black-tailed godwit (*Limosa limosa islandica*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓

Qualifying feature	Above-water noise (medium-high risk)	Collision above water	Collision below water	Changes in suspended sediment solids	Introduction of light	Litter	Introduction or spread of invasive species	Contamination	Visual disturbance (medium-high risk)
Common scoter (*Melanitta nigra*), Non-breeding	✓	✓	×	×	×	✓	×	×	✓
Common tern (*Sterna hirundo*), Breeding	✓	✓	×	✓	×	✓	×	×	✓
Curlew (*Numenius arquata*), Non-breeding	✓	×	×	×	✓	×	×	×	✓
Dark-bellied brent goose (*Branta bernicla bernicla*),	✓	✓	×	×	✓	×	×	✓	✓

Qualifying feature	Above-water noise (medium-high risk)	Collision above water	Collision below water	Changes in suspended sediment solids	Introduction of light	Litter	Introduction or spread of invasive species	Contamination	Visual disturbance (medium-high risk)
Non-breeding									
Dunlin (*Calidris alpina alpina*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓
Gadwall (*Mareca strepera*), Non-breeding	✓	✓	×	×	×	✓	×	×	✓
Goldeneye (*Bucephala clangula*), Non-breeding	✓	✓	×	×	✓	✓	×	×	✓
Grey plover (*Pluvialis squatarola*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓

Qualifying feature	Above-water noise (medium-high risk)	Collision above water	Collision below water	Changes in suspended sediment solids	Introduction of light	Litter	Introduction or spread of invasive species	Contamination	Visual disturbance (medium-high risk)
Knot (*Calidris canutus*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓
Little tern (*Sternula albifrons*), Breeding	✓	✓	✓	✓	×	✓	✓	×	✓
Oystercatcher (*Haematopus ostralegus*), Non-breeding	✓	✓	×	×	×	×	✓	✓	✓
Pink-footed goose (*Anser brachyrhynchus*), Non-breeding	No interaction of concern between the pressures from the Facility.								

Qualifying feature	Above-water noise (medium-high risk)	Collision above water	Collision below water	Changes in suspended sediment solids	Introduction of light	Litter	Introduction or spread of invasive species	Contamination	Visual disturbance (medium-high risk)
Pintail (*Anas acuta*), Non-breeding	✓	×	×	×	✓	×	✓	✓	✓
Redshank (*Tringa totanus*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓
Sanderling (*Calidris alba*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓
Shelduck (*Tadorna tadorna*), Non-breeding	✓	✓	×	×	✓	×	✓	✓	✓
Turnstone (*Arenaria interpres*), Non-breeding	✓	✓	×	×	✓	×	×	✓	✓

Qualifying feature	Above-water noise (medium-high risk)	Collision above water	Collision below water	Changes in suspended sediment solids	Introduction of light	Litter	Introduction or spread of invasive species	Contamination	Visual disturbance (medium-high risk)
Wigeon (*Mareca penelope*), Non-breeding	✓	✓	×	×	✓	×	×	✓	✓

A17.3.5 The conservation objectives for this SPA apply to the whole SPA site and the individual species/assemblage of species that have been identified as qualifying features above. The site aims to contribute to achieving the aims of the Birds Directive, by maintaining or restoring:

- 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 each of the qualifying features; and
- the distribution of qualifying features within the site.

The Wash and North Norfolk Coast SAC

A17.3.6 The Wash and North Norfolk Coast SAC has been designated for the qualifying features shown in **Table A17-2** for designated habitats and **Table A17-3** for designated species. The tables also include the sensitivities of the features to pressures arising from vessel movements and anchorage, as per Natural England's Advice on Operations for the site (Natural England, 2020b).

Table A17-2 Qualifying Habitats of The Wash and North Norfolk SAC and their sensitivity to pressures from vessel movement and anchorage, as per Natural England's Advice on Operations (Natural England, 2020b). All Sensitivities are Low Risk.

Qualifying feature	Abrasion / disturbance of the substrate	Changes in suspended solids	Deoxygenation	Introduction of light	Introduction or spread of invasive species	Litter	Nutrient enrichment	Disturbance of sediment below the seabed	Smothering	Wave exposure changes
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	✓	✓	×	×	✓	✓	×	✓	×	×
Coastal lagoons	✓	✓	✓	✓	✓		×	✓	✓	✓
Large shallow inlets and bays	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	The evidence base suggests that there is no interaction of concern between the pressure and the feature, or the effect of vessel movements and the feature could not interact.									
Mudflats and sandflats not covered by seawater at low tide	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
Reefs	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
Salicornia and other annuals colonising mud and sand	✓	✓	×	×	✓	✓	×	✓	×	×

Qualifying feature	Abrasion / disturbance of the substrate	Changes in suspended solids	Deoxygenation	Introduction of light	Introduction or spread of invasive species	Litter	Nutrient enrichment	Disturbance of sediment below the seabed	Smothering	Wave exposure changes
Sandbanks which are slightly covered by sea water all the time	✓	✓	✓	✓	✓	×	×	✓	✓	×

Table A17-3 Qualifying Species of The Wash and North Norfolk Coast SAC and their sensitivity to pressures from vessel movement and anchorage, as per Natural England's Advice on Operations (Natural England, 2020b). All Sensitivities are Low Risk Unless Otherwise Stated in Brackets.

Qualifying feature	Above-water noise (medium-high risk)	Visual disturbance (medium-high risk)	Underwater noise changes (medium-high risk)	Collision below water	Litter	Introduction or spread of invasive species	Contamination
Harbour (common) seal (*Phoca vitulina*)	✓	✓	×	✓	✓	×	×
Otter (*Lutra lutra*)	✓	✓	×	✓	×	✓	✓

A17.3.7 The conservation objectives for the qualifying features (Natural England, 2018) are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of the qualifying species within the site.

The Wash Ramsar site

A17.3.8 The Information Sheet on Ramsar Wetlands (May 2005)[2] for The Wash Ramsar site states that the site qualifies as a Ramsar site for the following reasons:

- Ramsar criterion 1 – The Wash is a large shallow bay comprising very extensive saltmarshes, major intertidal banks of sand and mud, shallow water and deep channels. It is the largest estuarine system in Britain.
- Ramsar criterion 3 – Qualifies because of the inter-relationship between its various components including saltmarshes, intertidal sand and mudflats and the estuarine waters. The saltmarshes and the plankton in the estuarine water provide a primary source of organic material which, together with the other organic matter, forms the basis for the high productivity of the estuary.
- Ramsar criterion 5 – Assemblages of international importance (292,541 waterfowl (five-year peak mean 1998/99-2002/03)).

A17.3.9 The site also qualifies under Ramsar criterion 6 for the reasons set out in **Table A17-4**.

[2] *https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK11072&SiteName=The Wash&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=* [accessed 30 January 2019]

Table A17-4 Qualifying Features Under Ramsar Criterion 6.

Qualifying feature	Status
Redshank (*Tringa totanus*)	Peak counts in spring/autumn
Curlew (*Numenius arquata*)	Peak counts in spring/autumn
Oystercatcher (*Haematopus ostralegus*)	Peak counts in spring/autumn
Grey plover (*Pluvialis squatarola*)	Peak counts in spring/autumn
Knot (*Calidris canutus*)	Peak counts in spring/autumn
Sanderling (*Calidris alba*)	Peak counts in spring/autumn
Black-tailed godwit (*Limosa limosa islandica*)*	Peak counts in spring/autumn
Ringed plover (*Charadrius hiaticula*)*	Peak counts in spring/autumn
Black-headed gull (*Larus ridibundus*)	Peak counts in winter
Common eider (*Somateria mollissima*)	Peak counts in winter
Bar-tailed godwit (*Limosa lapponica*)	Peak counts in winter
Shelduck (*Tadorna tadorna*)	Peak counts in winter
Dark-bellied brent goose (*Branta bernicla bernicla*)	Peak counts in winter
Dunlin (*Calidris alpina alpina*)	Peak counts in winter
Pink-footed goose (*Anser brachyrhynchus*)	Peak counts in winter
Golden plover (*Pluvialis apricaria*)*	Peak counts in winter
Lapwing (*Vanellus vanellus*)*	Peak counts in winter

* Species/populations identified subsequent to designation for possible future consideration under Ramsar criterion 6

A17.3.10 For Ramsar sites, a decision has been made by Defra and Natural England not to produce conservation advice packages, instead focussing on the production of High-Level Conservation Objectives. As the provisions of the Habitats Regulations extend to Ramsar sites, Natural England considers the conservation advice packages for the overlapping protected site and designations (i.e. The Wash SPA and The Wash and North Norfolk Coast SAC) to be sufficient to support the management of the Ramsar site interests. Consequently, for the purposes of the HRA, it will be assumed that the

conservation objectives for The Wash SPA and The Wash and North Norfolk Coast SAC can be applied to The Wash Ramsar site.

A17.4 Screening Exercise and Likely Significant Effect

A17.4.1 **Chapter 17 Marine and Coastal Ecology** presents an assessment of potential impacts of the proposed Facility on those receptors that are relevant to the scope of the HRA (i.e. marine and estuarine habitats, waterbirds, fish (as potential prey species of qualifying features) and marine mammals).

A17.4.2 It is considered that the pathway for an effect on protected sites (or functionally linked land) during the construction phase could occur via the delivery of materials to the site using vessels via The Wash and The Haven. During construction delivery of raw materials will be via both ship and road. The first phase of the wharf construction will be undertaken to allow a proportion of the raw materials to be delivered by ship rather than transportation by local roads.

A17.4.3 The number of vessels visiting during the construction phase is estimated at 89 vessel visits over approximately 24 months. This equates to an average of four vessels a month. It is anticipated that the actual deliveries will be in waves however, as certain elements of construction progress. It is anticipated that there would be a peak of five vessels predicted in any week.

A17.4.4 Although construction of the Facility will not take place within any protected sites, there are birds from the protected sites that would use this area, mostly for roosting on the saltmarshes and feeding on the mudflats of The Haven. This is expected to be the case particularly during very cold winters. In addition, the vessels will pass through the designated sites and in so doing could cause disturbance to populations using the habitats within the protected sites close to the mouth of The Haven. There is therefore the potential for impacts on birds during construction.

A17.4.5 During construction there will be a loss of intertidal habitat used by some of the birds that are part of the designated populations of The Wash SPA and Ramsar site. The habitat is outside of the SPA/Ramsar site boundary but The Haven as a whole is considered to provide a refuge for birds as a functionally connected habitat to the protected sites. There is, therefore, the potential for effects on a proportion of the bird population from the SPA/Ramsar site as a result of construction works.

A17.4.6 **Chapter 17 (Marine and Coastal Ecology)** identifies that there is the potential for sporadic presence of harbour seal within The Haven and potentially close to

the Facility. Furthermore, vessels moving through The Wash to reach The Haven could disturb seals, therefore the potential for effects on seals during the construction phase at the Facility have been assessed.

A17.4.7 Therefore, for the construction phase, the following potential effects have been assessed for bird populations, as part of The Wash SPA and Ramsar site:

- Noise effects from piling and dredging activities at the Facility during construction (impacting on designated species using the land adjacent to the Facility. No noise effects from construction are predicted on designated species within the SPA and Ramsar site boundaries themselves);
- Loss of habitat at the proposed development site; and
- Disturbance effects from an increase in vessel numbers during construction.

A17.4.8 The following potential effects have been assessed for harbour seal during the construction phase, as part of The Wash and North Norfolk Coast SAC:

- Underwater noise effects from piling and dredging activities at the Facility during construction (impacting on seals using the section of The Haven adjacent to the Facility. No noise effects are predicted on designated species within the SAC boundary itself).
- Disturbance effects from an increase in vessel numbers during construction.
- Disturbance effects at seal haul-out sites from an increase in vessel numbers during construction.
- Increased risk of collision from an increase in vessel numbers during construction.

A17.4.9 For the operational phase, the following were considered in this assessment as having the potential to have an effect on the qualifying features (and/or the supporting habitats of qualifying species) of The Wash SPA, The Wash and North Norfolk Coast SAC and The Wash Ramsar site (these potential effects are summarised below and discussed in further detail in **Section A17.6**):

- Changes in vessel traffic and movement leading to increased collision risk and above ground and underwater noise and visual disturbance to birds, seals and otter which are features of the designated sites.
- The potential for nitrogen oxides (NO_x), sulphur dioxide (SO_2), nitrogen, acid and ammonia deposition within the boundaries of protected sites as a result of the operational phase emissions from the Facility.

A17.4.10 As stated in **Chapter 17 Marine and Coastal Ecology**, no impacts to marine and coastal ecological receptors are anticipated during the decommissioning phase of the Facility. This is because the wharf will remain in place after the Facility is decommissioned, and the vessel movements arising from the operation of the Facility will cease. As such, impacts from the decommissioning phase have not been considered in this HRA.

A17.4.11 The following sub-sections provide a summary of the potential for impacts from the activities considered above. The Planning Inspectorate HRA Screening Matrices, detailing the outcome of the screening process for each individual qualifying feature, are presented in **Appendix A17.1.1** to this document.

Increased Collision Risk on Seals

A17.4.12 There will be an increase of 89 large cargo vessels over 24 months during the construction phase; and an increase of 580 vessels/year due to the Facility operation, which will last for the duration of the Facility's operation. This equates to a maximum increase of approximately 12 vessels per week. The total number of vessels using The Haven would increase during operation from 420 large cargo vessels/year to 1000 large cargo vessels/year. The Facility-related vessels will be travelling at a ~~maximum speed of 4 knots through The Haven, and 6 knots~~'safe speed' in compliance with COLREGS throughout The Haven, through the shipping channel and the anchoring area (the shipping channel to be used can be seen on **Figure 17.1**).

A17.4.13 Seals occasionally use The Haven area but the main areas for seals are in The Wash and the entrances to the inlets flowing into The Wash which are the areas where there are extensive mudflats and saltmarsh available to provide haul out sites and feeding areas. There are very few records of seals reaching the construction site and these are atypical rather than a normal usage of the area.

A17.4.14 Although The Haven is already used by large vessels as they transit to the Port of Boston, the increase in vessel numbers, particularly during the operation phase is relatively high. The vessels will need to pass through The Wash using the shipping channel, which passes through an area used extensively by seals to reach The Haven.

A17.4.15 To put the number of vessels into context with the wider area, data shows that, 77,441 vessels entered the whole of The Wash annually (212 vessels/day), as shown by the Vessel Density Grid Data 2015 from the MMO (MMO, 2017). Within the channel leading to The Haven, there are a minimum of approximately 11,000 vessels utilising the proposed shipping channel annually, or 30 vessels per day,

as shown by the Marine Traffic data (www.marinetraffic.com, 2017), plus those smaller vessels (e.g. fishing vessels under 10 m) for which satellite tracking data is not available. The increase of 580 vessels per year through the operational period of the Facility is a small increase compared to the number already present within the channel approaching The Haven (equating to an additional 5.27 % of vessels utilising the shipping channel). However, marine mammals are known to be sensitive to vessel collision, even though they are able to avoid vessels to an extent. The features sensitive to collisions are shown in **Table A17-3**.

A17.4.16 Section 17.8 of **Chapter 17 Marine and Coastal Ecology** assesses the impact of increased collision risk on marine mammals. Marine mammals were considered to be of low sensitivity to this impact, mainly due to their ability to detect and avoid vessels. However, this impact was considered to be of medium magnitude due to the increase in vessels. As such, it is included for assessment in **Section A17.6** of this document.

Increased Collision Risk on Otters

A17.4.17 As part of the suite of ecological surveys undertaken to date, checks for the presence of otters has been undertaken. No evidence of otters has been recorded during these surveys.

A17.4.18. Furthermore, no records of otters have been provided by the biological records centre for the area where the Facility is proposed. Therefore, it is concluded that residing otters are absent from the proposed Facility area. However, otters may be using The Haven (and other waterbodies within the wider area) for foraging and/or commuting purposes.

A17.4.19 The Facility-related vessels may result in increased collision risks on foraging/commuting otters that may be using the river. As a protected species, otters are of high sensitivity, however this species is able to detect and avoid vessels and therefore this impact is concluded to be of low magnitude primarily due to their ability to avoid contact with vessels and the fact that vessels will only be moving at and around high water. Consequently, it is concluded that no adverse effect is likely on the local foraging/commuting otter population and foraging/commuting otters are not considered further in this assessment.

Physical Disturbance (Noise and Visual)

A17.4.20 The presence of Facility-related vessels will inevitably lead to visual disturbance and an increase in above and below water noise. **Table A17-1** and **Table A17-2** identify the qualifying features that are sensitive to physical disturbance. Birds

and marine mammals are sensitive to both visual and auditory disturbance. Impacts of physical disturbance during the operational phase of the Facility have been assessed in Section 17.8 of **Chapter 17 Marine and Coastal Ecology** and have been included for further assessment in **Section A17.6**.

A17.4.21 No evidence (i.e. holts, resting places) of otters has been recorded during the ecological surveys undertaken to date. Furthermore, no records of otters have been provided by the biological records centre for the area where the Facility is proposed. Foraging/commuting otters may be using the area within close proximity to the shipping channel and anchorage area, therefore potential impacts on foraging/commuting otters may arise as result of increased visual and noise disturbance; however these are unlikely to be significant given that otters are able to detect such levels and alter their behaviour accordingly, i.e. avoiding the area. Given the availability of alternative foraging/commuting habitat for otters, it is concluded that no significant effect is likely on the foraging/commuting otter population. As such, foraging/commuting otters are not considered further in this assessment.

Increased Air Pollutant Emissions

A17.4.22 The potential for nitrogen oxides (NO_x), sulphur dioxide (SO_2), nitrogen, acid and ammonia deposition on designated Annex I habitats (as part of The Wash and North Norfolk Coast SAC) during the construction and operation of the Facility was assessed as a result of air quality dispersion modelling, carried out in **Chapter 14 Air Quality.**

A17.4.23 For the construction phase, this assessment showed that none of the levels of emissions exceeded the in-combination background threshold Critical Levels and Critical Loads during the construction. It was concluded that, in the intertidal zone, as these areas are inundated regularly, there is no potential for a build-up of nitrogen or acid deposition. Furthermore, as the designated species using these areas are mobile and have an extensive range, the route for impact on these species due to air quality emissions is very limited.

A17.4.24 For the operation phase, the levels of modelled deposition, as reported in **Chapter 14 Air Quality** can be considered to be insignificant in the short term. For the longer term however (based on annual mean levels), these cannot be considered insignificant as the contribution of all pollutants to the background levels were above 1 % of the relevant annual mean Critical Levels or Loads. As such, this has been screened in for further assessment for the operation phase in **Section A17.6**.

A17.5 In-Combination Effects

Introduction

A17.5.1 When assessing the implications of a plan or project in light of the conservation objectives for protected sites (i.e. assessing the potential for LSE and ascertaining the potential for effect on site integrity), it is necessary to consider the potential for in-combination effects (i.e. the effects of the project combined with potential effects of other planned projects), as well as effects due to the project in isolation.

A17.5.2 PINS Advice Note 10 provides guidance on what should be considered within in-combination effects and, states that other plans or projects should include:

- projects that are under construction;
- permitted application(s) not yet implemented;
- submitted application(s) not yet determined;
- all refusals subject to appeal procedures not yet determined;
- projects on the National Infrastructure's programme of projects; and
- projects identified in the relevant development plan (and emerging development plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited and a degree of uncertainty may be present.

A17.5.3 It is also noted that in some circumstances it may be appropriate to include plans and projects not yet submitted to a competent authority for consideration but for which sufficient detail exists on which to make judgements on their impact on the protected site.

A17.5.4 In undertaking an in-combination assessment it is important to consider the potential for each plan or project to influence the site. For an in-combination effect to arise, the nature of two effects does not necessarily have to be the same. The in-combination effects assessment, therefore, focuses on the overall implications for the site's conservation objectives, regardless of the type of effect.

A17.5.5 In addition, this in-combination assessment has adopted the following principle: for the proposed scheme to have the potential to contribute to in-combination effects, there must be sufficient cause to consider that a relevant habitat or species is sensitive to effects due to the project itself (e.g. because of a particular influence or sensitivity, or the presence of a species in notable numbers on at

least one survey occasion, rather than individuals being simply recorded within the site).

Other Plans and Projects Screened in to the HRA Process

A17.5.6 A list of plans and projects that have the potential to give rise to an in-combination effect with the proposed scheme has been compiled from the MMO Public register and through checking of Local Planning Authority public register.

A17.5.7 Details of each plan or project, alongside the distance from the Facility have been presented in **Table A17-5**. From this a decision has been taken as to whether or not it is likely to have a combined effect on qualifying interest features of the protected site with the Facility. The plans and projects have, therefore, been screened in or out of further assessment on this basis.

A17.5.8 Due to the wide-ranging nature of the harbour seal, and that they may forage at considerable distance from their principal haul-out site, there is the potential for in-combination effects from projects at a larger distance from the Facility. Therefore, for harbour seal, projects that are within the same reference population (the south-east England MU; SCOS, 2018) as the Facility, and that have the potential to overlap temporally, have been screened in for further assessment.

Table A17-5 Summary of Plans and Projects with the Potential to have in-Combination Effects

Applicant	Project Description	Distance from Facility (closest point)	Potential Effects on SPA, SAC or Ramsar site	Potential for in-combination effects	Conclusion on likely significant in-combination effects
Environment Agency	Boston Tidal Barrier	1 km	None assessed in project HRA screening	None	N/A
Port of Boston Limited	Port of Boston Maintenance Dredging & Disposal 2015	700 m	Yes – the dredged sediment is being disposed of in the protected sites. Potential for dredging to have an effect on SPA birds using the area around the dredging site.	None	No likely significant in-combination effects are anticipated considering the capital and maintenance dredge for the Facility are being carried out outside the protected sites; and no dredged material associated with dredging for the Facility will be disposed to sea. In addition, the hydrodynamic assessment has also not predicted any significant effects due to suspended sediments related to the proposed facility. The potential effects due to the plume at the dredge site would be highly localised and temporary.

Applicant	Project Description	Distance from Facility (closest point)	Potential Effects on SPA, SAC or Ramsar site	Potential for in-combination effects	Conclusion on likely significant in-combination effects
Water Level Management Alliance Limited	Wolferton Pumping Station	Approx. 30 km	Yes – dependent on specific construction activities	None	Project-specific effects are likely to be localised.
RNLI	RNLI Skegness - Emergency Works Application for Beach Re-Profiling	Approx. 30 km	Yes - localised increased suspended sediment concentrations	None	The effects will be very localised to the beach and the RNLI station.
Environment Agency	The Wash Tide Gauge (decommissioning, construction and maintenance), including scour protection	Approx. 15 km	Yes – the works are located within the protected sites	None	The installation will be small scale; therefore, no likely significant in-combination effects are anticipated.
University of Hull	Eel monitoring in The Wash	Approx. 15 km	None	None	N/A
Environment Agency	Hunstanton Beach Recharge	Approx. 30 km	Yes - localised increased suspended sediment concentrations	None	The effects will be very localised to the beach.
Environment Agency	Boston Barrier Phase 2 Ground Investigation	Approx. 1 km	None – project only involves removal of small samples in The Haven	None	N/A
Environment Agency	Havenside Flood Defence Scheme	Adjacent to Facility	None	None	The Havenside works are planned to be completed

Applicant	Project Description	Distance from Facility (closest point)	Potential Effects on SPA, SAC or Ramsar site	Potential for in-combination effects	Conclusion on likely significant in-combination effects
					before the construction of the Facility begins.
Triton Knoll Offshore Wind Farm Limited	Triton Knoll Offshore Wind Farm	Onshore cable corridor and Construction compound at Langrick 9.7 km from the Application Site	None	None	The Wash and North Norfolk Coast SAC was screened in for effects during construction only. Project will be fully operational prior to the Facility commencing construction.
National Grid Viking Link Ltd. and Energinet.dk	Viking Link Interconnector B/17/0340	Bicker Fen substation 14.4 km from the Application Site (Approximately 37 km from the proposed submarine cable corridor)	Underwater noise and collision risk effects to harbour seal during construction only	Yes	Potential for in-combination effects of underwater noise and an increased risk in vessel collision

A17.6 Appropriate Assessment

The Wash SPA and The Wash Ramsar Site

A17.6.1 The Wash is a site of national and international importance for its wader and wildfowl populations, supporting a minimum estimate of approximately 359,000 individuals annually (excluding introduced species) during the years of 2008/09 to 2012/13 (Austin *et al*., 2014). The majority of species are overwintering in the area, feeding on the extensive mud and sand flats exposed at low tide and roosting on the marshes bordering the feeding grounds at high tide. The area also supports resident species and breeding birds.

A17.6.2 Frampton North, at approximately 3 km, is the closest Wetland Bird Survey (WeBS) sector (where birds are counted regularly) to the Facility (**Figure 17.4c**). High densities of birds were recorded at Frampton North 23, at the mouth of The Haven, with 41 species of birds recorded to be using the sector across six years. Waders were the most abundant group of birds (16,065 individuals across six years), followed by gulls and terns (4,625 individuals across six years). Frampton North 60 is also considered to be an important habitat for birds because it is suitable for nesting and feeding and considering that the mudflats are backed by wide saltmarsh.

A17.6.3 Site specific surveys, undertaken for the purposes of assessment of the potential impacts of the Facility on birds, showed that the proposed Application site is used by waders and wildfowl for feeding on the intertidal mudflats and roosting on the saltmarsh areas. There are also extensive areas in the mouth of The Haven used by birds for roosting and feeding. These results are discussed in **Chapter 17 Marine and Coastal Ecology**.

Potential effects on birds due to habitat loss and disturbance through construction noise, vessel disturbance (visual, presence and noise during both construction and operation) and lighting at the proposed development site and in transit through The Wash and The Haven

Introduction

A17.6.4 These effects are considered individually below and also collectively as they all have the potential to displace birds from an area used for feeding or roosting either through habitat loss, construction noise or vessel presence.

A17.6.5 As stated previously, the number of vessels travelling up and down The Haven for the proposed scheme will cause an extra 89 vessels to use The Wash and The Haven during the 24-month construction period and an additional 580 vessels per year during operation. This is in comparison to existing numbers of vessels at approximately 420 per year (for The Haven) and approximately 11,000 vessels per year (using the proposed shipping channel in The Wash). There is therefore potential for disturbance during high water when the birds are using habitats for roosting. As the vessels will only be able to access The Haven around high water, no significant effects from vessel movements on birds using The Haven as feeding grounds are anticipated. It is, however, acknowledged that a small area of intertidal habitat would be lost as a consequence of construction of the Facility due to the dredging for the berthing area and potentially a small area of scour protection. During operation, the presence of grounded vessels in the berthing area as the tide recedes (vessels will need to ground on the intertidal area until the tide floods back in to re-float them) would reduce the availability of the intertidal area alongside the wharf.

Construction Disturbance

A17.6.6 Construction noise at the proposed development site could disturb some of the bird species that use the saltmarsh and mudflats for feeding and roosting and form part of the assemblage of waterbirds that make up The Wash SPA and Ramsar site or are qualifying species for the protected sites. The most likely cause of disturbance is the noise and vibration associated with construction activity, but mostly with regard to piling activities and potentially rock armouring for scour protection. This impact is assessed in detail in Section 17.8 of **Chapter 17 Marine and Coastal Ecology**.

A17.6.7 In order to assess this potential effect, the results of a study undertaken by the Environment Agency to monitor Ground Investigation (GI) works that it was

carrying out within The Haven during February and March 2019, were used. Due to the large numbers of birds present during the GI works, there was an agreement with Natural England to monitor the works for signs of disturbance.

A17.6.8 The monitoring included provision to temporarily stop works if "trigger" levels (i.e. a pre-defined number of birds) of any of the target species came within 500 m of the works. The results of the monitoring (Environment Agency, 2019) indicated that:

> *"the impact of visual or noise disturbance to non-breeding waterbirds from the GI activities was not significant. At most locations there were relatively few birds within the 500 m radius that was being monitored, the exception being within and adjacent to the RSPB's Frampton Marsh nature reserve, though even here the birds appeared habituated to a level of visual and noise stimuli. The largest numbers of birds that were typically found within 500 m were Brent Geese as they regularly move between locations and exploit a variety of habitats, including agricultural farmland. There was localised disturbance and displacement of waders and wildfowl, but the numbers involved were very small and tended to only occur at short range - up to 100 m but generally at less than 50 m. In most cases where birds took flight because of the GI they tended to land nearby and continue feeding or loafing. This was particularly noticeable along The Haven where, other than for a short period either side of high tide, there is a continuous linear strip of mudflat available on both sides of the channel. The most significant sources of disturbance were birds of prey and low-flying helicopters. The observations of the monitoring suggest that 250 m is a more reasonable distance to consider potential disturbance effects of GI activities on non-breeding waterbirds. There was no evidence of any visual or noise disturbance affecting birds over this distance".*

A17.6.9 The construction works for the proposed Facility will be temporary and it is predicted to take up to 18 months to complete the wharf construction. The piling noise is likely to be the most significant issue and therefore should be mitigated through avoiding the most sensitive times when the numbers of feeding waterbirds peak, which would be during the overwintering period. Piling works

should therefore be undertaken between May to September to avoid effects on overwintering birds.

A17.6.10 In addition, given the success of the measures undertaken for the GI works by the Environment Agency, for general construction works, monitoring and adherence to thresholds as recommended in the findings for this project is recommended. This would involve monitoring of bird numbers and behaviour associated with any noisy activities and stopping works if a threshold value is exceeded for numbers of birds within a 250 m radius before commencement of the noisy activity. The thresholds of bird numbers will be agreed with Natural England but is expected to be the same as for the works by the Environment Agency. These monitoring measures are detailed within the Outline Landscape and Ecological Mitigation Strategy (OLEMS) and are secured by Requirement 5 of the draft DCO which requires a final Landscape and Ecological Mitigation Strategy to be approved which must be substantially in accordance with the OLEMS.

A17.6.11 There is the potential for there to be impacts of lighting on birds using this area during the night. The area is already disturbed to some extent by the movement of vessels during higher periods of the tide and from other facilities in the local area, including the Port of Boston. Lighting for the Facility would be localised and focussed but could cause some disturbance to birds during night-time hours. However, lights would only be on when needed for essential night-time works and they would be targeted to only illuminate the areas where lighting is necessary, which would minimise any effect on the habitats used by birds in the vicinity of the construction works. Furthermore, waterbirds may feed nocturnally and some may actually take advantage of artificial light sources to extend feeding opportunities in darkness (e.g. Dwyer *et al*., 2013).

A17.6.12 Given the above measures, it is assessed that there would not be a significant disturbance effect on birds associated with the SPA and Ramsar as a result of noise and visual disturbance during the construction works.

Habitat Loss

A17.6.13 Bird counts were undertaken throughout the winter and spring of 2019/20 and during the winter and spring of 2021 for the intertidal areas where the development site is proposed (Area A) and the adjacent area (Area B). Area A and B are shown on **Figure 17.8**. Habitat loss as a result of the construction of

the proposed wharf would be mostly confined to Area A with an area of scour protection (as a worst=case scenario) on the edge of Area B.

A17.6.14 The bird counts revealed that a number of waterbirds use Area A for feeding and / or roosting, however, almost all species recorded were in numbers representing less than 1 % of The Wash population (based on the 5-year WeBS average counts for The Wash at the time of the survey, 2013/14 to 2017/18), and were therefore present in numbers not considered to be significant in the context of the wider Wash population. However, in both Area A and Area B the peak wintering counts of redshank and ruff were greater than 1 % of their respective 5-year average population in The Wash, indicating that, at times, significant numbers of these two species may forage within The Haven, including areas that may be lost during construction work (**Table A17-6**).

Table A17-6 Redshank counts for Sectors A and B (per centages show the % of the 5-yr latest WeBS species counts for The Wash SPA and the shaded numbers show where the % was greater than 1 %)

Redshank Counts	Count Sector A (within proposed development area)		Count Sector B (adjacent to proposed development area)	
Survey month	Low Tide	High Tide	Low Tide	High Tide
October 2019	18 (0.32 %)	20 (0.35 %)	25 (0.44 %)	78 (1.37 %)
November 2019	26 (0.46 %)	19 (0.33 %)	61 (1.01 %)	38 (0.67 %)
December 2019	14 (0.25 %)	27 (0.47 %)	19 (0.33 %)	33 (0.58 %)
January 2020	27 (0.47 %)	162 (2.84 %)	36 (0.63 %)	3 (0.05 %)
February 2020	26 (0.46 %)	29 (0.51 %)	21 (0.37 %)	93 (1.63 %)
March 2020	17 (0.30 %)	13 (0.23 %)	31 (0.54 %)	73 (1.28 %)
April 2020	0	0	0	0
May 2020	0	0	0	0
June 2020	0	0	0	0
January 2021	29 (0.51 %)	44 (0.77 %)	34 (0.6 %)	61 (1.01 %)
February 2021	18 (0.32 %)	18 (0.32 %)	16 (0.28 %)	21 (0.37 %)

A17.6.15 Redshank numbers at low tide (when most individuals were foraging on the intertidal) varied between 14 and 27 in Area A (which includes both sides of the river), with the peak representing <0.5 % of The Wash population 2013/14 to 2017/18. By comparison, numbers in Area B (adjacent area towards the mouth

of The Haven, on both sides of the river) were between 19 and 61 (with the peak representing 1.1 % of The Wash population). For ruff, the number at low tide in Area A was 1 on one occasion and for Area B were between 1 and 6 on three occasions (with an average of 3). Ruff are not a named component of the SPA assemblage, although they are a 'noteworthy species' on the Ramsar citation. The peak number of ruff present in both areas represented a minute proportion (<0.01 %) of The Wash waterbird assemblage. In terms of the overall number of waterbirds recorded using Area A, a peak count of 223 individuals in November 2019 represented an insignificant proportion (<0.1 %) of The Wash wintering waterbird assemblage (the 5-year average at the time of the count was over 350,000).

A17.6.16 Area B would remain available for feeding and at low tide there will be no vessel movements occurring. The opposite side of the river to the proposed Facility within Area A will also still be available for feeding.

A17.6.17 The area of intertidal habitat in or near the development is not within the designated site boundary and, although it is accepted that it provides a functionally linked habitat for species using The Wash SPA and Ramsar site, the area of mudflat to be lost within Area A is small (1.5 hectare (ha)). Adjacent areas, including Area B and the opposite side of the river to the proposed Facility within Area A, provide similar habitat that is used by the same bird species. These adjacent intertidal areas will still be available for feeding birds at low tide. Overall, it is not expected that feeding birds would be adversely affected by habitat loss, due to the relatively low numbers using Area A, the small area lost and the continued availability of adjacent feeding areas.

A17.6.18 The saltmarsh area on the wharf side of the river within Area A that provides a roosting area at high tide will be lost. The loss is calculated as a maximum (worst case scenario) of 1 ha (this includes a small area of loss (0.17 ha) that could potentially be lost on the edge of Area B to indirect loss and scour protection in the upper zone). This area of saltmarsh has been described as of poor quality due to its limited extent, low diversity and negligible zonation (Jacobs, 2011). This was confirmed by a survey carried out in 2014 (Environment Agency, 2014). The saltmarsh within Area A is a narrow strip of marsh (between 12 m and 28 m wide) that occurs between the seawall and an area of rock armour that occurs between the saltmarsh and the mudflat. To put the saltmarsh loss into context, the area of saltmarsh in The Haven is estimated at 62 ha and the area of saltmarsh in The Wash is 5814 ha (includes a small part of The Haven). The

loss is therefore estimated to be 0.017 % of the saltmarsh in these two areas (estimated to be 5826 ha in total due to some overlap between The Haven and The Wash). The loss is outside of the SPA boundary.

A17.6.19 The riverbank area is already subject to disturbance as it is alongside a public footpath and there is debris present within the marsh area. The counts from the two sectors at high water recorded between 13 and 162 redshank (the peak representing 2.8 % of The Wash population 2013/14 – 2017/18) in Area A (both sides of the river) and between 3 and 93 (1.6 % of The Wash population 2013/14 – 2017/18) in Area B (on both sides of the river). For ruff at high water, the counts were 1 in Area A, on one occasion, and between 1 and 4 (average of 3) on three occasions for Area B. Again, the peak number of waterbirds (of all species) using Area A represented less than 0.1 % The Wash wintering waterbird assemblage, with a peak count of 260 waterbirds.

A17.6.20 The adjacent saltmarsh, that will continue to be available within Area B, is much wider than in the area that would be lost and also provides a roosting habitat for waterbirds. The numbers of birds using the surveyed area was highly variable and birds seemed to move around the adjacent areas whilst feeding and roosting. The saltmarsh in the proposed development site provides a roosting area for some SPA/Ramsar species, albeit survey evidence suggests it is of poor quality (Environment Agency, 2014); however, on the basis of the survey data, the area immediately adjacent (i.e. Area B) is capable of supporting the same species and seems to support higher numbers when considering the daily and average count data. The numbers using the saltmarsh in these areas fluctuate widely and it is therefore not expected that the loss of the small area of saltmarsh habitat within Area A would represent an effect that could affect the ability of the wider area to support the same number of non-breeding birds.

A17.6.21 Studies on roosting sites in The Wash have been undertaken (Rehfisch, *et al*, 1996) based on extensive ringing data. The studies were looking into positioning of proposed intervals between roosting refuges based on movements of birds between roosts to ensure that birds could reach at least one refuge without excessive energy expenditure. To do this the study looked at how far waders dispersed between roosts. For redshank, it was concluded that roosting refuges should be placed 3.5 km apart in order to cater for 90 % (5.5 km and 9.5 km for 75 % and 50 % respectively) of the population being able to reach refuges by flights similar in distance to their between-roost movements. This would indicate

that waders will move between different roost sites within a given area that they use each year.

A17.6.22 The above conclusion appears to be supported by the count data that shows numbers of redshank reaching >1 % of the WeBS 5-year average on only one occasion out of eleven. The roost site was not supporting this level of use by redshank on each occasion, suggesting that redshank are likely to be using an alternative roost site elsewhere. It is likely, from the above information collated for the wader roost study, that roosts within the 3.5 km (and up to 9.5 km for some individuals) distance that redshank were shown to fly between roost sites will be used. This would indicate that alternative roost sites are available within The Haven that the redshank are using on a regular basis. There is also still the area of saltmarsh adjacent to the proposed development (within Area B), that links to the saltmarsh area that would be lost (on one side of Area A), which would still be available for roosting birds. This area of marsh showed higher average use by birds during the bird counts and provides a much wider area of marsh that is also used by higher numbers of redshank in general, compared to Area A.

A17.6.23 During operation however, it is recognised that this adjacent area of habitat (in Area B) would be close to sources of additional noise once the Facility is operational. This has been assessed in Section 10.4 of the ES. The change in noise levels from background levels has been investigated through noise modelling of potential sources including activities at the wharf and within the Facility. The findings of this investigation are that the predicted noise levels are similar to the baseline noise levels and that there is only a very small cumulative increase (maximum of 3.3 dB) at the closest receptor measured (**Table A17-7** and **Table A17-8**) (receptors locations are illustrated on **Figure 10.2**).

A17.6.24 **Table A17-7** and **Table A17-8** summarise the findings of the noise modelling during daytime and night-time. The increase predicted at Receptor 5 is used to inform this assessment as this is just across The Haven with open space between, so is most comparable in terms of location relative to the Facility to the location of the roost site. The sources of noise are variable for different areas of the Facility. Using the Waterbird Disturbance & Mitigation Toolkit (IECS, 2013) to determine the potential for impacts shows that at the cumulative levels of noise (most of which is already present as background levels, that the birds are already habituated to) there is potential for an occasional low-level behavioural response such as a heads-up. These values have been determined based on observed

responses of waterbirds (primarily mallard and redshank). Acceptable 'dose' levels are given as up to 70 dB(A).

Table A17-7 Daytime (0700-2300)

Receptor	Measured ambient noise level (dB)	Predicted noise level (dB LAeq,1hr)	Cumulative noise level (dB LAeq)[1]	Resulting change in noise level (dB)
R1	47.6	39	48.2	0.6
R2	47.6	38	48.1	0.5
R3	49.6	41	50.2	0.6
R4	55.5	44	55.8	0.3
R5	59.4	40	59.4	0.0
R6	59.0	37	59.0	0.0

1 - Decibel is a logarithmic scale so the cumulative noise level have been calculated accordingly

Table A17-8 Night-time (2300-0700)

Receptor	Measured ambient noise level (dB)	Predicted noise level (dB LAeq,15 min)	Cumulative noise level (dB LAeq)	Resulting change in noise level (dB)
R1	39.4	40	42.7	3.3
R2	37.3	37	40.2	2.9
R3	42.1	40	44.2	2.1
R4	52.7	47	53.7	1.0
R5	55.6	40	55.7	0.1
R6	46.5	38	47.1	0.6

A17.6.25 There is also potential for visual disturbance due to operational activities. The aggregate wharf is the part of the facility closest to Area B. This will be used for loading aggregate and it is expected that there would be an average of 2 vessels per week. Whilst these vessels are present there could be disturbance to roosting and feeding birds. For redshank, which are the birds present in highest numbers, the visual alert distances (according to the data in the toolkit (IECS, 2013)) are given as 250 m for unhabituated birds. This is where species show behavioural changes and most species will take flight or walk away moving to another area close by. It is expected that the birds using this area are habituated to vessel presence, given the number of vessels using The Haven and the narrow width of The Haven, and that they would habituate to some extent to the presence of the vessel and movements around the vessel. However, initially during

aggregate loading operations (twice a week) there could be some disturbance whereby redshank, and other waterbirds would relocate up to 250 m away on the saltmarsh habitat within Area B.

A17.6.26 In order to mitigate the loss of the roosting and foraging habitats for waders, but in particular, for redshank, works will be carried out to enhance the habitat within a Habitat Mitigation Area (see **Figure 1.1**), which is located at least 250 m away from the closest edge of the wharf, within Area B to improve the roosting and foraging habitat. This will involve the creation of shallow pools (10-15cm deep) in the existing marshy habitat; re-profiling the edges of existing pools and low profile banks; and, increasing the volume of 'roosting' rocks in the upper intertidal area. Redshank like to feed on the edge of pools but will also feed in water. The four pools created will diversify the existing habitat offering greater variety for feeding birds. Re-profiling the edges of existing pools and banks to provide gentle gradients will provide more feeding opportunities for redshank and other wading birds. Flattening and removal of the old, low profile bank in front of parts of the saltmarsh in this area is a key part of the works that would encourage redshank to use these areas. Redshank like to have a clear sightline when feeding and roosting and this would increase the sightline for the redshank. Relocating the rocks from Area A into the Habitat Mitigation Area would provide additional roosting areas for redshank in particular. The rocks are currently located along the frontage of the saltmarsh in Area A and B (see **Plate A17-2**). The rocks will be moved to the landward side of the existing line of rocks in Area B. This will increase the volume and height of roosting rocks. These works would be undertaken within the areas shown on **Figure 17.9**. The works are detailed in the Outline Landscape and Ecological Mitigation Strategy (OLEMS) and are secured by Requirement 5 of the draft DCO which requires a final Landscape and Ecological Mitigation Strategy to be approved which must be substantially in accordance with the OLEMS.

Plate A17-2 Rocks in Front of Saltmarsh

A17.6.27 It is concluded that mudflat and saltmarsh habitat loss would not constitute an adverse effect on the integrity for the SPA/Ramsar site. The habitat in the wider area (particularly with the mitigation measures outlined above) would be able to support feeding and roosting birds affected by the proposed Facility, with no negative effect on the supporting function that habitats within The Haven contribute to the structure and function of the SPA and Ramsar site. There is also not likely to be any negative effect due to operational noise at the facility, given the background noise levels and the very small increase predicted. There may be some visual disturbance within 250 m of the wharf, but this still leaves most of Area B available for roosting and feeding. The mitigation works proposed are outside of the 250 m range for visual disturbance thereby maximising the potential for encouraging roosting and feeding behaviour.

Vessel Transit Through The Wash

A17.6.28 For the construction and operational phases, vessels will be transiting through The Haven around high water and also within The Wash in the deeper channels for a greater duration of the tidal cycle. The highest numbers occur during the operational phase. The increase over baseline for the operational phase is therefore considered below, as a worst-case scenario.

A17.6.29 The shipping corridor is located within close proximity to the intertidal sandbanks in The Wash (within 200 m). This presents a likelihood for impact on all birds (waders, divers, ducks, etc.) that are utilising this suitable habitat, as well as those on the water.

A17.6.30 **Plate A17.1-3** shows the density of vessel movements in The Wash area, with the shipping channel to be used circled in red. As can be seen from **Plate A17.1-3**, the majority of the vessels are directed to / from Wisbech to the south (central shipping channel in **Plate A17.1-3**), King's Lynn (eastern shipping channel in **Plate A17.1-3**) and Boston (via The Haven) (the circled channel). At present, 77,441 vessels enter the whole of The Wash annually (212 vessels/day), as shown by the Vessel Density Grid Data 2015 from the MMO (MMO, 2017). The shipping channel used by vessels to access The Haven (shown within the red circle below) was used by approximately 11,000 vessels annually (according to an estimate derived from the marine traffic data below in **Plate A17.1-3** which would average at 30 vessels per day). Thus, in the context of The Wash, the increase in vessel numbers (i.e. approximately 580 additional commercial vessels plus pilotage) using the same shipping corridors as existing vessels, even during the operational period of the Facility, will be a small increase compared to the number already present within The Wash. The area of the shipping corridor that will be used for the Facility

is 10.46 km^2, which represents approximately 1.7 % of the total area of The Wash SPA (approximately 622 km^2).

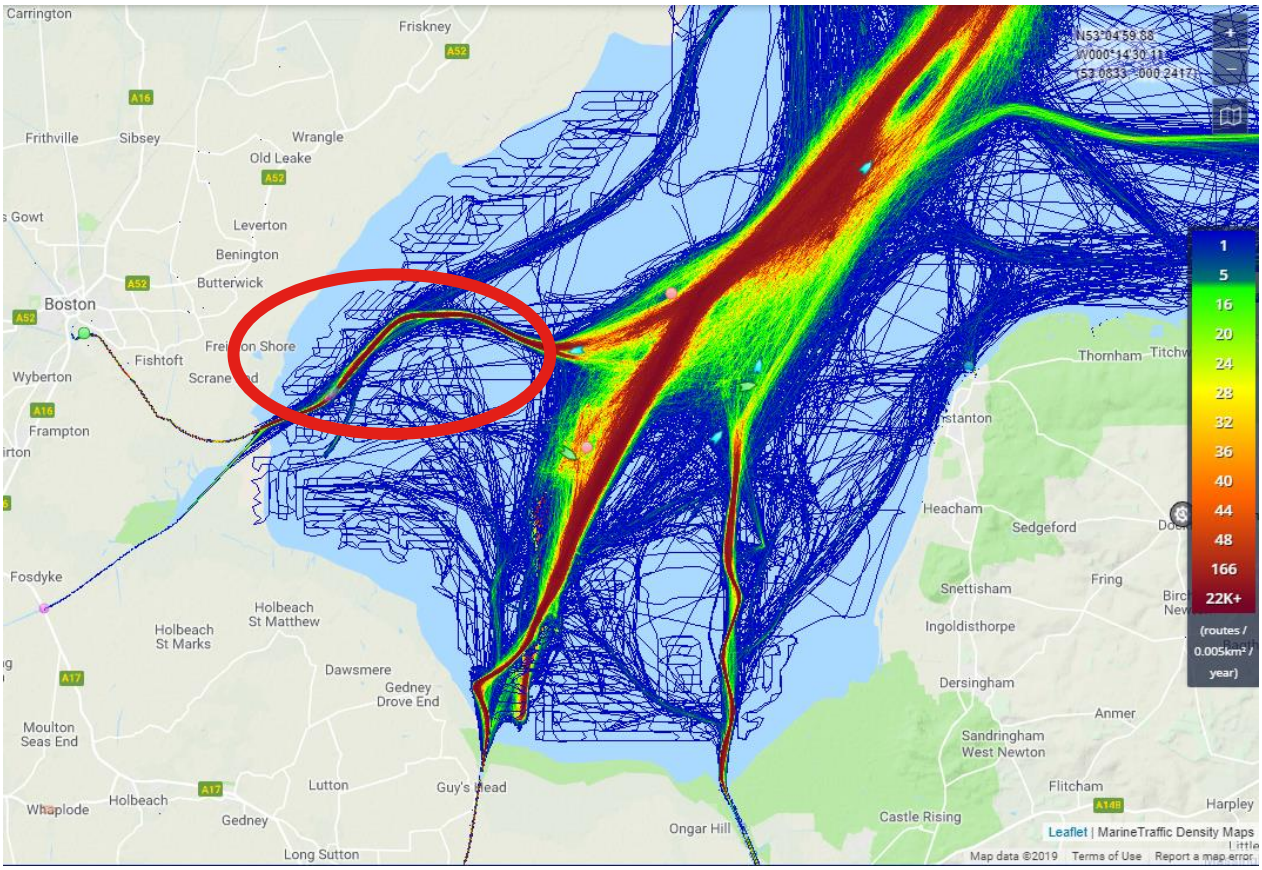

Plate A17.1-3 Marine Traffic Density Map from 2017. The Shipping Channel for the Facility is Circled in red. The Colour Scale on the Right Represents Vessel Movements per 0.005 km^2 per Year. Source: Marine Traffic - https://www.marinetraffic.com/

A17.6.31 A wide range of recreational and other activities currently take place in The Wash. In a review carried out by Natural England (2010), which focused on the risks from ongoing activities within the protected sites in The Wash, the area covering the proposed shipping channel was not highlighted as one of the sites at high risk to the protected features from commercial vessel movements. As such, considering the existing shipping activity within The Wash and the shipping channel, it is not anticipated that the increased shipping activity would result in an additional disturbance effect on the birds utilising this wider area.

Vessel Transit Through The Haven

A17.6.32 In the more localised area focused on the mouth of The Haven, vessels will be moving into the mouth of The Haven at around high water in order to transit through to the Facility. Given that the total number of commercial vessels is currently in the order of 420 per year through The Haven an increase of 580 vessels during the operational phase of the proposed Facility is considered to be high. However, between 2014 and 2019 ship numbers varied between 371 and 524 per year as discussed in **Chapter 18 Navigational Issues**. The Port of Boston has also indicated that there were years when there were higher numbers of vessels, including 1986/87 where a large number of grain exports occurred which would have increased vessel numbers up even higher, although the Port does not have the logs for this. This was just prior to the designation of the SPA in 1988. The vessels that will be using The Haven during the operational phase are similar in size to the commercial vessels currently using The Haven. Currently, large vessels transit on average once per day but anecdotal evidence from the Boston Harbour Master indicates that there are approximately 20-25 % of days per year when large vessels do not transit The Haven and also days when more than one large vessel transits, as seen during the behavioural monitoring of birds at the mouth of The Haven. It is generally the larger vessels that cause the disturbance to birds, as discussed further below. The shipping levels currently using The Haven and those forecast through the construction and operation of the facility are detailed further in **Chapter 18 Navigational Issues**.

A17.6.33 Monitoring surveys undertaken to record bird behaviour in this area showed an impact of disturbance due to vessel presence and movement in the mouth of The Haven (Bentley, 2020) based upon current vessel movements observed during the surveys. The effect of an increase in the number of vessel movements may therefore be an increase in the frequency of disturbance events to birds in the area.

A17.6.34 This effect is not likely to affect the feeding usage of the intertidal mudflats as the vessels will only be entering the Haven and berthing to unload around high water due to the restricted depth of water. At high tide, however, the proposed increase in vessel movements may increase the frequency of disturbances to roosting birds. This effect is likely to occur all the way along the Haven to the Facility,

although most of the effect will be in and around the mouth of The Haven where roosting sites are more numerous.

A17.6.35 The monitoring that was undertaken at the mouth of The Haven found that, overall, 24 bird species altered their behaviour due to boat presence or wash. Most bird disturbance occurred in small numbers, but disturbance to black-tailed godwit, redshank, oystercatcher, shelduck, turnstone, dark-bellied Brent goose, golden plover and lapwing occurred in significant numbers (i.e. more than 1 % of the Wash population, based on the WeBS 5-year average from The Wash at the time of the survey (between 2013/14 and 2017/18)).

A17.6.36 The following summarises the peak numbers of birds disturbed, expressed as a percentage of The Wash population: 220 redshank (3.9 %); c.700 oystercatchers (3.6 %); 36 shelduck (1.1 %); c. 250 dark-bellied Brent geese (1.7 %); 18 turnstone (2 %); c1,100 lapwing (7.53 %); c. 3,000 golden plover (21.2 %) and c. 2000 black-tailed godwit (23.8 %), which is also over double the count required to identify a site holding internationally important numbers.

A17.6.37 Changes in bird behaviour varied depending on the type of river traffic. The vast majority of birds that displayed a change in behaviour were disturbed due to river traffic presence, with fewer affected instead by ship wash. The larger counts of birds disturbed were caused by the large cargo ships, although smaller vessels did also cause disturbance. Wash caused by small boats varied; most fishing/private vessels caused very little wash on the mudflats, whereas the pilot boat caused a much higher wash on some occasions, similar to that of the large cargo ships, likely due to the speed at which it was travelling.

A17.6.38 As pilots will be accompanying the large vessels associated with the Facility into The Haven, there is also a requirement for a higher number of pilots to be transported out to the larger vessels. As each pilot vessel can transport up to 6 pilots, the majority of the time it should therefore be possible that only one pilot boat is required (as at present on the majority of occasions). However, there will be occasions when two pilot boats are required to transport the pilots to the vessels. The movements of the pilot boat generally do not cause disturbance as they are of smaller size, although, it is recognised that some of the pilot boat movements do cause disturbance through the wash that they create. Discussions with the Boston Harbour Master have identified that in the past, when there were significantly more, but smaller vessels, it was not uncommon to be using two pilot vessels operating at the same time. There are also occasions

when the pilots travel out of The Haven on a departing vessel and return on an incoming vessel without the need for the pilot boat. The planning of such will be highly dependent on the timings, water levels and ships draughts.

A17.6.39 At the river mouth, following disturbance all birds either returned to the same area or found another roosting/feeding location. Some of the alternative sites were approximately 800 m away from the original roost site. Repeated flights as a result of disturbance may cause the birds to deplete important energy reserves. There were also occasions where the birds were having to fly some distance to avoid the vessel, having been disturbed.

A17.6.40 The increase in the number of vessels during operation could increase the frequency of occurrence of this disturbance effect. However, it is important to note that all of the vessels arriving into/departing from The Haven will be travelling at the same time of day to take advantage of the high tide window, which provides a window of 3.5 hours during spring tides, which represents the worst case, however, in reality, the vessels seem to enter and leave The Haven over a period of approximately 60 minutes, as observed during the bird behaviour monitoring at the mouth of The Haven. As such, the period during which the frequency of disturbance events will be increased is limited over each tidal cycle. After the commercial vessels have passed and the tidal window has closed, those birds that may be displaced from the site would be able to return to the grounds undisturbed by such shipping movements. The short tidal window also means that the risk of repeated flights by species exhibiting a flight and return response to disturbance is minimised.

A17.6.41 The bird data collated for disturbance events (Bentley, 2020) has been analysed in detail below. A summary table of the data is also provided in **Appendix A17.1.2.4**.

A17.6.42 The effect has been considered in two stages. Firstly, the effect prevailing under the baseline situation where vessels currently travel through The Haven (and will continue to do so) is analysed. This activity has occurred for many years and numbers of birds within The Wash SPA do not appear to have been affected overall. The number of birds present at the time of designation in 1988 and

subsequent periods is shown in **Appendix A17.1.2.4** and shows that for most species numbers fluctuate but have generally increased since designation.

A17.6.43 The second stage is to consider the additional vessel movements and the potential effect that this could have on the birds using the roost sites around The Haven, in the context of the baseline disturbance effects.

A17.6.44 A descriptive table of the behavioural responses exhibited in response to vessel disturbance events during the survey (Bentley, 2020) is provided in **Appendix A17.1.2.4**, where bird species affected more than once in a single survey visit are highlighted (i.e. to determine species where repeat disturbance responses may have occurred). Many of the species affected by disturbance at the roosting sites around the mouth of The Haven fly to an alternative roost site after one disturbance episode and therefore do not display repeated responses. SPA qualifying species generally fly off to alternative roost sites where they appear to be outside of the range of disturbance for subsequent vessel movements. Although this is not a desired outcome, it does show that they are not subjected to repeated disturbance events which could have a detrimental effect on energy reserves. The species that do seem to be affected by repeated disturbance events are lapwing and golden plover, which regularly returned to the same roosting site following disturbance events.

A17.6.45 The large cargo vessels were observed during the surveys to enter and leave The Haven within a time period of up to 60 minutes around high water. The tidal window at spring tides is, however, up to 3.5 hours and it takes approximately 60 minutes to transit The Haven. After this, it appeared that any disturbance is mainly due to smaller vessels travelling relatively fast and causing disturbance through presence of the vessel or the wash created.

A17.6.46 The survey data showed that the following SPA / Ramsar qualifying species were affected by disturbance during the baseline survey (Bentley, 2020), but in numbers that are not significant in the context of The Wash population (i.e. less than 1 % of the total population recorded from the 5-year WeBS average):

- Dunlin;
- Knot;
- Eider;
- Wigeon;

- Black-headed gull;
- Curlew; and,
- Grey plover.

A17.6.47 **Table A17-9** below summarises disturbance events where significant numbers of SPA qualifying features or assemblage components displayed behavioural responses. 'Significant numbers' in this instance refers to numbers representing more than 1 % of the 5-year average WeBS count in The Wash for a given species at the time of the surveys (2013/14 to 2017/18). Additional surveys undertaken during the winter of 2021 are showing consistent results with lower numbers of waders present at the mouth of The Haven and higher numbers of gulls during the January counts. The largest quantity of birds that changed their behaviour in the latest counts (January and February 2021) were c. 425 lapwing as a result of disturbance by the pilot boat during the February count. Large flocks of lapwing were observed regularly at the mouth of The Haven during the observations in the winter of 2019/20 and seemed to be relatively low sensitivity to disturbance of vessels as they returned to the same locations after multiple disturbance events. They did undertake short flights during disturbance events and so would have had additional energy usage which has been calculated in the analysis provided below.

Table A17-9 Summary of disturbance events affecting >1 % of The Wash population.

Species in bold are qualifying features of the SPA in their own right. Highlighted entries represent instances where repeat disturbances were observed for a given species on a single visit. Green indicates a first repeat, yellow a second repeat, red a third repeat.

Time	Vessel type	Species	No.	% of WeBS 5-year avg.	Response	Comments
Survey 1: 22 Nov. 2019						
1406	Large cargo ship	Ringed plover	40	3.16	Flight / return after 45s	Roost affected by ship wash, which can be mitigated through speed restrictions
1426	Large cargo ship	Lapwing	200	1.37	Displacement by 300 m	
		Turnstone	18	1.98	Flight / return after 60s	
1440	Fishing boat	No behavioural responses in significant numbers				
1452	Pilot	No behavioural responses in significant numbers				
Survey 2: 19 Dec. 2019						
0938	Pilot	Golden plover	750	5.3	Flight / return after 90s	
		Lapwing	500	4.11	Flight / return after 90s	
1009	Large cargo ship	Lapwing	1,100	7.53	Flight / return after 90s	
		Black-tailed godwit	c.2,000	23.88	Displacement	
		Golden plover	c.3,000	21.21	Flight / return after 90s	
		Redshank	220	3.85	Displacement	

Time	Vessel type	Species	No.	% of WeBS 5-year avg.	Response	Comments
		Cormorant	10	2.07	Displacement by 200 m	A maximum of 2 individuals (0.41 % of the population) had been disturbed at 0946, i.e. for most individuals this was the first event.
1045	Small boat	Lapwing	c.500	3.42	Flight / return after 120s	
1107	Cargo ship	Lapwing	c.1,000	6.84	Displacement by 800 m	Eventual displacement after repeated flight and return responses.
		Golden plover	c.500	3.53	Displacement by 800 m	Eventual displacement after repeated flight and return responses.
		Mallard	55	4.25	Displacement by 100 m	
1115	Small boat	Mallard	50	3.86	Displacement by 150 m	This likely represents a group of birds that were displaced and then subsequently moved further away.
1136	Pilot boat	No behavioural responses in significant numbers				
Survey 3: 17 Jan. 2020						
0912	Pilot	**Turnstone**	22	2.41	Displacement by 100 m	Disturbed by ship wash
0912	Fishing boat	**Oystercatcher**	c.700	3.56	Displacement by 250 m	
		Lapwing	c.600	4.11	Displacement by 250 m	
		Brent goose	c.250	1.70	Displacement by 300 m	

Time	Vessel type	Species	No.	% of WeBS 5-year avg.	Response	Comments
0937	Pilot	No behavioural responses in significant numbers				
0943	Large cargo ship	Lapwing	c.800	5.48	Flight / return after 90s	
		Black-tailed godwit	c.200	2.39	Flight / return after 90s	A maximum of 5 individuals (0.06 % of the population) had been disturbed earlier in the day, i.e. for most individuals this was the first event.
1102	Fishing boat	No behavioural responses in significant numbers				
Survey 4: 17 Feb. 2020						
1223	Cargo ship	**Shelduck**	36	1.13	Displacement by 800 m	Displacement during initial disturbance resulted in no significant disturbance from consequent vessel transits.
		Teal	54	1.61	Displacement by 800 m	
1227	Cargo ship	No behavioural responses in significant numbers				
1251	Cargo ship	No behavioural responses in significant numbers				
Survey 5: 12 Mar. 2020						
0648	Cargo ship	**Oystercatcher**	c.300	1.52	Displacement by 800 m	
		Turnstone	15	1.65	Displacement by 800 m	

A17.6.48 Of those species that were disturbed to a greater degree (i.e. those referred to in the above table), the data has shown that some species generally fly off to alternative roosts after just one disturbance event. These species are redshank, oystercatcher and, to an extent, black-tailed godwit. It is not expected therefore that the proposed increase in vessel numbers transiting through The Haven would result in significant disturbance to these species (i.e. birds displaced by an initial disturbance event would not be affected by subsequent vessel transits through the Haven, regardless of frequency). Further information on the monitoring observations of species exhibiting a flight and displacement response is provided below.

A17.6.49 **Redshank:** On one occasion, a significant number (220 individuals, or 3.9 % of The Wash population) was disturbed from a roost site, although they were displaced from the site and were not, therefore, affected by subsequent disturbance events during the rest of the survey visit. This was broadly the case across all survey dates (though in other survey visits numbers affected were less than 0.7 % of the SPA population), indicating that, generally speaking, disturbances by vessels at the mouth of the Haven result in a displacement of redshank from the roost, rather than repeated effects on constantly returning individuals.

A17.6.50 Given that the displacement response indicates other suitable habitats are locally available for roosting (such as the saline lagoons at Freiston Shore RSPB reserve and intertidal areas in The Wash outwith the disturbance range), it is likely that, once initially disturbed, there would be movement away from the affected location and there would be no further effect from an increased frequency of vessel movement during the high tide window.

A17.6.51 Redshank are very tolerant to moderate and high-level disturbances (Cutts *et al*., 2013); therefore, it is likely that the presence of ship wash over the roosting ground is more likely to result in displacement than the presence of the vessels themselves. Control of speed restrictions in The Haven / approach to the Haven for vessels for the Facility could be used to mitigate disturbances caused by ship wash, reducing the likelihood of disturbance / displacement in the first instance.

A17.6.52 It is important to note that during periods of maximum foraging potential for redshank at the mouth of the Haven (i.e. at and around low tide) there will be no increase in vessel access given the draft requirements of the larger cargo vessels. Consequently, there will be no change in the baseline vessel traffic for

large periods of the day, including all low tide periods when there is maximum foraging potential for redshank.

A17.6.53 **Oystercatcher**: On two separate dates, a significant proportion (up to 700 individuals, or 3.6 % of The Wash population) was disturbed, although most (if not all) were displaced from the roost and were therefore not affected by subsequent disturbance events during the rest of the survey visit. This was broadly the case across all survey dates (though in other survey visits numbers affected were less than 1 % of the population), indicating that, generally speaking, disturbance by vessels at the mouth of the Haven result in a displacement from the site, rather than repeated effects on constantly returning individuals (as with redshank).

A17.6.54 As stated for redshank, during periods of maximum foraging potential for oystercatchers (i.e. at low tide when Black Buoy Sand and the Freiston foreshore is exposed), there will be no increase in vessel access given the draft requirements of the larger cargo vessels, therefore there will be no change in the baseline during periods of maximum foraging activity. Again, nearby sites such as the saline lagoons at Freiston Shore RSPB reserve, saltmarsh at Frampton Marsh and The Scalp and areas of mudflat outwith the disturbance radius of the navigation route are expected to be suitable as an alternative roosting location for oystercatchers displaced from the mouth of the Haven.

A17.6.55 **Black-tailed godwit:** Black-tailed godwit were disturbed on three out of the six survey dates. Disturbance of significant numbers of black-tailed godwits was reported during the surveys, including on one occasion around 2,000 individuals (representing c.25 % of the most recent population counts in the Wash), indicating that the mouth of the Haven is occasionally used by a large proportion of the SPA population. This is a tactile feeding species that largely forages in intertidal mudflats and very shallow water (including saline lagoons), therefore peak foraging activity is again likely to be undertaken at low tide when there will be no change in baseline vessel traffic.

A17.6.56 During the two surveys in which godwits were seen to respond to vessel movements, one occasion resulted in a return of around 200 individuals (2.4 % of The Wash population) to the roosting site following disturbance by a large cargo vessel and the other saw displacement from the site by around 2,000 individuals (just less than 25 % of The Wash population). The fact that the larger response was a displacement response indicates that this is a viable tactic for

this species in this location and there is suitable alternative habitat locally. As with other species, an abandonment response to vessel disturbance would indicate that an increase in the frequency of vessel movements over high tide would be unlikely to significantly alter the magnitude or frequency of disturbances.

A17.6.57 The smaller group of birds returning to the site indicates that there may be potential for subsequent disturbance events for a small proportion of individuals but as the higher number of birds disturbed flew elsewhere it is clear that there are alternative roost sites that can, and do, get used by the disturbed birds.

A17.6.58 Again, nearby sites such as the saline lagoons at Freiston Shore RSPB reserve, saltmarsh at Frampton Marsh and The Scalp and areas of intertidal outwith a disturbance radius of the navigation route are expected to be suitable as an alternative roosting location for black-tailed godwits displaced from the mouth of the Haven.

A17.6.59 **Turnstone:** Turnstones will equally feed at high tide and low tide, so both foraging and roosting behaviour may be interrupted by vessel disturbances, although they are considered to be very tolerant to moderate and high-level disturbance and can habituate rapidly (Cutts *et al*., 2013) During the surveyed period, turnstone displayed disturbance responses on three separate dates, up to a maximum of 18 individuals (around 2 % of The Wash population). On all three occasions, some or all were displaced from the site a short distance (maximum 300 m), although on one occasion a total of 15 birds returned to the roost site following disturbance. On no occasion was there any repeated disturbance effects. This suggests that there are suitable nearby sites to which birds can locally redistribute following a disturbance event, and the fact that there were no repeat disturbances (even during subsequent passage of large cargo vessels) indicates that an increase in vessel frequency would not cause an increase in disturbance effect for this species.

A17.6.60 **Shelduck**: in most instances, the number of shelduck affected by disturbance effects was less than 1 % of the SPA population and effects of that scale would not have a significant effect on the distribution and population of shelduck across the wider SPA. On one occasion a slightly higher number were displaced from the site (representing just over 1 % of the most recent 5-year WeBS average). However, given that this species generally displayed a displacement response, rather than returning to the same site following disturbance, at no point was there

a repeat disturbance response by a significant number of birds. As with the other qualifying features that displayed a displacement response rather than flight and return, an increase in the frequency of vessel movements over the high tide window would be unlikely to materially alter the magnitude or frequency of disturbance. The spatial extent effect would not change, given that vessels would continue to use existing navigation routes.

A17.6.61 **Dark-bellied brent goose**: Brent geese are considered to be highly sensitive to disturbances (Cutts *et al.*, 2013). There was only a single occasion during the surveys in which disturbance responses from Brent geese were recorded (250 birds, representing 1.7 % of The Wash population).

A17.6.62 Based on this single observation, the response to vessel disturbance manifested as flight and displacement to an alternate nearby location where foraging then commenced. Again, this suggests that increased frequency of vessel disturbances over high tide would not increase the disturbance levels (i.e. a first event would cause displacement of geese to nearby undisturbed areas therefore would be unlikely to be affected by a change in the frequency of subsequent effects during the same high tide period). There would be no change in the spatial extent to which these effects would occur (vessels would continue to use existing navigation routes into and out of the Haven).

A17.6.63 Brent geese will roost on water and also in coastal areas, therefore nearby sites outwith a disturbance radius of the navigation route would offer alternative roosting locations for those displaced during high tide periods. This may include subtidal / inundated intertidal areas plus saltmarsh / coastal fields at The Scalps, Frampton Marsh RSPB reserve and Freiston Shore RSPB reserve.

A17.6.64 Species that were affected by repeated disturbance events (notably lapwing and golden plover, and on one occasion, black-tailed godwit) were due to the fact that they displayed a tendency to return to roost sites at the mouth of The Haven once initial disturbances had passed. These species are more likely to be affected by increased frequency of vessel traffic during high tide windows since an increase in the number of disturbances over a set period of time would increase the energy expenditure from repeated flight and return responses. Further information on the observed responses by lapwings and golden plover are provided below.

A17.6.65 Lapwing and golden plover are not qualifying features of the SPA in their own right but do form a component of the non-breeding waterbird assemblage. The

5-year assemblage mean in the most recent WeBS counts for The Wash was 399,238 individuals (2014/15 to 2018/19). The peak number of lapwing disturbed during the survey visits (1,100) represents 0.3 % of the total assemblage recorded. The peak number of golden plover (3,000) represents 0.8 % of the total assemblage.

A17.6.66 Both lapwing and golden plover will frequently roost together in large groups. Both species displayed a preference during the survey to return to roosting sites following disturbance, usually after a period of flight of around 60-90 seconds (as a worst case up to 120 seconds), although repeated disturbances did on occasion lead to displacement, indicating that a displacement response is viable and there is suitable alternative habitat locally.

A17.6.67 In terms of foraging, lapwings and golden plovers preferentially feed on grazing fields, cultivated land and coastal fields/saltmarsh, often inland, and would not be affected by changing vessel traffic in the Haven at high tide. Where feeding on intertidal habitats is necessitated, this would be optimal at low tide when mud/sand is exposed, during which times there would be no change in the baseline vessel traffic.

A17.6.68 Energy cost per flight have been calculated for lapwing and golden plover due to these repeat disturbance events. Energy cost per flight can be calculated using an equation from Kvist *et al.*, 2001 (as used in Collop *et al.*, 2016, regarding energy costs of wintering waders responding to disturbance in the Wash), where the $Cost\ (kJ) = (10^{0.39} \times M^{0.35}\text{-}0.95)/1000 \times S$; (where M = body mass (g) and S = flight time (s)).

A17.6.69 The body mass of lapwing is 140 to 320 g, and the body mass of golden plover is 160 to 280g (taken from RSPB website). The flight time is considered to be the worst case recorded in the surveys (i.e. 120 seconds). With this in mind, the energy cost per flight for lapwing is between 1.546 and 2.104 kJ, and the energy cost per flight for golden plover is between 1.626 and 2.003 kJ.

A17.6.70 The thermal neutral requirements for wading birds has been calculated using Nagy *et al*., 1999 (again as used in Collop *et al.*, 2016): where the $Energy\ requirement\ (kJ) = 10.5 \times M^{0.681}$; (where M = body mass (g)). Using this calculation, the daily energy requirement for lapwing is between 303.88 and 533.58 kJ, and the daily energy requirement for golden plover is between 332.81 and 487.20 kJ. As such, the cost per flight as a percentage of the daily intake requirement for each species can be calculated. For a lapwing, each 120-second

flight response would represent around 0.39 % to 0.51 % of its daily energy intake requirements. For a golden plover, each flight would represent around 0.41 % to 0.48 % of its daily energy intake.

A17.6.71 As an example, an additional (theoretical) four vessel transits per day would result in an increase in daily energy requirements of up to 2 % for lapwing and golden plover. As such, the predicted impacts of additional energy expenditure on these species when responding to an increase in vessel disturbance is therefore very low. These calculations are based on an assumption of 120-second flights, although it should be noted that in most instances flight times were considerably shorter than 120 seconds (in most cases half of this), therefore energy costs are likely to be lower than 2 %.

A17.6.72 There was also a disturbance event to black-tailed godwit on the 17th January 2020 where a pilot vessel disturbed c.200 individuals, which circled for 90 seconds before returning to their roost site. This would have expended energy for these individuals who could then have potentially been further disturbed by subsequent events. However, as mentioned previously, displacement from the site is an equally viable response for this species.

A17.6.73 In view of the SPA's importance for the wintering assemblage of waterbirds in the Wash, it is important to consider the effects of disturbance on the assemblage as a whole, as well as considering individual component species. The peak number of birds that responded to a single vessel disturbance event was in December 2019, when a total of 6,980 individuals (largely from roosting flocks of golden plover, black-tailed godwit and lapwing) took flight. This represents around 1.8 % of the most recent WeBS 5-year average in The Wash and suggests that significant numbers may be affected by initial disturbance from the passage of large cargo ships. However, far fewer birds took flight as a consequence of subsequent disturbance events (i.e. less than 1 % of the SPA population) each time. This indicates that most birds affected were displaced elsewhere following the first event, indicating that an increase in the frequency of vessel transits over the high tide period would not significantly increase the

risk of disturbance-related effects such as excess energy exertion – most birds would already have been displaced by those initial vessel movements.

A17.6.74 Again, it is worth noting that the main foraging activity is likely to take place at low tide, when vessel traffic would be unchanged from the existing situation. As such, it is mostly roosting birds that would be affected.

A17.6.75 The monitoring has shown that although the sensitivity of the birds is high to an initial disturbance, most of the birds fly off to alternative roost sites and are not disturbed again. As the baseline situation includes large vessels transiting regularly through The Haven, the sensitivity for most species to repeat disturbances is low or negligible. For those birds that habitually return to the same roosting site and are disturbed again on subsequent visits (primarily lapwing and golden plover), the energy usage for the additional flights seems to only represent a small percentage of additional usage, mostly thought to be due to the short flights that arise as a result of disturbance. For the SPA/Ramsar site waterbird assemblage as a whole, although the initial disturbance event showed high levels of disturbance, any subsequent events were below 1 % in terms of the assemblage disturbed.

A17.6.76 The disturbance monitoring covered the area of marsh habitat at the mouth of The Haven. In terms of any disturbance occurring elsewhere along the shipping channel and along The Haven itself, it is expected that these areas are already subjected to the same baseline levels of disturbance as at the mouth of The Haven and therefore any additional vessel traffic as a result of the proposed facility would equally not have a significant additional effect on birds.

A17.6.77 Vessel movements have been taking place through The Haven for at least the last 100 years with numbers varying over the years. Therefore, it would seem reasonable to assume that the disturbance to birds at the mouth of The Haven is not having an overall effect on distribution and numbers of birds in the SPA. The fact that high bird numbers are still observed at the mouth of The Haven shows that the roost site is still used despite the disturbance events.

A17.6.78 The disturbance events only happen around the high water period within a possible maximum tidal window around the mouth of The Haven of up to 3.5 hours as a worst case during spring tides, but in reality, this appears to be a window of approximately 60 minutes given the observations of vessel movements during the surveys. It is estimated to take the larger vessels approximately 60 minutes to transit from the Port of Boston to The Wash. The

Haven is largely a one-way channel for large vessels but passing is possible in localised areas of the channel. The disturbance only therefore occurs for a maximum of 7 hours in any 24-hour period, with 3.5 of those hours happening at night-time when visual disturbance is expected to be less, particularly in the winter period.

A17.6.79 There are no large vessel movements outside of these periods so the remaining low tide feeding areas are not affected by such movements. These areas are therefore expected to provide a good foraging resource for birds at all times when the mudflats are exposed. It seems likely that the birds use the areas at all other states of the tide and use alternative nearby roosting sites during the periods when the larger vessels transit through The Haven.

A17.6.80 It is recognised that there are currently approximately 840 vessel movements and that there will be some days when there are no large vessels currently transiting The Haven. Anecdotal evidence from the Boston Harbour Master indicates that there were around 20-25 % of days with no throughput of larger vessels during 2020. During the predicted operation of the proposed facility there would be vessels transiting through The Haven every day. An increase of 46 days (from 137 days to 183 days of the total overwintering period) disturbance results from the predicted increase in larger vessels due to the Boston Alternative Energy Facility. Given that the birds appear to have adapted to the long-term baseline disturbance by flying to alternative nearby roost locations then it is reasonable to assume that they would continue to do this. The alternative roost sites are obviously providing enough roosting areas to sustain these populations over the long term, with the baseline levels of disturbance and are at such close distances to ensure minimal additional energy usage. **Figure 17.10** shows the location of alternative habitats in the area around the mouth of The Haven and shows that there are many areas of habitat that could still be available for roosting, particularly along the Freiston Shore. It is therefore expected that the same behavioural response would occur for the disturbance in the days when previously no large vessels came through The Haven.

A17.6.81 In light of the assessment above, it is not considered that SPA or Ramsar qualifying features, including the overall assemblage, would experience

significant disturbance effects due to the increase in vessel numbers using The Haven.

A17.6.82. The assessment of disturbance effects indicates that there could be an additional effect (i.e. over baseline conditions) on bird populations using The Wash SPA and Ramsar site and The Haven (as functionally linked habitat) which could be disturbed from vessel presence and noise, loss of intertidal area and lighting at the proposed development site. However, the potential effects are not predicted to be significant in light of the conservation objectives of the protected site. It is concluded that there would not be an adverse effect on the integrity of The Wash SPA in relation to the conservation objectives (this conclusion also applies to the Ramsar site). The HRA integrity matrices are provided in **Appendix A17-1-2.**

A17.6.83 There are not expected to be any in-combination effects on the birds using The Wash SPA and Ramsar site from any known projects that are proposed or any ongoing maintenance activities. The rationale for screening out likely significant in-combination effects has been provided in **Table A17-5**.

The Wash and North Norfolk Coast SAC

A17.6.84 Harbour seal come ashore in sheltered waters, typically on sandbanks and in estuaries, but also in rocky areas. Harbour seal regularly haul-out on land in a pattern that is often related to the tidal cycle (SCOS, 2018). Harbour seal give birth to their pups in June and July and pups can swim almost immediately after birth (SCOS, 2018). Harbour seals moult in August and spend a higher proportion of their time on land during the moult than at other times (SCOS, 2018).

A17.6.85 Harbour seal take a wide variety of prey including sandeels, gadoids, herring and sprat, flatfish and cephalopods. Diet varies seasonally and regionally. Prey diversity and diet quality also showed some regional and seasonal variation (SCOS, 2018).

A17.6.86 Harbour seal normally forage within 40-50 km around their haul out sites. Although, tracking studies have shown that harbour seal can travel 50-100 km offshore and travel 200 km between haul-out sites (Lowry *et al.,* 2001; Sharples *et al.,* 2012). Harbour seal exhibit relatively short foraging trips from their haul

out sites. The range of these trips does vary depending on location and the surrounding marine habitat.

A17.6.87 The location of the proposed Facility site is approximately 8 km from the mouth of The Wash. However, it is only 3 km (at its closest point) from the most northern extremity of The Wash and North Norfolk Coast SAC (**Figure 17.1**), which includes the harbour seal, as a qualifying feature. Havenside Local Nature Reserve (LNR) is also nearby (**Figure 17.1**), and observations of harbour seals have been made (although rarely) within The Haven.

A17.6.88 The extensive intertidal flats at The Wash provide ideal conditions for the breeding and hauling-out of the harbour seal. The seal colony present in The Wash is the largest colony of harbour seals in the UK, containing 7 % of the total UK population.

A17.6.89 The final 5 km of The Haven before it reaches The Wash is part of The Wash and North Norfolk Coast SAC. As noted above, occasional harbour seal sightings have been observed within The Haven, although in much smaller numbers than within The Wash itself. As such, it is likely that the seals utilise the subtidal in The Haven on occasions whilst foraging in the area. One individual seal was observed in The Haven channel close to the Application Site by Royal HaskoningDHV staff during the site visit on the 8th October 2018. As reported in the Boston Barrier Environmental Statement (ES), there are no other recent records of harbour seals within 2 km of the Facility area (Environment Agency, 2014).

A17.6.90 Marine Scotland commissioned the Sea Mammal Research Unit (SMRU) to produce maps of grey seal distribution in UK waters (Russell *et al.,* 2017). These maps were produced by combining information about the movement patterns of electronically tagged seals with survey counts of seals at haul-out sites. The resulting maps show estimates of mean seal usage (seals per 5 km x 5 km grid cell) within UK waters. The maps indicate that harbour seal usage is high in and around the shipping channel for the Facility and anchorage area, with a harbour seal density of 3.189 per km^2 within the shipping channel and anchorage location (**Figure 17.5**; Russel *et al.,* 2017). This is similar to the harbour seal density within the whole of The Wash, with an estimated density of 3.2 per km^2, based

on the data provided by Russel *et al.* (2017). The harbour seal density is lower within The Haven itself, with an estimated density of 0.80/km^2.

A17.6.91 There is an estimated 4,965 harbour seal in the south-east England Management Unit (MU), based on the most recent August counts (2017) at haul-out sites (Special Committee on Seals (SCOS), 2018). The August 2017 counts of harbour seal at haul-out sites on the south-east coast of England were 290 at Donna Nook, 3,210 at The Wash, 399 at Blakeney Point, 271 at Scroby Sands and 694 along the Essex and Kent coast (the Essex and Kent sites were not surveyed in 2017, and so the 2016 count is noted here) (SCOS, 2018).

A17.6.92 The haul-out sites in The Wash and adjacent to the proposed shipping channel have been shown in **Figure 17.6**. Within The Wash, there are a number of different harbour seal haul-out and pupping sites (a total of 50 sites within The Wash; **Figure 17.6** (SCOS, 2018)). Of these sites, none are located within 500 m of the anchorage location and shipping channel to be used for the proposed Boston project, with the closest site being the Friskney South site, at approximately 790 m from the shipping channel (**Figure 17.6**).

A17.6.93 The 2018 count (Thompson, 2019) of harbour seals of the three closest sites to the shipping channel and anchorage location (**Figure 17.6**) recorded a total of 38 adults and 16 pups at Friskney South, seven adults and no pups at the Rodger site (approximately 830 m from the shipping channel), and one adult and one pup at the Ants site (approximately 970 m from the shipping channel, and 2.1 km from the anchorage area). This equates to a small proportion of the total harbour seal count, of 3,747 adults (1.2 %) and 1,498 pups (1.1 %) in 2018 (Thompson, 2019). The nearest site with a significant number of harbour seal is Kenzies Creek (4.05 km from the shipping channel), with 143 adults and 94 pups recorded in 2018 (3.8 % of all adults recorded in The Wash, and 6.3 % of all pups).

A17.6.94 In the assessments of impacts on the harbour seal population, the following density and reference populations will be used:

- Harbour seal density at the Facility:
  - **0.80 / km^2** (to take account of the expected lower number of harbour seal present within The Haven).
- Harbour seal density for the project:
  - **3.189 / km^2** (to take account of the high number of harbour seal expected

to be present within the shipping channel and anchorage area).

- Harbour seal reference populations:
  - **4,965** in the south-east England MU; and
  - **4,146** in The Wash and North Norfolk Coast SAC (based on the most recent count of 3,747 harbour seals within The Wash proper, and 399 harbour seals at Blakeney Point, which is also part of The Wash and North Norfolk Coast SAC).

A17.6.95 It is acknowledged that, at the time of the DCO application submission, more recent data on harbour seal within The Wash was available (SCOS, 2019). The reference population is similar in both reports (4,961 in the updated south-east England MU (SCOS, 2019). As the updated harbour seal data (within SCOS, 2019) was not significantly different to that within the data used in this assessment (SCOS, 2018), the resultant impact assessments have therefore not been updated.

Underwater noise impacts from piling and dredging activities at the Facility during construction

A17.6.96 The specific noise levels that will be generated by the piling activity is currently unknown, although it is anticipated that there will be approximately 310 piles. A literature search for available data regarding potential noise levels and impact ranges was carried out.

A17.6.97 Parameters of the planned piling and dredging works are outlined below:

- Piling
  - 310 x 762 mm diameter steel tubular or bored concrete piles for the construction of the wharf.
    - Expected to take approximately 6 months.
  - In addition, 6,000 m of sheet piling to be installed to form the flood defence.
    - Expected to take approximately 3 months.
- Dredging
  - Will likely be undertaken from landside, or from a floating marine plant, and in the dry wherever possible (noting that some areas to be dredged will be fully underwater at all times, and therefore there will be some dredging activities underwater).
  - Indicative quantity of 150,000 m^3 of soft silt and clay to be dredged from the water and 75,000 m^3 from landward. All material to be managed on

land.

- Expected to take approximately 5 months in total; 2 months prior to the wharf construction, and 3 months following the wharf construction.

A17.6.98 A desk-based assessment of other similar projects has been undertaken, in order to estimate the potential impact ranges for harbour seal. The impact ranges (and areas) as shown in **Table**

A17.6.99 **A17-10** below will be used to inform the assessment.

A17.6.100 Impact piling has long been established as a source of high-level underwater noise (Würsig *et al.,* 2000; Caltrans, 2001; Nedwell *et al.,* 2003; 2007; Parvin *et al.,* 2006; Thomsen *et al.,* 2006). If a marine mammal is located very close to the piling sound source, the high peak pressure sound levels have the potential to cause death or physical injury, with a severe injury having the potential to lead to death, without mitigation. High exposure levels from underwater noise sources (such as impact piling) can cause permanent auditory injury or hearing impairment, through permanent loss of hearing sensitivity (Permanent Threshold Shift; PTS); and / or from a temporary loss in hearing sensitivity (Temporary Threshold Shift; TTS).

A17.6.101 The potential for permanent or temporary auditory injury is not just related to the level of the underwater sound and its frequency relative to the hearing bandwidth of the animal but is also influenced by the duration of exposure. The level of impact on an individual is related to the Sound Exposure Level (SEL) that an individual receives.

A17.6.102 For harbour seal, a fleeing response is assumed to occur at the same noise levels as TTS. As outlined in Southall *et al.* (2007) the onset of behavioural disturbance is proposed to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (i.e. TTS onset). Although, as Southall *et al*. (2007) recognise that this is not a behavioural effect per se, exposures to lower noise levels from a single pulse are not expected to cause disturbance. However, any compromise, even temporarily, to hearing functions could have the potential to affect behaviour. Therefore, any fleeing response from harbour seals would be the same as for TTS onset and would be within the assessment for temporary auditory effect (TTS) as outlined below.

A17.6.103 Pinnipeds (such as harbour seal) use sound both in air and water for social

and reproductive interactions (Southall *et al.,* 2007), but not for finding prey. Therefore, Thompson *et al.,* (2012) suggest damage to hearing in pinnipeds may not be as sensitive as it could be in other species of marine mammals; however, using the precautionary approach, both seal species are given a sensitivity of high to the impact of PTS exposures. The effect would be permanent and marine mammals within the potential impact area are considered to have very limited capacity to avoid such effects, and unable to recover from the effects.

PTS and TTS can occur instantaneously from acute exposure to high noise levels, such as single strike (SEL_{ss}) of the maximum hammer energy during piling. PTS and TTS can also occur as a result of prolonged exposure to increased noise levels, such as during the duration of pile installation (SEL_{cum}). ***Table***

A17-10 *outlines predicted impact ranges (and areas) for harbour seal. The following assessments are based on these impact ranges, and the impact magnitude levels as shown in* ***Table***

A17-10.Table

A17-10 Ranges of effect for harbour seal from underwater noise generating activities

Project (source)	Activity and parameters modelled	Species	Threshold	Impact range (and area)
Port of Cromarty Firth	Impact piling • 2 m cylindrical piles • 500 kJ hammer energy • 60 strikes per minute • Piling period of 1 hour • Worst-case source noise levels of 217.7 dB re 1 µPa SPL_{peak} @ 1 m and 192.8 dB re 1 µPa2s SEL_{ss} @ 1 m	Harbour seal	PTS 218 dB re 1 µPa SPL_{peak} unweighted (NMFS, 2018)	-
			TTS 212 dB re 1 µPa SPL_{peak} unweighted (NMFS, 2018)	<10 m
			PTS 185 dB re 1 μPa^2s SEL_{cum} weighted (NMFS, 2018) Fleeing animal model	90 m (<0.01 km^2)
			TTS 170 dB re 1 μPa^2s SEL_{cum} weighted (NMFS, 2018) Fleeing animal model	690 m (0.46 km^2)
	Impact piling • Sheet piles • 120 kJ hammer energy	Harbour seal	PTS 218 dB re 1 µPa SPL_{peak} unweighted (NMFS, 2018)	-

Project (source)	Activity and parameters modelled	Species	Threshold	Impact range (and area)
	• 60 strikes per minute • Piling period of 1 hour • Worst-case source noise levels of 207.5 dB re 1 µPa SPL_{peak} @ 1 m and 182.6 dB re 1 μPa^2s SEL_{ss} @ 1 m • Fleeing animal model		TTS 212 dB re 1 µPa SPL_{peak} unweighted (NMFS, 2018)	-
			PTS 185 dB re 1 μPa^2s SEL_{cum} weighted (NMFS, 2018) Fleeing animal model	10 m (<0.01 km^2)
			TTS 170 dB re 1 μPa^2s SEL_{cum} weighted (NMFS, 2018) Fleeing animal model	280 m (<0.01 km^2)
Victoria Harbour, Hartlepool	Dredging • Trailer Suction Hopper Dredging (TSHD) • 175.6 dB re 1 µPa SPL_{RMS} @1 m • 24 hours	Harbour seal	PTS 201 dB re 1 μPa^2s SEL_{cum} weighted non-impulsive (NMFS, 2018) Fleeing animal model	<10 m
			TTS 181 dB re 1 μPa^2s SEL_{cum} weighted non-impulsive (NMFS, 2018) Fleeing animal model	<10 m
	Dredging • Backhoe dredger • 165.0 dB re 1 µPa SPL_{RMS} @1 m • Fleeing animal model	Harbour seal	PTS 201 dB re 1 μPa^2s SEL_{cum} weighted non-impulsive (NMFS, 2018) Fleeing animal model	<10 m
			TTS 181 dB re 1 μPa^2s SEL_{cum} weighted non-	<10 m

Project (source)	Activity and parameters modelled	Species	Threshold	Impact range (and area)
			impulsive (NMFS, 2018) Fleeing animal model	

A17.6.104 The number of harbour seal that could therefore be anticipated to be exposed to the potential for PTS or TTS onset is presented in **Table A17-11**. As shown below, there is no potential for permanent auditory injury (PTS) as a result of a piling (single strike) activity. There is therefore no requirement for mitigation to ensure no risk of any permanent auditory injury (PTS) to harbour seal.

Table A17-11 Maximum number of harbour seal (and % of reference population) that could be at risk of permanent and temporary auditory injury (PTS and TTS) from a single piling strike or cumulative exposure

Potential impact	Criteria and threshold	Impact range (and area)	Maximum number of individuals (% of reference population)
PTS from single strike piling	218 dB re 1 µPa SPL_{peak} unweighted (NMFS, 2018)	0 m (0 km^2)	0
PTS from cumulative piling	185 dB re 1 µPa2s SEL_{cum} weighted (NMFS, 2018)	90 m (<0.01 km^2)	0.008 (based on the harbour seal density of 0.80/km^2 at the Facility). 0.0002 % (of the SE England MU population). 0.0002 % (of the most recent count of seals in The Wash and North Norfolk Coast SAC).
TTS from single strike piling	212 dB re 1 µPa SPL_{peak} unweighted	<10 m (0.0003 km^2)*	0.0002 (based on the harbour seal density of 0.80/km^2 at the Facility). 0.000005 % (of the SE England MU population). 0.000005 % (of the most recent count of adult seals in The Wash).
TTS from cumulative piling	170 dB re 1 µPa2s SEL_{cum} weighted (NMFS, 2018)	690 m (0.46 km^2)	0.37 (based on the harbour seal density of 0.80/km^2 at the Facility). 0.007 % (of the SE England MU population). 0.009 % (of the most recent count of seals in The Wash and North Norfolk Coast SAC).

Potential impact	Criteria and threshold	Impact range (and area)	Maximum number of individuals (% of reference population)
PTS from dredging activities (cumulative)	201 dB re 1 µPa2s SEL_{cum} weighted non-impulsive (NMFS, 2018)	<10 m (0.0003 km^2)*	0.0002 (based on the harbour seal density of 0.80/km^2 at the Facility). 0.000005 % (of the SE England MU population). 0.0002 % (of the most recent count of seals in The Wash and North Norfolk Coast SAC).
TTS from dredging activities (cumulative)	181 dB re 1 µPa2s SEL_{cum} weighted non-impulsive (NMFS, 2018)	<10 m (0.0003 km^2)*	0.0002 (based on the harbour seal density of 0.80/km^2 at the Facility). 0.000005 % (of the SE England MU population). 0.0002 % (of the most recent count of seals in The Wash and North Norfolk Coast SAC).

** based on the area of a circle*

A17.6.105 The assessment of effects indicates that a very small number of harbour seals (0.008) could be at risk of PTS or TTS onset under the cumulative threshold, and that less than 1 % of The Wash and North Norfolk Coast SAC population of harbour seals could be affected as a result of piling and dredging activities. Due to the very small number of harbour seal potentially affected, there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal.

Mitigation

A17.6.106 As a precautionary approach, mitigation will be undertaken for piling works during high tides, to ensure that any potential for impact to marine mammals (and fish species) are reduced as far as is possible. These measures are secured by Condition 14 of the Deemed Marine Licence contained in Schedule 11 of the draft DCO. This mitigation would include:

- Pre-piling watch for marine mammals, when piling activities are undertaken during high tides, following the Joint Nature Conservation Committee (JNCC) protocol for minimising the risk of injury to marine mammals from piling noise‡.

‡ *http://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf*

- Soft-start and ramp-up procedures, for piling activities undertaken during high tides, following the standard JNCC protocol for minimising the risk of injury to marine mammals from piling noise[1].

Changes in vessel traffic and movement leading to increased underwater noise, disturbance and collision risk on harbour seals during construction

Potential for effects on harbour seal due to vessel disturbance (presence and noise)

A17.6.107 As stated in Section 17.8 of **Chapter 17 Marine and Coastal Ecology**, there will be an increase in the number of vessels through the operational phase of the Facility. However, it is unlikely that vessel noise would be sufficient to cause the onset of either a permanent auditory injury (PTS) or a temporary auditory injury (TTS) in harbour seals.

A17.6.108 Thomsen *et al.* (2006) reviewed the effects of ship noise on seal species. As seals use lower frequency sound for communicating (with acute hearing capabilities at 2 kHz) there is the potential for detection, avoidance and masking effects in seals. Thomsen *et al.* (2006) consider that ship noise around 2 kHz could be heard above ambient noise (but not necessarily avoided) at a distance of approximately 3 km for harbour seals, and the zone of audibility will be approximately 20 km for vessels with a much lower frequency noise of 0.25 kHz (ambient noise = 94 and 91 dB rms re 1 µPa at 0.25 and 2 kHz, respectively). The zone of responsiveness of harbour seal is considered to be at a maximum of 400 m from the vessel, although the frequency of the sound source, and the speed at which the vessel is travelling would affect the distance at which harbour seal may react (Thomsen *et al*., 2006). The Southall *et al*. (2007) TTS / fleeing response for seal species underwater is 171 dB re 1 µPa.

A17.6.109 A study of the noise source levels from several different vessels (Jones *et al*., 2017) shows that for a cargo vessel of 126 m in length (on average), travelling at a speed of 11 knots (on average) would generate a mean sound level of 160 dB re 1 µPa @ 1 m (with a maximum sound level recorded of 187 dB re 1 µPa @ 1 m). For harbour seal, the sound level required to result in a permanent auditory injury (PTS) or temporary auditory injury (TTS) under the National Marine Fisheries Service (NMFS) (2018) threshold guidance for marine

mammals, would be 218 dB re 1 µPa and 212 dB re 1 µPa, respectively, if an individual were to be exposed to vessel noise for a period of 24 hours.

A17.6.110 Taking in to account that a harbour seal would need to be exposed to vessel noise, at the maximum sound level recorded, for a period of 24 hours to be exposed to sound levels that could cause a auditory injury, it is considered unlikely that vessels could cause auditory injury in harbour seal. The sound levels that could result in a permanent or temporary auditory injury in harbour seal are higher than the maximum recorded sound levels for large cargo vessels, therefore, the only potential effect of underwater noise from vessels would be disturbance.

A17.6.111 The vessels travelling to and from the Facility will be ~~slow moving (~~travelling at a speed of up to approximately 12~~6~~ knots in ~~The Wash and slower (4 knots) in~~ The Haven), or would be stationary within the anchorage location, and most noise emitted is likely to be of a low frequency. However, the levels could be sufficient to cause local disturbance to sensitive marine mammals in the immediate vicinity of the vessel, depending on ambient noise levels.

A17.6.112 Marine mammals present within or near the Facility shipping channel would be habituated to the presence of vessels given the existing levels of marine traffic in the area. The current marine traffic data indicates that there are approximately 11,000 vessels entering the shipping channel annually, or 30 vessels per day, as shown by the Marine Traffic data (www.marinetraffic.com, 2017) (**Plate A17.1-3**). The increase of a maximum of 89 vessels, per year in the construction period is a small increase compared to the number already present within The Wash (equating to an additional 0.8 % of vessel movements within The Wash).

A17.6.113 Similar levels of shipping traffic were also recorded by the MMO in 2015, which shows that there were 11,917 vessels entering the shipping channel and anchorage area in 2015, or 33 vessels per day (as shown by the Vessel Density Grid Data 2015 from the MMO (MMO, 2017)). The increase of 89 vessels in the construction period is a small increase compared to the number already present within the shipping channel and anchorage area (equating to an additional 0.075 % of existing vessels). The number of ships travelling to the Port of Boston, using the same shipping channel as for the Facility, is currently approximately 420 per year (or 8 per week), as described in **Chapter 18 Navigational Issues**.

A17.6.114 As a worst-case scenario, the number of harbour seals that could be disturbed by underwater noise from vessels has been assessed based on the

total proposed scheme area, including the shipping corridor from The Wash to the Application Site, and the vessel anchorage area; a total area of 10.46 km^2 (shown as the shipping channel on **Figure 17.1**). This is very precautionary, because it is highly unlikely that underwater noise from vessels could result in disturbance to the entire area at any one time. Any disturbance is likely to be limited to the immediate vicinity around the actual vessel (for example, less than 10 m) at any one time.

A17.6.115 Best practice measures will be put in place in order to minimise the disturbance that is caused to marine mammals from the vessel traffic. These measures will be secured by Requirement 14 of the DCO through the approval of a Navigation Management Plan which must include measures for managing potential risks to marine mammals. This will mainly be in the form of a non-dedicated (but certified under the JNCC MMO certification scheme) observer on board each vessel, looking out for marine mammals as the vessel makes its way through The Wash and up The Haven. Vessels should maintain the same course and speed to give the seal time to avoid the vessel; or observers at land-based locations for defined periods to determine risk).

A17.6.116 Any disturbance of harbour seals due to vessel noise would be temporary and could affect up to 33.4 harbour seals (or 1.0 % of The Wash and North Norfolk Coast SAC population) based on the harbour seal density within the shipping corridor and anchorage area of 3.189 harbour seals per km^2 (Russel *et al*., 2017). The assessment of effects indicates that 1 % of The Wash and North Norfolk Coast SAC population of harbour seals could be temporarily disturbed as a result of vessel noise. Therefore, there would be no significant disturbance and no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal.

Potential disturbance at harbour seal haul-out sites

A17.6.117 Harbour seal may become disturbed from haul-out sites due to the presence of vessels, which, if occurring in the breeding season, can result in the abandonment of pups. Due to this, harbour seals are considered to be highly sensitive to vessel disturbance at haul-out sites, particularly if that occurs within the breeding season.

A17.6.118 Studies on the distance of disturbance, on land or in the water, for hauled-out harbour seals have found that the closer the disturbance, the more likely seals are to move into the water. The estimated distance at which most seal

movements into the water occurred varies from study site and type of disturbance but has been estimated at typically less than 100 m (Wilson, 2014). Grey and harbour seals have also been reported to move into the water when vessels are at a distance of approximately 200 m to 300 m (Wilson, 2014).

A17.6.119 A study was carried out by SMRU (Paterson *et al.,* 2015) using a series of controlled disturbance tests at harbour seal haul-out sites, consisted of regular (every three days) disturbance through direct approaches by vessel and effectively 'chasing' the seals into the water. The seal behaviour was recorded via GPS tags, and found that even intense levels of disturbance did not cause seals to abandon their haul-out sites more than would be considered normal (for example seals travelling between sites) and the seals were found to haul-out at nearby sites or to undertake a foraging trip in response to the disturbance (but would later return).

A17.6.120 Further studies on the effects of vessel disturbance on harbour seals when they are hauled out, suggest that even with repeated disturbance events that are severe enough to cause individuals to flee into the water, the likelihood of harbour seals moving to a different haul-out site would not increase. Furthermore, this appeared to have little effect on their movements and foraging behaviour (Paterson *et al*., 2019).

A17.6.121 A study of the reactions of harbour seal from cruise ships found that, if a cruise ship was less than 100 m from a harbour seal haul-out site, individuals were 25 times more likely to flee into the water than if the cruise ship was at a distance of 500 m from the haul-out site (Jansen *et al.,* 2010). At distances of less than 100 m, 89 % of individuals would flee into the water, at 300 m this would fall to 44 % of individuals, and at 500 m, only 6 % of individuals would flee into the water (Jansen *et al.,* 2010). Beyond 600 m, there was no discernible effect on the behaviour of harbour seal. As a precautionary approach, any harbour seal haul-out sites within 600 m of the shipping channel and anchorage location will be considered to have the potential to be subjected to disturbance while the seals are hauled out.

A17.6.122 Within The Wash, there are a number of different harbour seal haul-out and pupping sites (a total of 50 sites within The Wash; **Figure 17.6** (SCOS, 2018)). Of these sites, none are located within 600 m of the anchorage location and shipping channel to be used for the proposed Boston project, with the closest

site being the Friskney South site, at approximately 840 m from the shipping channel (**Figure 17.6**).

A17.6.123 The 2018 count of harbour seals of the three closest sites to the shipping channel and anchorage location (**Figure 17.6**) recorded a total of 38 adults and 16 pups at Friskney South, seven adults and no pups at the Rodger site, and one adult and one pup at the Ants site. This equates to a very small proportion (up to 1.2 % of all adults, and 1.1 % of all pups) of the total harbour seal count, of 3,747 adults and 1,498 pups in 2018 (Thompson, 2019).

A17.6.124 In the vicinity of the three sites located closest to the shipping channel and anchorage location there are a further 47 haul-out locations to which seals could move if disturbed, without having to move too far. The increased shipping levels would be present year-round, therefore, any potential pupping sites along the route would be exposed to disturbance, meaning that any harbour seal looking for a pupping site would be exposed to the potential for increased disturbance prior to the birth of any pups each season, allowing individuals to choose a nearby site with no increased shipping levels (as a result of the Facility), if required. Harbour seal pups are born having pre-shed their white coat in utero and are able to swim almost immediately (SCOS, 2018); they would therefore not be confined to the site at which they were born if they were exposed to any disturbance effects due to the increased vessel movements.

A17.6.125 The harbour seal haul-out sites within The Wash are submerged at high tide due to being situated on tidally submerged mudflats. The tidal nature of The Haven means that ships will only be able to travel up the shipping channel at or near high tide, commencing from the anchor point a maximum of two hours before high tide, and ending a maximum of 1.5 hours after high tide. As a result, the harbour seal haul-out sites would be submerged and inaccessible to seals when vessels would be able to travel along the shipping channel. There would therefore be no potential for harbour seal at haul-out sites to be disturbed when the vessels are using the shipping channel. The closest haul-out site is 2.2 km from the anchorage site, therefore there is no potential disturbance at harbour seal haul-out sites from vessels located in the anchorage area.

A17.6.126 Due to the distance of these sites to the shipping channel and anchorage location, the low number of harbour seal (and pups) present at the nearest sites, and the ability of harbour seals and pups to move to any one of the other suitable sites nearby, it is concluded that harbour seal within The Wash would not be

exposed to a disturbance effect, while hauled-out, due to the increased number of vessels using the shipping channel and anchorage sites. Therefore, there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives harbour seal.

Potential for effects on harbour seal as a result of increased collision risk

A17.6.127 As stated within Section 17.8 of **Chapter 17 Marine and Coastal Ecology** and outlined above, during the operational phase of the Facility, it is expected that there will be an increase in vessel traffic, with an additional 580 vessels per year expected over the current vessel numbers currently using the shipping channel. As indicated above, this is a small increase of vessel numbers through the existing shipping channel, with a 5.27 % increase over annual vessel numbers within this channel.

A17.6.128 As outlined above, the existing levels of shipping traffic around the facility shipping corridor is high and harbour seals are therefore habituated to the presence of vessels and would be able to detect and avoid vessels. Although marine mammals are able to detect and avoid vessels, vessel strikes are known to occur, possibly due to distraction whilst foraging and socially interacting, or due to the marine mammals' inquisitive nature (Wilson *et al.,* 2007). Therefore, increased vessel movements can pose an increased risk of vessel collision to harbour seals.

A17.6.129 Studies have shown that larger vessels are more likely to cause the most severe or lethal injuries, with vessels over 80 m in length causing the most damage to marine mammals (Laist *et al.,* 2001). The vessels for the proposed Facility are expected to be 100 m in length. Vessels travelling at high speeds are considered to be more likely to collide with marine mammals, and those travelling at speeds below 10 knots would rarely cause any serious injury (Laist *et al.,* 2001). ~~The vessels moving to and from the Facility would be restricted to a speed of 4 knots within The Haven, and 6 knots through the shipping channel and anchorage area within The Wash, therefore reducing the risk to cause any serious injury.~~ Subject to the pilotage requirements for navigational safety and efficiency (vessel management), and the application of the principle of 'safe speed' (application of COLREGS), vessel speeds of 'as low a speed as reasonably practicable' are to be encouraged within The Haven and The Wash. Noting that since the potential for fatal collisions with marine mammals is significantly reduced at vessel speeds of less than 10 knots, vessel speeds should be aimed to be below that speed.

A17.6.130 Although the risk of collision related to the operation of the Facility is likely to be low given the low speed of the vessels and restricted area in The Wash, as a precautionary scenario, the number of harbour seals that could be at increased collision risk with vessels during the operation of the Facility has been assessed on a very worst-case of 5 % of the number of individuals that could be present in the shipping channel and anchorage location.

A17.6.131 In total, the area that has been defined as having the potential for an increase in collision risk for harbour seal is 10.46 km^2, with an estimated density of 3.189 harbour seals per km^2 within this area (as calculated from the Russel *et al*., 2017 data).

A17.6.132 A total of 1.7 harbour seals (0.03 % of the SE England MU; or 0.04 % of The Wash and North Norfolk Coast SAC population) could be at increased risk of collision at any one time. Taking into consideration the small relative increase in the number of vessels in the area, their ~~slow~~ speed of travel ~~(of 6 knots or less)~~ and restricted area of the shipping channel and anchorage site, the likelihood that harbour seals would be able to detect and avoid any vessels in order to avoid collision and the small number of seals that could be at risk; it can be concluded that there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal.

Changes in vessel traffic and movement leading to increased underwater noise, disturbance and collision risk on harbour seals during operation

Potential for effects on harbour seal due to vessel disturbance (presence and noise)

A17.6.133 As stated above, there will be an increase in the number of vessels through the operational phase of the Facility, with 580 vessels above the existing levels per year, (or 12 per week), representing an increase of 5.3 % above baseline levels (of 11,000 vessels per year). However, it is unlikely that vessel noise would be sufficient to cause the onset of either a permanent auditory injury (PTS) or a temporary auditory injury (TTS) in harbour seals.

A17.6.134 As outlined above, the vessels related to the proposed Facility will be slow moving, and the noise emitted is likely to be of lower frequency. Noise levels reported by Malme *et al*. (1989) and Richardson *et al*. (1995) for large surface vessels indicate that physiological damage to auditory sensitive marine mammals is unlikely. However, the levels could be sufficient to cause local

disturbance to sensitive marine mammals in the immediate vicinity of the vessel, depending on ambient noise levels.

A17.6.135 Best practice measures will be put in place in order to minimise the disturbance that is caused to marine mammals from the vessel traffic. As noted above this is secured by Requirement 14 of the Draft DCO (document reference 2.1). This will mainly be in the form of an observer on board each vessel, looking out for marine mammals as the vessel makes its way through The Wash and up The Haven, in line with Natural England's Evidence Information Note EIN030; or observers at land-based locations for defined periods to determine risk).

A17.6.136 The potential for disturbance from vessels during the operational phase would the same as within the construction period, with up to 33.4 harbour seals (or 1.0 % of The Wash and North Norfolk Coast SAC population) based on the harbour seal density within the shipping corridor and anchorage area of 3.189 harbour seals per km^2 (Russel *et al*., 2017). The assessment of effects indicates that 1 % of The Wash and North Norfolk Coast SAC population of harbour seals could be temporarily disturbed as a result of vessel noise. Although numbers of vessels is much higher during operation than during the construction phase this impact is still considered to be minimal. Therefore, there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal.

Potential disturbance at harbour seal haul-out sites

A17.6.137 As outlined above, harbour seal may become disturbed from haul-out sites due to the presence of vessels, which, if occurring in the breeding season, can result in the abandonment of pups.

A17.6.138 Best practice measures will be put in place in order to minimise the disturbance that is caused to marine mammals from the vessel traffic. As noted above this is secured by Requirement 14 of the Draft DCO. This will mainly be in the form of an observer on board each vessel, looking out for marine mammals as the vessel makes its way through The Wash and up The Haven, in line with Natural England's Evidence Information Note EIN030; or observers at land-based locations for defined periods to determine risk).

A17.6.139 The potential for impact would the same as for the construction phase. Due to the distance of haul-out sites to the shipping channel and anchorage location, the low number of harbour seal (and pups) present at the nearest sites, and the

ability of harbour seals and pups to move to any one of the other suitable sites nearby, it is concluded that harbour seal within The Wash would not be exposed to a disturbance effect, while hauled-out, due to the increased number of vessels using the shipping channel and anchorage sites. Therefore, there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal.

Potential for effects on harbour seal as a result of increased collision risk

A17.6.140 As discussed above, during the operational phase of the Facility, it is expected that there will be an increase in vessel traffic, with an additional 580 vessels expected per year, and 12 per week, through the operational period, over the current vessel numbers currently using the shipping channel. As outlined above, this is a small increase of vessel numbers through the existing shipping channel, with a 5.27% increase over annual vessel numbers within this channel during the operational phase.

A17.6.141 The potential for increased risk of collision from vessels during the operational phase would be the same as for the construction phase, with a total of 1.7 harbour seals (0.03 % of the SE England MU; or 0.04 % of The Wash and North Norfolk Coast SAC population) at increased risk of collision if it is considered that 5 % would be at risk, and a total of 3.3 harbour seals (0.06 % of the SE England MU; or 0.08 % of The Wash and North Norfolk Coast SAC population) may be at risk of collision with vessels if it is considered that up to 10 % could be at risk. Taking into consideration the small relative increase in the number of vessels in the area, their slow speed of travel ~~(of 6 knots or less)~~ and restricted area of the shipping channel and anchorage site, the likelihood that harbour seals would be able to detect and avoid any vessels in order to avoid collision and the small number of seals that could be at risk; it can be concluded that there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal.

Increased emissions to air and deposition on marine and estuarine habitats from the operation of the Facility

A17.6.142 As mentioned in **Section A17.4**, according to the air quality deposition modelling that was carried out (reported within **Chapter 14 Air Quality**) the longer term however (based on annual mean levels), these cannot be considered

insignificant as the contribution of all pollutants to the background levels were above 1 % of the relevant annual mean Critical Levels or Loads.

A17.6.143 The critical loads within the air quality modelling were based on the conservative estimate range for saltmarsh, given by the Air Pollution Information System (APIS).

A17.6.144 For the saltmarshes linked to The Wash and North Norfolk Coast SAC, the predicted project-alone impact was greater than 1 % of the Critical Load. However, overall deposition of contaminants (specifically nitrogen) is generally of low importance for saltmarshes as the inputs are generally significantly below the large nutrient loadings from riverine and tidal inputs. Mature, upper areas of saltmarsh (like those found along The Haven) are also likely to be subject to direct run-off from the surrounding catchment. Biogeochemical cycling of nutrients through microbial activity is quite rapid in this open system and nitrogen losses via denitrification may be considerable (Barnes & Owen, 1998).

A17.6.145 Although there is limited information on the specific types of saltmarsh that are designated under The Wash and North Norfolk Coast SAC, the sensitivity review on MarLIN for pioneer saltmarsh and *Puccinellia maritima* saltmarsh community habitats for the pressure 'changes in nutrient levels', which also addresses aerial deposition, states that moderate enrichment may be beneficial to plant communities within a saltmarsh. Nitrogen is typically a limiting nutrient in saltmarsh ecosystems and added nitrogen resulted in increased primary production and decomposition (Valiela & Teal, 1974; Long & Mason, 1983). At a benchmark level, an increase in nutrients was concluded unlikely to have a significant effect on communities (Tyler-Walters, 2001; Tyler-Walters, 2004). Natural England's Advice on Operations also states that the saltmarsh habitats of The Wash and North Norfolk Coast SAC are not sensitive at the pressure benchmark for 'nutrient enrichment', stating that "…*The benchmark for this pressure indicates that nutrient enrichment levels will be within acceptable levels, therefore it is unlikely that this habitat would be significantly affected by contamination at this magnitude*" (Natural England, 2020b). However, it is not clear what this magnitude/benchmark is (in a quantitative sense), and there is limited information other available on the effect of other nutrients/pollutants on saltmarsh habitats.

A17.6.146 With regards to deposition on to intertidal habitats (such as mudflats and shellfish beds that are exposed and covered at every state of the tide), where

although deposition may occur in-between tides, this would be washed away with the tide; although there is the potential for this to contribute to a change in water quality, in the context of the wider water column, this is not considered to be significant. This is further supported by the fact that the Air Pollution Information System (APIS) does not identify deposition as a main input of pollutants to the marine system, compared to other sources of pollutant inputs (such as discharge pipes etc.).

A17.6.147 **Chapter 17 Marine and Coastal Ecology** assesses the significance of this impact and as a conservative estimate, considers that saltmarshes are of medium sensitivity to aerial deposition, and that the magnitude of impact is low. Based on the modelling results of the air quality modelling, and that there are no exceedances of the in-combination Critical Load, there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for coastal and marine habitats.

In-combination Effects for Marine Mammals

A17.6.148 During construction, potential effects to marine mammals are due to underwater noise from piling and dredging activities at the Facility, and an increase in vessels having the potential for disturbance from vessels, in water and at haul-out sites, and the potential for an increase in collision risk due to the increased vessels.

A17.6.149 As outlined in **Table A17-5**, the VikingLink project has the potential for overlapping construction phases with the Facility, and has the potential to effect harbour seal from The Wash and North Norfolk Coast SAC, due to underwater noise effects, and an increased risk of collision due to the increase in vessel

numbers. There is therefore the potential for in-combination effects with the construction of the Facility.

A17.6.150 **Table A17-12** below provides the in-combination assessment for the VikingLink construction phase effects with the effects of the Facility during the construction phase.

Table A17-12 In-combination assessment for harbour seal from The Wash and North Norfolk Coast SAC

Potential Cumulative Impact	Assessment for Other Project	Assessment for the Facility	In-Combination Effects Assessment
Underwater noise impacts	Underwater noise sources with the potential for PTS and TTS during construction of the VikingLink project include Side Scan Sonar (SSS) and Multi-Beam Echosounder (MBES). Disturbance impacts were predicted to occur from all potential construction activities, including SSS and MBES, Pingers, vessel noise, cable trenching and rock placement (National Grid Viking Link Ltd and Energinet.dk, 2017). The Natura 2000 report stated that the highly localised potential for effect for either PTS or TTS (within 50 m), and the temporary and transient nature of activities that could have a disturbance effect, in conjunction with the highly mobile nature of marine mammals means that it is unlikely there would a negative effect, therefore, a significant effect on harbour seal is not anticipated (National Grid Viking Link Ltd and Energinet.dk, 2017).	Less than one harbour seal will be at risk from PTS from piling activities at the Facility (0.008), and less than one would be at risk of PTS from dredging activities (0.0002). Less than one seal would also be at risk of TTS from piling (0.37), or from dredging activities (0.0002). Due to the very small number of harbour seal potentially affected, there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC. Disturbance from vessels, based on very worst-case and precautionary assessment, could impact up to 33.4 harbour seals. Any such disturbance would be localised and temporary, and result in a very small proportion of the population potentially being affected. The very low number of harbour seal potentially disturbed would not be significant, and there would be no adverse effect on the integrity of The Wash and North Norfolk Coast SAC.	Mitigation on the VikingLink project would ensure that any potential impact of PTS or TTS to harbour seal would be at a negligible level. Taking this into account with the very low number of harbour seal potentially at risk of PTS, TTS, or disturbance as a result of piling or dredging activities at the Facility, or the increase in vessels, it is concluded that there would be **no adverse effect** from the two projects together, with a very low number of individuals potentially impacted, and therefore **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC**.
Increased risk of collision	The Natura 2000 report for VikingLink states that as the vessels associated with the project will be travelling relatively slowly, the likelihood of collision is very low, and the increase in	The increase in vessel numbers could, based on very worst-case and precautionary assessment, increase the risk of collision to up to two harbour seals (1.7). The sensitivity of harbour seal to an increase in collision is low,	The very small number of harbour seal at increased risk of collision from the Facility and the VikingLink project together would have

Potential Cumulative Impact	Assessment for Other Project	Assessment for the Facility	In-Combination Effects Assessment
	vessel traffic will be relatively small and temporary, and therefore a significant effect on harbour seal associated with increased collision is not anticipated (National Grid Viking Link Ltd and Energinet.dk, 2017).	and with the very small number of seals potentially impacted, there would be no significant effect, and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC**.	**no adverse effect on the integrity of The Wash and North Norfolk Coast SAC**.

A17.6.151 With regard to in-combination operational effects, the only effect being considered is that of increased vessel presence within the shipping channel and anchorage area. There are no other projects that would have an in-combination effect on increased vessel use of the same shipping channel during the operational phase of the Facility. For example, any vessels associated with the offshore wind farms that are located within 30 km of the shipping channel and anchorage area, would not be using the same shipping channel and instead travelling to other nearby ports, such as Kings Lynn. Therefore, there is no potential for in-combination effects for marine mammals.

A17.6.152 The effects identified and assessed in this chapter with regard to marine mammals also have the potential to interact with each other, which could give rise to synergistic effects as a result of that interaction. For disturbance effects, the largest potential effect is considered to represent the worst-case effect, as if an individual has already been disturbed from an area, it cannot be disturbed further as a result of additional activities. Following the same approach, it would also not be possible for individuals to be disturbed from an area, and to also be affected by a vessel collision risk, as any individuals disturbed would not be present in the area, and therefore would not be exposed to additional effects. Therefore, the worse-case effects assessed above take these interactions into account, and assessments are considered conservative and robust in terms of the potential for interactions.

A17.7 Conclusion

A17.7.1 This assessment has considered impacts arising from the construction and operation phases of the proposed facility on The Wash SPA and Ramsar site and The Wash and North Norfolk Coast SAC together with functionally connected habitats within The Haven. The HRA integrity matrices are included within **Appendix A-17.1.2**, in accordance with the structure and format specified

in the Planning Inspectorate Advice Note 10. There are not predicted to be any effects due to the decommissioning phase as the wharf would be left in position. The assessment was informed by the preliminary impact assessment, as well as the results of the ES together with consultation with Natural England, MMO, Lincolnshire Wildlife Trust and the Royal Society for the Protection of Birds (as detailed in **Appendix A17.1.3**).

A17.7.2 The activities included for assessment are as follows:

- Underwater noise effects from piling and dredging activities;
- Collision risk;
- Visual disturbance due to vessels and lighting;
- Increased noise levels; and.
- Potential emissions of NO_x, SO_2, and deposition of nitrogen, acid and ammonia on designated Annex I habitats.

A17.7.3 Visual and noise disturbance and injury from underwater noise, were screened in for likely significant effect regarding birds and marine mammals. Collision risk and disturbance to harbour seal haul-out sites were also considered to have a likely significant effect on marine mammals.

A17.7.4 A desk based assessment of the potential for underwater noise impacts from piling and dredging activities at the Facility was undertaken, and results have shown that there is the potential to effect a very small number of harbour seal, with no potential for permanent auditory injury (PTS) due to a single strike of the piling works. However, a soft-start and pre-piling watch protocol will be implemented for any piling works being undertaken at high tide, to ensure that any potential for effect to harbour seal are mitigated for.

A17.7.5 It is concluded that the increased presence of vessels using the mouth of The Haven during construction and operation of the proposed development would not significantly increase the frequency or magnitude of disturbance events, and the presence of the vessels beaching on the intertidal zone adjacent to the wharf and any lighting issues would not have a significant effect on bird numbers, SPA-wide distribution and behaviour and therefore no adverse effect on integrity of the SPA and Ramsar site.

A17.7.6 As a wider initiative linked to the project, a biodiversity net gain package is currently being discussed to provide additional wetland and lagoon habitat within

the RSPB reserves at the mouth of The Haven. This would provide additional feeding and roosting areas. This has the potential to provide a new site for birds to use for roosting and foraging, which would provide a benefit overall to the SPA and Ramsar site.

A17.7.7 In terms of potential for impact on seals, it is concluded that the shipping channel to be used for the Facility has existing high levels of marine traffic, of which the Facility-related traffic would form a small portion of (580 Facility-related vessels per year, compared to approximately 11,000 vessels per year in the shipping channel). With that in mind, as well as the ~~slow~~ speed of the vessels ~~(6 knots or less)~~ and the restricted area of the shipping channel and anchorage site, the likelihood that harbour seals in particular would be able to detect and avoid any vessels, and that the area of the shipping channel is considered a low risk area from shipping activities in relation to seals, no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives is concluded.

A17.7.8 Air quality impacts have been assessed and it is concluded that there is no adverse effect due to emissions from the construction and operation phases.

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Appendix A17.1.1 HRA Screening Matrices

This appendix contains the HRA screening matrices for the Facility in accordance with the structure and format specified in the Planning Inspectorate Advice Note 10. The Appendix is structured as follows:

- **Appendix A17.1.1.1**: HRA screening matrix for The Wash SPA
- **Appendix A17.1.1.2**: HRA screening matrix for The Wash and North Norfolk Coast SAC
- **Appendix A17.1.1.3**: HRA screening matrix for The Wash Ramsar site

Planning Inspectorate

Advice Note 10
Habitats Regulations Assessment

Appendix A17.1.1: Screening Matrices for The Wash SPA, The Wash and North Norfolk Coast SAC, The Wash Ramsar site

Potential Effects

Potential effects upon the protected site(s)[4] which are considered within the submitted HRA report for the Facility are provided in the table below.

Table A17-1-1-1 Effects considered within the screening matrices

Designation	Effects described in submission information	Presented in screening matrices as
The Wash SPA The Wash and North Norfolk Coast SAC The Wash Ramsar site	• Collision risk associated with increased vessel movements	• Increased collision risk
	• Disturbance from increased vessel movements	• Disturbance
	• Increased underwater noise levels from piling and dredging activities at the Facility • Increased underwater noise levels from vessel movements • Increased above water noise levels from vessel movements	• Changes to noise levels
	• Changes to air quality during operation	• Changes to air quality

[4] *As defined in Advice Note 10.*

STAGE 1: SCREENING MATRICES

The protected sites included within the screening assessment are:

- The Wash SPA
- The Wash and North Norfolk Coast SAC
- The Wash Ramsar site

Evidence for, or against, likely significant effects on the protected site(s) and its qualifying feature(s) is detailed within the footnotes to the screening matrices below.

Matrix Key:

✓ = Likely significant effect **cannot** be excluded
✕ = Likely significant effect **can** be excluded

C = construction
O = operation
D = decommissioning

Where effects are not relevant to a particular feature the matrix cell has been formatted as follows:

HRA Screening Matrix A17.1.1.1: The Wash SPA

Name of protected site and designation: The Wash SPA															
EU Code: UK9008021															
Distance to NSIP: 3 km															
Site features	**Likely effects of NSIP**														
Effect	*Increased collision risk*			*Disturbance*			*Changes to noise levels*			*Changes to air quality*			*In combination effects*		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Bar-tailed godwit (*Limosa lapponica*), Non-breeding	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**× d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Bewick's swan (*Cygnus columbianus bewickii*), Non-breeding	**×a**	**×c**	**×d**	**×a**	**×c**	**×d**	**×a**	**×c**	**× d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Black-tailed godwit (*Limosa limosa islandica*), Non-breeding	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**× d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Common scoter (*Melanitta nigra*), Non-breeding	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**× d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Common tern (*Sterna hirundo*), Breeding	**×a**	**×b**	**×d**	**×a**	**xc**	**×d**	**×a**	**xc**	**× d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Curlew (*Numenius arquata*), Non-breeding	**×a**	**×c**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**× d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**

Name of protected site and designation: The Wash SPA														
Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Dunlin (*Calidris alpina alpina*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Gadwall (*Mareca strepera*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Goldeneye (*Bucephala clangula*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Grey plover (*Pluvialis squatarola*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Knot (*Calidris canutus*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Little tern (*Sternula albifrons*), Breeding	×a	×b	×d	×a	xc	×d	×a	xc	×d	×g	×h	×d	×a	×i	×d
Oystercatcher (*Haematopus ostralegus*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Pink-footed goose (*Anser brachyrhynchus*), Non-breeding	×a	×c	×d	×a	×c	×d	×a	×c	×d	×g	×h	×d	×a	×i	×d
Pintail (*Anas acuta*), Non-breeding	×a	×c	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Redshank (*Tringa totanus*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d

Name of protected site and designation: The Wash SPA														
Sanderling (*Calidris alba*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Shelduck (*Tadorna tadorna*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Turnstone (*Arenaria interpres*), Non-breeding	×a	×b	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Waterbird assemblage, Non-breeding	×a	×c	×d	✓e	✓e	×d	✓f	✓f	×d	×g	×h	×d	×a	×i	×d
Wigeon (*Mareca penelope*), Non-breeding	×a	×b	×d	✓e	✓e	×d	×a	✓f	×d	×g	×h	×d	×a	×i	×d

Evidence supporting conclusions:

a. No significant extra shipping activity through the Wash will take place due to the Facility, during the construction and decommissioning phases. A majority of the marine related construction works will take place from the land side of the Facility (dredging, piling). No marine works will take place during the decommissioning of the Facility. Specific impacts from these have been assessed in **Chapter 17 Marine and Coastal Ecology,** Section 17.8. However, for the purposes of this HRA, no LSE is concluded.

b. Although increased shipping activity throughout The Wash could affect qualifying bird species that fly low above the sea surface, or below, this is considered a low risk environment by Natural England, where the recommendation for a low risk impact is "*Unless there are evidence based case or site specific factors that increase the risk, or uncertainty on the level of pressure on a receptor, this pressure generally does not occur at a level of concern and should not require consideration as part of an assessment*" . As such, no LSE is concluded.

c. There is no interaction of concern between the increased risk caused from the Facility, as determined from the supplementary information provided by Natural England. As such, no LSE is concluded.

d. No decommissioning-phase impacts are anticipated as the wharf structure linked to the Facility will be left in place and not decommissioned. Therefore, no LSE can be concluded.

e. Increased ship activity throughout The Wash has the potential to affect the behaviour of roosting, foraging, commuting and breeding birds. LSE could not be excluded, as the qualifying interest features are at medium-high risk from visual disturbance caused by vessel movements.

f. Increased noise levels in The Wash SPA poses a medium-high risk to these qualifying interest features, as it has the potential to affect their foraging, roosting and breeding behaviour. As such, LSE could not be excluded.

g. The construction-phase aerial deposition was considered insignificant, as a result of the air quality modelling reported in **Chapter 14 Air Quality**. As such, no LSE is concluded.

h. Although birds are sensitive to changes in air quality, due to their mobile nature, it is unlikely that the increase in air emissions caused from the Facility will impact the qualifying features. As such, no LSE is concluded.

i. The screening exercise for a potential LSE has confirmed that there are no other plans or projects relevant to the assessment of effects for this site (**Table A17-5**). LSIE with other plans and projects, therefore, can be excluded for this protected site.

HRA Screening Matrix A17.1.1.2: The Wash and North Norfolk Coast SAC

Table A17-1-1-3 HRA Screening Matrix for The Wash and North Norfolk Coast SAC

Name of protected site and designation: The Wash and North Norfolk Coast SAC															
EU Code: UK0017075															
Distance to NSIP: 3 km															
Site features	**Likely effects of NSIP**														
Effect	*Increased collision risk*			*Disturbance*			*Changes to noise levels*			*Changes to air quality*			*In combination effects*		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×g**	**✓h**	**×e**	**×a**	**×j**	**×e**
Coastal lagoons	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×g**	**✓h**	**×e**	**×a**	**×j**	**×e**
Large shallow inlets and bays	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×g**	**✓h**	**×e**	**×a**	**×j**	**×e**
Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×g**	**✓h**	**×e**	**×a**	**×j**	**×e**
Mudflats and sandflats not covered by seawater at low tide	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×a**	**×b**	**×e**	**×g**	**✓h**	**×e**	**×a**	**×j**	**×e**

Name of protected site and designation: The Wash and North Norfolk Coast SAC															
Reefs	×a	×b	×e	×a	×b	×e	×a	×b	×e	×g	✓h	×e	×a	×j	×e
Salicornia and other annuals colonising mud and sand	×a	×b	×e	×a	×b	×e	×a	×b	×e	×g	✓h	×e	×a	×j	×e
Sandbanks which are slightly covered by sea water all the time	×a	×b	×e	×a	×b	×e	×a	×b	×e	×g	✓h	×e	×a	×j	×e
Otter (*Lutra lutra*)	×a	×c	×e	×a	×c	×e	×a	×c	×e	×g	×i	×e	×a	×j	×e
Harbour (common) seal (*Phoca vitulina*)	✓d	✓d	×e	✓f	✓f	×e	✓f	✓f	×e	×g	×i	×e	✓k	×j	×e

Evidence supporting conclusions:

a. No significant extra shipping activity through the Wash will take place due to the Facility, during the construction and decommissioning phases. A majority of the marine related construction works will take place from the land side of the Facility (dredging, piling). No marine works will take place during the decommissioning of the Facility. Specific impacts from these have been assessed in **Chapter 17 Marine and Coastal Ecology,** Section 17.8. However, for the purposes of this HRA, no LSE is concluded.

b. There is no pathway for impact from the increased vessel movements caused from the Facility, as determined from the supplementary information provided by Natural England. As such, no LSE is concluded.

c. The habitats most at risk from these activities are not suitable for otter foraging, breeding, resting or holt construction. It is considered unlikely that any otters would be present in the shipping channel and anchorage area to be at risk from these effects. As such, no LSE is concluded.

d. The harbour seal and otter have the potential to be affected by increased vessel movements, as The Wash is a very densely populated area, especially with regards to seals. As such, LSE could not be excluded.

e. No decommissioning-phase impacts are anticipated as the wharf structure linked to the Facility will be left in place and not decommissioned. Therefore, no LSE can be concluded.

f. The harbour seal has the potential to be disturbed from the increase in vessels at haul-out sites, as well as the associated increase in underwater noise relating to the Facility during both construction and operation. As such, LSE could not be excluded.

g. The construction-phase aerial deposition was considered insignificant, as a result of the air quality modelling reported in **Chapter 14 Air Quality**.

h. The air quality modelling results shows the area of influence could affect some habitats, as these Annex I habitats are at risk from changes in air quality and subsequent deposition LSE could not be excluded without assessment.

i. The air quality modelling carried out for the operational phase of the Facility concluded that the area of influence does overlap with the SAC. However, marine mammals are unlikely to be sensitive to the potential effect of the Facility on air quality during operation. As such, no LSE is concluded.

j. The screening exercise for a potential LSE (**Table A17-5**) indicates that the operation of the Facility would not have the potential to result in in-combination effects.

k. The screening exercise for a potential LSE has confirmed that there is potential for other plans or projects to have in-combination effects (**Table A17-5**). As such, LSE could not be excluded.

HRA Screening Matrix A17.1.1.3: The Wash Ramsar site

Table A17-1-1-4 HRA Screening Matrix for The Wash Ramsar Site

Name of protected site and designation: The Wash Ramsar site															
EU Code: site number 395															
Distance to NSIP: 3 km															
Site features	**Likely effects of NSIP**														
Effect	*Increased collision risk*			*Disturbance*			*Changes to noise levels*			*Changes to air quality*			*In combination effects*		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Redshank (*Tringa totanus*)	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Curlew (*Numenius arquata*)	**×a**	**×c**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Oystercatcher (*Haematopus ostralegus*)	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Grey plover (*Pluvialis squatarola*)	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Knot (*Calidris canutus*)	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Sanderling (*Calidris alba*)	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**
Black-tailed godwit (*Limosa limosa islandica*)	**×a**	**×b**	**×d**	**✓e**	**✓e**	**×d**	**✓f**	**✓f**	**×d**	**×g**	**×h**	**×d**	**×a**	**×i**	**×d**

Name of protected site and designation: The Wash Ramsar site															
Ringed plover (*Charadrius hiaticula*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Black-headed gull (*Larus ridibundus*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Common eider (*Somateria mollissima*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Bar-tailed godwit (*Limosa lapponica*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Shelduck (*Tadorna tadorna*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Dark-bellied brent goose (*Branta bernicla bernicla*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Dunlin (*Calidris alpina alpina*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Pink-footed goose (*Anser brachyrhynchus*)	✕a	✕c	✕d	xc	✕c	✕d	✕a	✕c	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Golden plover (*Pluvialis apricaria*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d
Lapwing (*Vanellus vanellus*)	✕a	✕b	✕d	✓e	✓e	✕d	✓f	✓f	✕d	✕g	✕h	✕d	✕a	✕i	✕d

Evidence supporting conclusions:

a. No significant extra shipping activity through the Wash will take place due to the Facility, during the construction and decommissioning phases. A majority of the marine related construction works will take place from the land side of the Facility (dredging, piling). No marine works will take place during the decommissioning of the Facility. Specific impacts

from these have been assessed in **Chapter 17 Marine and Coastal Ecology,** Section 17.8. However, for the purposes of this HRA, no LSE is concluded.

b. Although increased shipping activity throughout The Wash could affect qualifying bird species that fly low above the sea surface, or below, this is considered a low risk environment by Natural England, where the recommendation for a low risk impact is "*Unless there are evidence based case or site specific factors that increase the risk, or uncertainty on the level of pressure on a receptor, this pressure generally does not occur at a level of concern and should not require consideration as part of an assessment*" . As such, no LSE is concluded.

c. There is no interaction of concern between the increased collision risk caused from the Facility, as determined from the supplementary information provided by Natural England. As such, no LSE is concluded.

d. No decommissioning-phase impacts are anticipated as the wharf structure linked to the Facility will be left in place and not decommissioned. Therefore, no LSE can be concluded.

e. Increased ship activity throughout The Wash has the potential to affect the behaviour of roosting, foraging, commuting and breeding birds. LSE could not be excluded, as the qualifying interest features are at medium-high risk from visual disturbance caused by vessel movements.

f. Increased noise levels in The Wash SPA poses a medium-high risk to these qualifying interest features, as it has the potential to affect their foraging, roosting and breeding behaviour. As such, LSE could not be excluded.

g. The construction-phase aerial deposition was considered insignificant, as a result of the air quality modelling reported in **Chapter 14 Air Quality**. As such, no LSE is concluded.

h. Although birds are sensitive to changes in air quality, due to their mobile nature, it is unlikely that the increase in air emissions caused from the Facility will impact the qualifying features. As such, no LSE is concluded.

i. The screening exercise for a potential LSE has confirmed that there are no other plans or projects relevant to the assessment of effects for this site (**Table A17-5**). LSE with other plans and projects, therefore, can be excluded for this protected site.

Appendix A17.1.2 HRA Integrity Matrices

This appendix contains the integrity matrices for the Facility, in accordance with the structure and format specified in the Planning Inspectorate Advice Note 10. The Appendix is structured as follows:

- Appendix A17.1.2.1: HRA Integrity Matrix for The Wash SPA
- Appendix A17.1.2.2: HRA Integrity Matrix for The Wash and North Norfolk Coast SAC
- Appendix A17.1.2.3: HRA Integrity Matrix for The Wash Ramsar site

Planning Inspectorate

Advice Note 10
Habitats Regulations Assessment

Appendix A17.1.2: Integrity Matrix for The Wash SPA, The Wash and North Norfolk Coast SAC, The Wash Ramsar Site

STAGE 2: EFFECTS ON INTEGRITY

Likely significant effects have been identified for the following sites:

- The Wash SPA
- The Wash and North Norfolk Coast SAC
- The Wash Ramsar site

These sites have been subject to further assessment in order to establish if the NSIP could have an adverse effect on their integrity. Evidence for the conclusions reached on integrity is signposted 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

Where effects are not relevant to a particular feature the matrix cell has been formatted as follows:

HRA Integrity Matrix A17.1.2.1: The Wash SPA

Table A17-1-2-1 HRA Integrity Matrix for The Wash SPA

Name of protected site and designation: The Wash SPA															
EU Code: UK9008021															
Distance to NSIP: 3 km															
Site features	**Adverse effect on integrity**														
Effect	*Increased collision risk*			*Disturbance*			*Changes to noise levels*			*Changes to air quality*			*In combination effects*		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Bar-tailed godwit (*Limosa lapponica*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Bewick's swan (*Cygnus columbianus bewickii*), Non-breeding	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Black-tailed godwit (*Limosa limosa islandica*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Common scoter (*Melanitta nigra*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Common tern (*Sterna hirundo*), Breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Curlew (*Numenius arquata*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Dunlin (*Calidris alpina alpina*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Gadwall (*Mareca strepera*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Goldeneye (*Bucephala clangula*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Grey plover (*Pluvialis squatarola*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Knot (*Calidris canutus*), Non-breeding	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**
Little tern (*Sternula albifrons*), Breeding	**a**	**a**	**a**	**a**	**×b**	**a**	**a**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**

Name of protected site and designation: The Wash SPA															
Oystercatcher (*Haematopus ostralegus*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a
Pink-footed goose (*Anser brachyrhynchus*), Non-breeding	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Pintail (*Anas acuta*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a
Redshank (*Tringa totanus*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a
Sanderling (*Calidris alba*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a
Shelduck (*Tadorna tadorna*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a
Turnstone (*Arenaria interpres*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a
Waterbird assemblage, Non-breeding	a	a	a	xb	a	a	xb	a	a	a	a	a	a	a	a
Wigeon (*Mareca penelope*), Non-breeding	a	a	a	xb	×b	a	xb	×b	a	a	a	a	a	a	a

Evidence supporting conclusions:

a. The Stage 1 Screening assessment concluded that LSE could be excluded (HRA Screening Matrix A17.1.1.1).

b. Maintaining the integrity of this SPA is based on the maintenance of the population levels and extent of supporting habitats. Disturbance issues as a result of increased vessel movements were predicted not to be significant when considering the additional disturbance events that the birds would be subjected to as a result of the proposed increase in vessel numbers and the effect is not therefore predicted to affect the population levels of any of the SPA species, nor is it expected to affect the supporting habitats, as assessed in **Chapter 17 Marine and Coastal Ecology**, Section 17.8, assessment of impacts on marine and coastal ecology. See **Section A17.6** for the relevant appropriate assessment.

HRA Integrity Matrix A17.1.2.2: The Wash and North Norfolk Coast SAC

Table A17-1-2-2 HRA Integrity Matrix for The Wash and North Norfolk Coast SAC

Name of protected site and designation: The Wash and North Norfolk Coast SPA															
EU Code: UK0017075															
Distance to NSIP: 3 km															
Site features	**Adverse effect on integrity**														
Effect	*Increased collision risk*			*Disturbance*			*Changes to noise levels*			*Changes to air quality*			*In combination effects*		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	a	a	a	a	a	a	a	a	a	a	×c	a	a	a	a
Coastal lagoons	a	a	a	a	a	a	a	a	a	a	×d	a	a	a	a
Large shallow inlets and bays	a	a	a	a	a	a	a	a	a	a	×d	a	a	a	a
Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	a	a	a	a	a	a	a	a	a	a	×c	a	a	a	a
Mudflats and sandflats not covered by seawater at low tide	a	a	a	a	a	a	a	a	a	a	×d	a	a	a	a
Reefs	a	a	a	a	a	a	a	a	a	a	×d	a	a	a	a
Salicornia and other annuals colonising mud and sand	a	a	a	a	a	a	a	a	a	a	×c	a	a	a	a
Sandbanks which are slightly covered by sea water all the time	a	a	a	a	a	a	a	a	a	a	×d	a	a	a	a
Otter (*Lutra lutra*)	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Harbour (common) seal (*Phoca vitulina*)	×b	×b	a	×b	×b	a	×b	×b	a	a	a	a	e	e	a

Evidence supporting conclusions:

a. The Stage 1 Screening assessment concluded that LSE could be excluded (HRA Screening Matrix A17.1.1.2)..

b. Due to the size of the shipping channel representing a very small proportion of The Wash area, the increased shipping activity (leading to collision risk, disturbance and noise) is unlikely to interfere with the population and distribution of the harbour seal and otter. Likewise, the very small number of harbour seal potentially affected by the underwater noise from piling and dredging activities during construction is unlikely to lead to interference with the population and distribution of the harbour seal. As such, no adverse effect on integrity can be concluded. See **Section A17.6** for the relevant appropriate assessment.

c. The air quality modelling reported in **Chapter 14 Air Quality** indicated that the aerial deposition for some pollutants was slightly greater than 1 % of the Critical Load. However, overall deposition of contaminants (specifically nitrogen) is generally of low importance for saltmarshes as the inputs are generally significantly below the large nutrient loadings from riverine and tidal

inputs. As no exceedances of the Critical Load were predicted from an in-combination PEC point of view, no adverse effects on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives were concluded.

d. Aerial deposition on to intertidal habitats (such as mudflats and shellfish beds that are exposed and covered at every state of the tide), where although deposition may occur in-between tides, this would be washed away with the tide; although there is the potential for this to contribute to a change in water quality, in the context of the wider water column, this is not considered to be significant. This is further supported by the fact that APIS does not identify deposition as a main input of pollutants to the marine system, compared to other sources of pollutant inputs (such as discharge pipes etc.). As such, the modelled deposition is not expected to have a wider impact on intertidal habitats or water quality, and no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives were concluded.

e. Potential effects from the Facility alone and the in-combination project together have the potential to effect a small number of harbour seal, and as such is unlikely to lead to interference with the population and distribution of the harbour seal. Therefore, no adverse effect on integrity can be concluded. See **Section A17.6** for the relevant appropriate assessment.

HRA Integrity Matrix A17.1.2.3: The Wash Ramsar site

Table A17-1-2-3 HRA Integrity Matrix for The Wash Ramsar Site

Name of protected site and designation: The Wash Ramsar site																
EU Code: site number 395																
Distance to NSIP: 3 km																
Site features	**Adverse effects on integrity**															
Effect	*Increased collision risk*			*Disturbance*			*Changes to noise levels*			*Changes to air quality*			*In combination effects*			
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	
Redshank (*Tringa totanus*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Curlew (*Numenius arquata*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Oystercatcher (*Haematopus ostralegus*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Grey plover (*Pluvialis squatarola*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Knot (*Calidris canutus*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Sanderling (*Calidris alba*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Black-tailed godwit (*Limosa limosa islandica*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Ringed plover (*Charadrius hiaticula*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Black-headed gull (*Larus ridibundus*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Common eider (*Somateria mollissima*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Bar-tailed godwit (*Limosa lapponica*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Shelduck (*Tadorna tadorna*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Dark-bellied brent goose (*Branta bernicla bernicla*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Dunlin (*Calidris alpina alpina*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Pink-footed goose (*Anser brachyrhynchus*)	**a**	**a**	**a**		**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Golden plover (*Pluvialis apricaria*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	
Lapwing (*Vanellus vanellus*)	**a**	**a**	**a**	**xb**	**×b**	**a**	**xb**	**×b**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	

Evidence supporting conclusions:

a. The Stage 1 Screening assessment concluded that LSE could be excluded (HRA Screening Matrix A17.1.1.3).

b. Maintaining the integrity of this site is based on the maintenance of the population levels and extent of supporting habitats. Disturbance issues as a result of increased vessel movements were predicted to not be significant given that repeat disturbance events that would occur due to the increase in vessel numbers do not disturb significant numbers of birds and the effect is not therefore expected to affect the population levels of any of the designated species, nor is it expected to affect the supporting habitats, as assessed in **Chapter 17 Marine and Coastal Ecology**, Section 17.8, assessment of impacts on marine and coastal ecology. See **Section A17.6** for the relevant appropriate assessment.

A17.1.2.4 Summary data for bird disturbance events

Species in bold are those that are SPA or Ramsar listed species. Species with * are those that are identified in the Ramsar site designation as 'Species/populations identified subsequent to designation for possible future consideration under criterion 6.' Green shading indicates that the species was previously disturbed in the same day. It may not be the same individuals, but this is difficult to prove unless the numbers are much higher in subsequent events. Yellow shading indicates three disturbance events and pink reflects four disturbance events in any one day.

Table 17-1-2-4 Bird Survey Results, 22nd November 2019

Time	Vessel Type	Species	SPA baseline population number (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed by vessel arrival	Number of birds disturbed by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of 2013-2018 WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
14:06	**Large cargo ship**	Ringed Plover* *Charadrius hiaticula*		Red	National: 340 International: 730		40	1,264	3.16	Birds roosting on rocks at Tabb's head & once disturbed flew and circled their roost for 45 seconds before returning.		Ringed plover is regarded as a very tolerant species to moderate- and high-level disturbance and can habituate to anthropogenic disturbance rapidly (Cutts *et al.*, 2013). As such it is unlikely that regular disturbance would be an issue other than potential ship wash, which can be mitigated through vessel speed limits. According to NE's supplementary conservation advice for The Wash SPA, ringed plovers are not currently a major component of the wintering assemblage. 40 individuals represents 0.01 % of the recent (2014/15-2018/19) assemblage WeBS counts.
		Dunlin *Calidris alpina*	29,000 (23,467)	Amber	National: 3400 International: 13300		20	26,321	0.08			Dunlin is regarded as a very tolerant species to moderate- and high-level disturbance (Cutts *et al.*, 2013). Ship wash impacts should be able to be mitigated through vessel speed restrictions. During this survey (and all of the consequent surveys in the below tables), the number of dunlin affected was very low in the context of the SPA population (in this instance less than 0.1 %) therefore effects to this scale would not represent a significant effect on the distribution and population within the SPA.
14:26	**Cargo ship**	Lapwing* *Vanellus vanellus*		Red	National: 6200 International: 20000	200		14,611	1.37	Flew to different roost site c300 m away.		Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated disturbance of a significant proportion (i.e. >1 %) of the population in recent WeBS counts. During this tidal cycle lapwing were displaced to an alternate site so were not affected by subsequent disturbance events. Birds displaced from the site at the first disturbance would be unlikely to be affected by an increase in the frequency of vessel traffic entering and exiting the Haven. 200 individuals represent 0.05 % of the most recent assemblage WeBS counts.

Time	Vessel Type	Species	SPA baseline population number (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed by vessel arrival	Number of birds disturbed by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of 2013-2018 WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
		Redshank *Tringa totanus*	4331 (2766)	Amber	National: 1200 International: 2400	4	2	5,712	0.11	Flew to different roost site c300 m away.	2 Redshank took flight and flew c300 m to a roost site after the waves had washed over their chosen feeding area.	Redshank are regarded as a very tolerant species to moderate- and high-level disturbance (Cutts *et al*., 2013). 300 m displacement affected *c*.0.1 % of the SPA population. Ship wash can be mitigated through vessel speed limits. A very small proportion of the SPA population (*c*.0.1 %) was disturbed; birds were largely displaced from the site and were therefore not affected by further disturbance events reported in this table. This was the case across all survey dates (for this species), indicating that generally speaking disturbances at the mouth of the Haven result in a displacement from the site, rather than repeated effects on constantly returning individuals (and the energy budget implications this may have). If this is the case, an increase in the daily frequency of vessel movements would be unlikely to significantly alter the magnitude of disturbance reactions at the mouth of the Haven (i.e. it is likely that once initially disturbed, there would be movement away from the affected site therefore less risk of repeated disturbance). Although the frequency of disturbance events will increase, there will be no increase in the spatial area likely to be affected. Redshank would likely be able to roost alternatively in the saline lagoons at Freiston RSPB and on the intertidal outwith a disturbance radius of the navigation route.
		Turnstone *Arenaria interpres*	980 (388)	Amber	National: 480 International: 1400	15	3	911	1.98	Circled their original roost site for 60 seconds before settling back.	3 Turnstone took flight and flew c300 m to a roost site after the waves had washed over their chosen feeding area.	While turnstone returned to the roost site following disturbance and thus may be affected by consequent events, disturbance effects were only recorded in *c*.2 % of the SPA population. However, turnstones are recognised to be a very tolerant species to moderate- and high-level disturbance and can habituate rapidly (Cutts *et al.*, 2013) so it is unlikely that regular disturbance would be an issue other than potential ship wash over feeding sites. Ship wash can be mitigated through vessel speed limits.
		Ringed Plover* *Charadrius hiaticula*		Red	National: 340 International: 730	3		1,264	0.24	Circled their original roost site for 60 seconds before settling back.		Ringed plover is regarded as a very tolerant species to moderate- and high-level disturbance and can habituate to anthropogenic disturbance rapidly (Cutts *et al.*, 2013). As such it is unlikely that regular disturbance would be an issue other than

Time	Vessel Type	Species	SPA baseline population number (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed by vessel arrival	Number of birds disturbed by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of 2013-2018 WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
												potential shipwash, which can be mitigated through vessel speed limits. The maximum number of birds that experienced repeated disturbance responses during the survey was a very small proportion (<0.25 %) of the population recorded in recent WeBS counts.
		Dunlin *Calidris alpina*	29,000 (23,467)	Amber	National:3400 International: 13300	150		26,321	0.57	Circled their original roost site for 60 seconds before settling back.		Although a second disturbance event, only 20 individuals responded to the first disturbance event so for at least 130 of the individuals recorded this was the first disturbance event in the tidal cycle. Although dunlin appear to favour a return to roost sites following disturbance (i.e. increasing their vulnerability to an increase in the frequency of disturbance events), 150 birds represents a very low (*c.*0.6 %) proportion of the wider population (based on recent WeBS counts).
		Eider *Somateria mollissima*	1109 (no SPA data as Ramsar species only	Amber	National: 770 International: 9800	2		653	0.31	Flew 500 m from roost.		This represents less than 1 % of the Ramsar population and therefore would be unlikely to have a significant effect on distribution and population within the Ramsar site.
14:40	**Small fishing boat**	None				0					The effects of the boat wash were much less than that of the larger cargo ships.	
14:52	**Small pilot boat**	**Redshank *Tringa totanus***	4331 (2766)	Amber	National: 1200 International: 2400		1	5,712	0.02		Flew 10 m to a roost site after it's chosen feeding area was washed out by the waves	Earlier in the day 6 redshank were disturbed and all flew to nearby roost sites. This one individual may have flown in since the previous disturbance and was feeding. In the event that this individual was the same as one of the birds disturbed earlier, this represents 0.02 % of the population under recent WeBS counts being affected by repeat disturbance events. Could be avoided through vessel speed restrictions.

Table A17-1-2-5 Bird Survey Results, 19th December 2019

Time	Vessel Type	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a Percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
09:38	**Small pilot boat**	Golden Plover* *Pluvialis apricaria*			National: 4000 International: 9300	750		14,146	5.30	Took flight from their roosting spot, flew around for 90 seconds before settling back down to roost.		Golden plover are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated disturbance of a significant proportion of the population in recent WeBS counts. Given that this species appeared to return to roosts after disturbance, an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle.
		Lapwing* *Vanellus*		Red	National: 6200 International: 20000	500	100	14,611	4.11	Took flight from their roosting spot, flew around for 90 seconds before settling back down to roost.	Took flight following displacement caused by the wash of the boat.	Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated disturbance of a significant proportion of the population in recent WeBS counts. Given that this species appeared to return to roosts after disturbance, an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle.
Before entering mouth of The Haven	**Large cargo ship**	Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	2		482	0.41	Flew c500 m north before settling on the water.	Both species flew to avoid collision.	
		Great Northern Diver *Gavia immer*		Amber	National: 43 International: 50	1		2 (1.8)	55.6 %	Flew 750 m south before resting on the water		
10:09	**Same large cargo ship as above (entering mouth of The Haven**	**Oystercatcher *Haematopus ostralegus***	24,000 (17,380)	Amber	National: 3200 International: 8200	50		19,679	0.25	Flew c300 m to another roost site		This represents less than 1 % of the SPA population and therefore would be unlikely to have a significant effect on distribution and population within the SPA. They also flew to an alternative roost site and as such less likely to be subject to another disturbance event on this tidal cycle.
		Lapwing* *Vanellus vanellus*		Red	National: 6200 International: 20000	c1,100		14,611	7.53	Flew and circled their current roost site for c90 seconds before returning to their original roost site.		Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated repeat disturbance of up to 600 individuals (given that only 500 were disturbed during the first event), which represents a significant proportion of the population in recent WeBS counts. Given that this species appeared to return to roosts after disturbance, an increase in vessel traffic may lead to an

Time	Vessel Type	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a Percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
												increased number of disturbance events per tidal cycle. 1,100 individuals represents around 0.3 % of the most recent WeBS assemblage population in The Wash.
		Black-tailed Godwit* *Limosa limosa*	260 (5295)	Amber	National: 430 International: 610	c2,000		8,376	23.88	All birds took flight	It is assumed that the birds flew off to an alternative roost as they are not mentioned for future vessel disturbance in subsequent episodes during the day	Although a large number of birds were disturbed, they were displaced from the site and were therefore not affected by further disturbance events. As such, an increase in the frequency of vessel movements during high tide would be unlikely to significantly alter the disturbance reactions of this species at the mouth of the Haven (i.e. it is likely that once initially disturbed, there would be movement away from the affected site therefore less risk of repeated disturbance). Black-tailed godwit would likely be able to roost alternatively in the saline lagoons at Freiston RSPB and on the intertidal / saltmarsh outwith a disturbance radius of the navigation route.
		Golden Plover* *Pluvialis apricaria*			National: 4000 International: 9300	c3,000		14,146	21.21	Flew and circled their current roost site for c90 seconds before returning to their original roost site.		This represents repeat disturbance of a maximum of 2,250 individuals, which represents a significant proportion of the population in recent WeBS counts, although only represents 0.8 % of the most recent assemblage WeBS counts. Given that this species appeared to return to roosts after disturbance, an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle.
		Redshank *Tringa totanus*	4331 (2766)	Amber	National: 1200 International: 2400	220		5,712	3.85	All birds took flight		A significant proportion of the SPA population was disturbed, although they were displaced from the site and were therefore not affected by further disturbance events reported in this table. This was generally the case across all survey dates (for this species), indicating that generally speaking disturbances at the mouth of the Haven result in a displacement from the site, rather than repeated effects on constantly returning individuals (and the energy budget implications this may have). If this is the case, an increase in the daily frequency of vessel movements would be unlikely to significantly alter the magnitude of disturbance reactions at the mouth of the Haven (i.e. it is likely that once initially

Time	Vessel Type	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a Percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
												disturbed, there would be movement away from the affected site therefore less risk of repeated disturbance). Although the frequency of disturbance events will increase during high tide, there will be no increase in the spatial area likely to be affected. Redshank would likely be able to roost alternatively in the saline lagoons at Freiston RSPB and on the intertidal outwith a disturbance radius of the navigation route.
		Knot *Calidris canutus*	75,000 (112,057)	Amber	National: 2600 International: 5300	500		170,471	0.29	All birds took flight		Knot is regarded as a tolerant species to moderate- and high-level disturbance (Cutts *et al.*, 2013). Very low (<0.3 %) proportion of SPA population affected, with no subsequent disturbances, indicating that increasing frequency of vessel traffic would not have a significant effect on disturbance levels.
		Dunlin *Calidris alpina*	29,000 (23,467)	Amber	National: 3400 International: 13300	100		26,321	0.38	All birds took flight		Dunlin is regarded as a very tolerant species to moderate- and high-level disturbance (Cutts *et al.*, 2013). As such it is unlikely that regular disturbance would be an issue other than from ship wash. Ship wash impacts should be mitigatable through vessel speeds. Very low (<0.4 %) proportion of SPA population affected, with no subsequent disturbances, indicating that increasing frequency of vessel traffic would not have a significant effect on disturbance levels.
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	10		482	2.07	Flew c200 m and returned to resting on the water		
10:45	**Small boat (from mouth of the River Welland toward The Wash)**	Lapwing* *Vanellus vanellus*		Red	National: 6200 International: 20000	c500		14,611	3.42	C500 Lapwing took flight and circled their roost for 120 seconds before returning to roost.		Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated repeat disturbance of up to 500 individuals, which represents a significant proportion of the population in recent WeBS counts. Given that this species appeared to return to roosts after disturbance (following 90-120 seconds of flight), an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle.

Time	Vessel Type	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a Percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
		Wigeon *Mareca Penelope*	3900 (9380)	Amber	National: 4500 International: 14000	c100		10,856	0.92	Both species were resting on the water and flew c400 m before returning to resting on the water		There is no mitigation available that would reduce the disturbance to birds using the water channel within navigation routes. However, in this (and all other survey visits), the number of wigeon affected was very low in the context of the SPA population (i.e. less than 1 %). Effects to this scale would not represent a significant effect on the distribution and population within the SPA.
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	3		482	0.62			
11:07	**Cargo ship**	Lapwing* *Vanellus vanellus*		Red	National: 6200 International: 20000	c1,000		14,611	6.84	Took flight from roost site and flew c800 m to a different roost site.		Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though this observation indicated repeat disturbance of up to 1,000 individuals, which represents a significant proportion of the population in recent WeBS counts. Following this fourth event, birds were seen to displace from the roost site to an alternative. This may indicate that, following repeat disturbances, there comes a point at which the birds revert from the previous response of flight and return to a response of flight and abandonment/displacement. This could in fact suggest that increasing the frequency of vessel movements may, rather than significantly increasing overall energy expenditure, instead increases the chances of displacement.
		Golden Plover* *Pluvialis apricaria*			National: 4000 International: 9300	c500		14,146	3.53			Golden plover are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though this observation indicated repeat disturbance of up to 500 individuals, which represents a significant proportion of the population in recent WeBS counts. Following this disturbance event, birds were seen to displace from the roost site to an alternative location. This may indicate that, following repeat disturbances, there comes a point at which the birds revert from the previous response of flight and return to a response of flight and abandonment/displacement. This could in fact suggest that increasing the frequency of vessel movements may, rather than significantly increasing overall energy

Time	Vessel Type	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a Percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
												expenditure, instead increases the chances of displacement.
		Wigeon *Mareca Penelope*	3900 (9380)	Amber	National: 4500 International: 14000	30		10,856	0.28	Flew c100 m before returning to the water to rest.		There is no mitigation available that would reduce disturbance to birds using the water channel within navigation routes. However, subsequent disturbances affected fewer individuals indicating that, following the first event, birds were displaced from the navigation routes. If this was the case, increasing the frequency of daily vessels would not significantly change the disturbance levels. For example, the number of wigeon affected by repeat events during the survey was very low (<0.3 %) of the number recorded in recent WeBS counts.
		Mallard *Anas platyrhynchos*		Amber	National: 6700 International: 20000	55		1,295	4.25			
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	3		482	0.62	Roosting on the water then flew c150 m before returning to the water		
11:15	**Small boat**	Mallard				50		1,295	3.86	Roosting birds flew c150 m before returning to the water.	No changes in behaviour were detected	
		Wigeon	3900 (9380)			10		10,856	0.09	Flew c50 m before landing on the saltmarsh.		There is no mitigation available that would reduce disturbance to birds using the water channel within navigation routes – it is inherent that any increases in vessel traffic will increase the number of times birds are required to undertake evasive tactics. However, on all surveyed dates, subsequent disturbances affected fewer individuals than the initial disturbances indicating that, following the first event, birds were displaced from within navigation routes (for example, the number of wigeon affected by repeat events during this survey date was very low (<0.3 %) of the number recorded in recent WeBS counts). Assuming this to be the case, an increase in the frequency of daily vessels would not significantly change the disturbance levels.

Time	Vessel Type	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a Percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
11:36	**Small pilot boat**	None								No changes in behaviour were detected in regard to the boat's wash or by the boat's presence. It is worth noting that by this stage the majority of birds had already been displaced by previous vessel movements.		

Table A17-1-2-6 Bird Survey Results, 17th January 2020

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
09:12	Pilot boat	**Turnstone *Arenaria interpres***	980 (388)	Amber	National: 480 International: 1400		22	911	2.41		Both species feeding on the muddy banks and then flew c100 m to another accessible feeding location.	Turnstones are recognised to be a very tolerant species to moderate- and high-level disturbance and can habituate rapidly (Cutts *et al.*, 2013) so it is unlikely that regular disturbance would be an issue other than potential ship wash over feeding sites. Pilot boat wash extended 1 m than the water level due to the speed of the vessel. This can be mitigated through vessel speed restriction and enforcement.
		Redshank *Tringa totanus*	4331 (2766)	Amber	National: 1200 International: 2400		36	5,712	0.63			Redshank are regarded as a very tolerant species to moderate- and high-level disturbance (Cutts *et al*., 2013). A very low proportion of the SPA population (*c*.0.6 %) was disturbed; birds were displaced from the site and were therefore not affected by the further disturbance events reported in this table. This was largely the case across all survey dates (for this species), indicating that generally speaking disturbances at the mouth of the Haven result in a displacement of this species from the site, rather than repeated effects on constantly-returning individuals (and the energy budget implications this may have). If this is the case, an increase in the daily frequency of vessel movements would be unlikely to significantly alter the magnitude of disturbance reactions at the mouth of the Haven (i.e. it is likely that once initially disturbed, there would be movement away from the affected site therefore less risk of repeated disturbance). This disturbance event was due to ship wash from the pilot boat and could be avoided through enforcement of speed restrictions. Although the frequency of disturbance events will increase, there will be no increase in the spatial area likely to be affected. Redshank would likely be able to roost and forage alternatively in the saline lagoons at Freiston RSPB and on the intertidal outwith a disturbance radius of the navigation route.
09:12	Small fishing boat and pilot boat (same as mentioned	**Oystercatcher *Haematopus ostralegus***	24,000 (17,380)	Amber	National: 3200 International: 8200	c700		19,679	3.56	Flew c250 m to an alternative roost location.		As the pilot and fishing vessels do not usually have such an impact it is possible that this impact was partly down to the speed of the pilot vessel. This can be mitigated by limiting vessel speed.

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
	above) entered The Wash from the River Haven	**Dunlin** ***Calidris alpina***	29,000 (23,467)	Amber	National: 3400 International: 13300	50		26,321	0.19	Flew c250 m to an alternative roost location.		During this survey (and the consequent surveys in the below tables), the number of dunlin affected was very low in the context of the SPA population (in this instance less than 0.2 %).
		Lapwing* *Vanellus vanellus*		Red	National: 6200 International: 20000	c600		14,611	4.11	Flew c250 m to an alternative roost location.		Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated disturbance of a significant proportion of the population in recent WeBS counts. Given that this species may have returned to the roost given that a subsequent disturbance event is listed below, an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle.
		Dark-bellied Brent Geese ***Branta bernicla bernicla***	17,000 (17,621)	Amber	National: 980 International: 2100	c250		14,687	1.70	Flew c300 m and landed on the saltmarsh to feed.		Brent geese are considered to be highly sensitive to disturbances (Cutts *et al.*, 2013). This was the only occasion during the surveys in which disturbance responses from brent geese were recorded. Based on this observation, it appears that the response to vessel disturbance manifested as flight and displacement to an alternate nearby location where foraging commenced. If this response is typical, it suggests that increased frequency of vessel disturbances over high tide would not increase the disturbance levels (i.e. a first event would displace birds to undisturbed areas therefore would be unlikely to be affected by a change in the frequency of subsequent effects). There was no record of this species being disturbed on subsequent vessel movements on the same day.
		Teal *Anas crecca*		Amber	National: 4300 International: 5000	25		3,357	0.74	Flew c150 m before resting on the water		
		Black-headed Gull ***Chroicocephalus ridibundus***	31,403 Ramsar species	Amber	National: 22000 International: 20000	10		17,840	0.06	Flew c250 m to an alternative roost location.		During this survey (and others), the number of black headed gulls affected by vessel disturbance was very low in the context of the SPA population (in this instance less than 0.06 %) therefore effects to this scale would not represent a significant effect on the distribution and population within the SPA.
		Wigeon ***Mareca Penelope***	3900 (9380)	Amber	National: 4500 International: 14000	12		10,856	0.11	Flew c150 m before resting on the water		There is no mitigation available that would reduce the disturbance to birds using the water channel within navigation routes. However, in this (and all other survey visits), the number of wigeon affected was very low in the context of the SPA

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
												population (i.e. less than 1 %). Effects to this scale would not represent a significant effect on the distribution and population within the SPA.
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	3		482	0.62	Flew c50 m to another roost site		
		Shelduck *Tadorna tadorna*	16,000 (6379)	Amber	National: 610 International: 3000	2		3,175	0.06	Flew c100 m before resting on the water		In this instance, the number of shelducks affected was very low in the context of the SPA population (i.e. less than 1 %). Effects to this scale would not represent a significant effect on the distribution and population within the SPA.
		Red-breasted Merganser *Mergus serrator*			National: 100 International: 860	1		76	1.32	Flew c400 m before resting on the water		
09:37	**Pilot boat**	Great-crested Grebe *Podiceps cristatus*			National: 170 International: 6300	1		89	1.12	Flew c500 m before resting on the water	No changes in behaviour were detected	Behaviour changed due to pilot vessel before vessel reached the mouth
		Herring Gulls *Larus argentatus*		Red	National: 7300 International: 10200	2		6,266	0.03	Flew c50 m before returning to the water		Behaviour changed due to pilot vessel before vessel reached the mouth
		Mallard *Anas platyrhynchos*		Amber	National: 6700 International: 20000	2		1,295	0.15	All species flew c200 m before returning to the water		
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	2		482	0.41			
		Eider *Somateria mollissima*	1109	Amber	National: 770 International: 9800	1		653	0.15			In this (and all other survey visits), the number of wigeon affected was very low in the context of the Ramsar population (i.e. less than 1 %). Effects to this scale would not represent a significant effect on the distribution and population within the Ramsar.
		Oystercatcher *Haematopus ostralegus*	24,000 (17,380)	Amber	National: 3200 International: 8200	32		19,679	0.16	Both species were roosting & flew c150 m to a different roost site.		In this instance, the number of oystercatchers affected was very low in the context of the SPA population (i.e. less than 1 %). The previous event on the same day disturbed c700 oystercatcher which flew to an alternative roost. It is possible that these individuals returned soon after but may also have been different individuals. Effects to this scale would not represent a significant effect on the distribution and population within the SPA.
		Black-tailed Godwit* *Limosa limosa*	260 (5295)	Amber	National: 430 International: 610	5		8,376	0.06			In this instance, the number of black-tailed godwits affected was very low in the context of the SPA population (i.e. less than 1 %). Effects to this scale would not represent a significant effect on the distribution and population within the SPA.

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
09:43	**Large ship**	Great-crested Grebe *Podiceps cristatus*			National: 170 International: 6300	1		89	1.12	Flew 400 m to avoid collision in the Wash	No changes in behaviour were detected.	Behaviour changed before vessel reaching the mouth
		Lapwing* *Vanellus vanellus*		Red	National: 6200 International: 20000	c800		14,611	5.48	Both species flew from their current roost site and circled for 90 seconds before returning to their original roost site		Lapwing are reasonably tolerant of moderate-level disturbances (Cutts *et al.*, 2013), though the survey indicated there may have been repeat disturbance of up to 600 individuals (given that 600 were disturbed during the first event), which represents a significant proportion of the population in recent WeBS counts. Given that this species appeared to return to roosts after disturbance, an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle
		Black-tailed Godwit* ***Limosa limosa***	260 (5295)	Amber	National: 430 International:610	c200		8,376	2.39			This represents disturbance of a significant proportion of the population in recent WeBS counts, although the first disturbance event only affected a maximum of 5 individuals therefore for most of the birds this was the first disturbance. However, given that this species appeared to return to the roost after disturbance, an increase in vessel traffic may lead to an increased number of disturbance events per tidal cycle.
		Redshank ***Tringa totanus***	4331 (2766)	Amber	National: 1200 International: 2400	6		5,712	0.11	All species flew c300 m to a different roost site		During this survey, the number of redshanks affected by repeated disturbance effects was very low in the context of the SPA population (*c.*0.1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Curlew ***Numenius arquata***	3700 (4194)	Red	National: 1400 International: 8400	2		6,970	0.03			During this survey (and other surveys), the number of curlews affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Dunlin ***Calidris alpina***	29,000 (23,467)	Amber	National: 3400 International: 13300	5		26,321	0.02			During this survey (as with other survey visits), the number of dunlins affected by repeated disturbance effects was very low in the context of the SPA population (0.02 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Teal *Anas crecca*		Amber	National: 4300 International: 5000	27		3,357	0.80	Both species flew c500 m to		

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
		Wigeon ***Mareca Penelope***	3900 (9380)	Amber	National: 4500 International: 14000	8		10,856	0.07	a different roost site		There is no mitigation available that would reduce disturbance to birds using the water channel within navigation routes. However, subsequent disturbances affected fewer individuals indicating that, following the first event, birds were either displaced from the navigation routes or not so easily disturbed a second time. If this was the case, increasing the frequency of daily vessels would not significantly change the disturbance levels. For example, the number of wigeon affected by repeat events during the survey was very low (0.07 %) of the number recorded in recent WeBS counts.
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	3		482	0.62	Flew c100 m from a roost site before resting on the water		
11:02	**Small fishing boat**									No changes in behaviour were noted.		

Table A17-1-2-7 Bird Survey Results, 17th February 2020

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
12:23	**Large cargo ship**	**Shelduck *Tadorna tadorna***	16,000 (6379)	Amber	National: 610 International: 3000	36		3,175	1.13	All species flew from their current roost site c800 m to another roost site.	No changes in behaviour were detected.	
		Teal *Anas crecca*		Amber	National: 4300 International: 5000	54		3,357	1.61			
		Grey Plover *Pluvialis squatarola*	5500 (7696)	Amber	National: 430 International: 2500	5		9,462	0.05			During this survey, the number of grey plovers affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Redshank *Tringa totanus*	4331 (2766)	Amber	National: 1200 International: 2400	35		5,712	0.61			During this survey, the number of redshanks affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Curlew *Numenius arquata*	3700 (4194)	Red	National: 1400 International: 8400	16		6,970	0.23			During this survey (and other surveys), the number of curlews affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Oystercatcher *Haematopus ostralegus*	24,000 (17,380)	Amber	National: 3200 International: 8200	10		19,679	0.05			During this survey, the number of oystercatchers affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Herring Gull *Larus argentatus*		Red	National: 7300 International: 10200	2		6,266	0.03	Both species flew c200 m before resting on the water.		
		Great Black-backed Gull *Larus marinus*		Amber	National: 9175 International: 3600	1		603	0.17			
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	2		482	0.41	Flew c100 m before resting on the water.		
12:27	**Large cargo ship**	**Shelduck *Tadorna tadorna***	16,000 (6379)	Amber	National: 610 International: 3000	3		3,175	0.09	Resting on the water at the river mouth and flew c150	No changes in behaviour	During this survey (and all other surveys), the number of shelducks affected by repeated disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). This suggests that those disturbed in the first event were displaced from the site and were therefore unlikely to be affected by repeat disturbances.

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	WeBS Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash	Comments for SPA species
										m to avoid collision.	were detected.	Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Redshank ***Tringa totanus***	4331 (2766)	Amber	National: 1200 International: 2400	5		5,712	0.09	Both species flew from their current roost site c800 m to another roost site.		During this survey, the number of redshanks affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Oystercatcher ***Haematopus ostralegus***	24,000 (17,380)	Amber	National: 3200 International: 8200	6		19,679	0.03			During this survey, the number of oystercatchers affected by disturbance effects was very low in the context of the SPA population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the SPA.
		Black-headed Gull ***Chroicocephalus ridibundus***	31,403 Ramsar species only)	Amber	National: 22000 International: 20000	1		17,840	0.01	Roosting then flew & circled its current site for 80 seconds before returning.		During this survey (and other surveys), the number of black-headed gulls affected by disturbance effects was very low in the context of the Ramsar population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the Ramsar site.
12:51	**Large cargo ship**	**Black-headed Gull** ***Chroicocephalus ridibundus***	31,403 (Ramsar species only)	Amber	National: 22000 International: 20000	1		17,840	0.01	Same bird as mentioned for 12:27 vessel movement) flew c500 m from current roost location to new roost location on a buoy.	No changes in behaviour were detected.	During this survey (and other surveys), the number of black-headed gulls affected by disturbance effects was very low in the context of the Ramsar population (i.e. less than 1 %). Effects to this level would not represent a significant effect on the distribution and population of this species in the Ramsar site.
		Cormorant *Phalacrocorax carbo*		Amber	National: 620 International: 1200	1		482	0.21	Flew from roosting location c100 m before resting on the water.		

Table A17-1-2-8 Bird Survey Results, 12th March 2020

Time	Vessel Type & Activity	Species	SPA baseline population number 5 year mean peak (2006-11 5 yr mean peak)	Red or Amber List	Threshold for National & International Importance	Number of birds disturbed of that species by vessel arrival	Number of birds disturbed of that species by ship wash	WeBS 5 year average for The Wash 2013-2018	Birds disturbed as a percentage of latest WeBS data (%)	Response to vessel arrival	Response to ship wash
06:48	Large cargo ship	**Oystercatcher *Haematopus ostralegus***	24,000 (17,380)	Amber	National: 3200 International: 8200	c300		19,679	1.52	All roosting waders flew c800 m to another roosting location.	No changes in behaviour were detected.
		Turnstone *Arenaria interpres*	980 (388)	Amber	National: 480 International: 1400	15		911	1.65		
		Redshank *Tringa totanus*	4331 (2766)	Amber	National: 1200 International: 2400	10		5,712	0.18		
		Dunlin *Calidris alpina*	29,000 (23,467)	Amber	National: 3400 International:13300	50		26,321	0.19		

Appendix A17.1.3 Consultation

Date	Method of communication	Stakeholder/Consultee	Topic
May 2018	PINS Correspondence	All	Scoping Opinion to all statutory consultees
11 February 2019	Meeting	Natural England	Project update meeting with presentation on project developments and next steps. Focus on terrestrial and marine ecology issues and the HRA.
3 April 2019	Meeting	MMO	Meeting to discuss the scheme and potential impacts on the marine environment, including aspects of deemed marine licensing within the DCO.
19 June 2019	Email	All Section 42 Consultees	Preliminary Environmental Information Report sent for consultation.
19 June 2019	Meeting	RSPB Frampton	Meeting to introduce the project and discuss potential community benefits and potential suggestions for compensatory habitat.
25 June 2019	Meeting	Lincolnshire Wildlife Trust	Round table meeting to discuss Phase Three statutory consultation and the publication of the PEIR.
August 2019	Emails (received)	Section 42 Responses	Responses from NE, RSPB and LWT received to be incorporated into ES chapters and HRA.
11 September 2019	Meeting	RSPB Frampton	Project update meeting to discuss Section 42 response and go through the RSPB's comments.

Date	Method of communication	Stakeholder/Consultee	Topic
23 September 2019	Meeting	Natural England	Meeting to discuss comments raised by Natural England following submission of the PEIR.
16 June 2020	Meeting	Natural England, Environment Agency, Lincolnshire Wildlife Trust and RSPB	Project update meeting to discuss changes to the project and provide information on upcoming consultation proposals. Also, an overview of findings from recent overwintering bird surveys and breeding bird surveys was provided.
07 September 2020	Email	Natural England, Environment Agency, Lincolnshire Wildlife Trust and RSPB	Email sent with attached copies of bird count reports for the overwintering and breeding bird numbers.
30 September 2020	Email	Natural England, Environment Agency, Lincolnshire Wildlife Trust and RSPB	Email with Breeding Bird Survey Report and an update on the assessment.
13 October 2020	Meeting	RSPB	Meeting to discuss the feasibility of mitigation options for marine ornithology. Two options were discussed which could form a mitigation package: habitat creation at Freiston Shore and habitat improvement at Frampton Marshes. Overall, it was concluded that improving roosting would be more beneficial at Freiston and improving breeding and feeding could be beneficial at Frampton Marshes.

Date	Method of communication	Stakeholder/Consultee	Topic
			The potential for vessel movements affecting red throated diver in the Greater Wash SPA was discussed as a potential in-combination effect.
22 October 2020	Meeting	RSPB and Natural England	Meeting to give a summary of the mitigation options discussed at the meeting on the 13th October, and discussion on terrestrial ecology mitigation measures.
24 November 2020	Email	RSPB and Natural England	Email sent with Marine Ecology Chapter and HRA sent for information.
01 December 2020	Email	RSPB and Natural England	Final submitted Marine Ecology chapter and HRA sent for information alongside breeding bird survey report.
08 February 2021	Meeting	Natural England, Lincolnshire Wildlife Trust and RSPB	Meeting to discuss updates to the HRA since the version sent previously and a further presentation on the bird survey data.
12 February 2021	Email	Natural England, Lincolnshire Wildlife Trust and RSPB.	The latest draft of the HRA was circulated for 'red flag review'. The HRA was updated to provide more clarity and detail on stand-alone and cumulative effects. Additional information relating to species specific effects with regard to vessel disturbance at mouth of The Haven was incorporated.
17 February 2021	Email	Natural England, Lincolnshire Wildlife Trust and RSPB.	As requested at the meeting on the 8th February 2021, an ornithology and marine stakeholder engagement plan was produced by the Applicant's consultants and circulated for review.

Date	Method of communication	Stakeholder/Consultee	Topic
25 February 2021	Email	Natural England	Email received with red flag review comments on the revised HRA.
26 February 2021	Email	RSPB	Email received with red flag review comments on the revised HRA.
26 February 2021	Meeting	Natural England, Lincolnshire Wildlife Trust and RSPB.	Meeting to discuss the Natural England, RSPB and Lincolnshire Wildlife Trust red flag reviews.
05 March 2021	Email	Natural England, Lincolnshire Wildlife Trust and RSPB.	Following the 'red flag' review and subsequent meeting a supplementary HRA information document was circulated by the Applicant's consultants. This document set out additional information that had been gathered for incorporation in to the HRA in direct response to the comments in the red flag review and meeting of 26th February. This included details of a newly introduced Habitat Mitigation Area, primarily for redshank, 250 m south of the wharf development.
12 March 2021	Email	Natural England	Natural England's response to the Supplementary HRA Document sent to them on 5th March 2021.
15 March 2021	Email	The Crown Estate	Confirmation of The Crown Estate's land ownership in the vicinity of the Habitat Mitigation Area (which is the area below Mean High Water Springs). Also confirmation that…The Crown Estate "is supportive of its use as environmental mitigation land."