KEEPING BRITAIN TRADING

IMMINGHAM EASTERN RO-RO TERMINAL

Habitats Regulations Assessment
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1 Introduction

1.1 Overview

1.1.1 This Habitats Regulations Assessment (HRA) has been prepared to support Associated British Ports' (ABP) application for a Development Consent Order (DCO) which, if approved, will authorise the construction and consequent operation of a new roll-on/roll-off (Ro-Ro) facility within the Port of Immingham. This proposed development will be known as the Immingham Eastern Ro-Ro Terminal (IERRT).

1.1.2 The site for the proposed IERRT lies within the eastern sector of the Port which is situated on the southern bank of the Humber Estuary between North Killingholme and Grimsby. The boundary of the proposed development is shown in Figure 1.

1.2 Project background

1.2.1 ABP, the owner and operator of the Port of Immingham, is proposing to construct a new Ro-Ro facility within the Port. The proposed new facility is designed to service the embarkation and disembarkation of principally commercial cargo carried either by accompanied trailer (where the Heavy Goods Vehicle (HGV) tractor unit and driver travel on the vessel with the trailer) or unaccompanied trailers which are delivered to the port of embarkation and then collected at the port of disembarkation by different HGV tractor units and drivers. It should be noted that in addition to wheeled or Ro-Ro cargo, the Ro-Ro vessels using the new facility will also be able to carry, on occasion, a small and limited number of passengers travelling by vehicle. This will only be possible, however, when the demands of the Ro-Ro cargo operation permit in terms of space/capacity for passengers becoming available.

1.2.2 The proposed IERRT development will consist of marine works within the Humber Estuary and landside works within the existing port estate. The following paragraphs summarise the principal elements of the project in the context of both the marine and landside infrastructure. Full details are provided in Chapters 2 and 3 in Volume 1 of the Environmental Statement (ES) (Application Document Reference number 8.2.2 and 8.2.3 respectively).

1.2.3 **Marine infrastructure works** – The marine works will comprise a number of distinct components. In brief, these include:

- An approach jetty from the shore;
- A linkspan with bankseat to provide a solid foundation;
- Two secured floating pontoons linked by another linkspan bridge;
- Two finger piers to provide three berths (one on either side of the northern-most outer finger pier furthest from the shore, and one on the northern side of the southern-most inner finger pier) thereby enabling the

vessels to berth alongside with their stern ramps resting on a floating pontoon which will match the rising and falling of the tide;
- A capital dredge of the new berth pocket; and
- Disposal of dredged material at sea on the basis that no beneficial alternative use for the material has been identified (see Waste Hierarchy Assessment in Appendix 2.1 in Volume 3 of this Environmental Statement (ES) (Application Document Reference number 8.4.2(a));
- Possible inclusion of vessel impact protection measures to provide protection in the unlikely event of an errant vessel contacting the Immingham Oil Terminal (IOT) jetty. ABP does not believe that such measures will actually be required, but it has been decided to make provision for them in the DCO application so as to ensure that the infrastructure is consented as part of the IERRT DCO should it be determined at some future date that they are required.

1.2.4 **Landside infrastructure works** – In summary, the landside works consist of the following:

- The demolition of four existing commercial buildings (and a 'lean-to' on one of the buildings). Two of the buildings to be demolished which are used by Malcolm West Forklifts, will be replaced within the existing site boundary but their relocation will facilitate the construction of the internal bridge (see below);
- The improvement of the surface of the development site so to enable it to accommodate the cargo which is either awaiting embarkation on to one of the Ro-Ro vessels or awaiting collection after disembarkation - together with a small vehicular passenger waiting area. These works will include resurfacing and the provision of new pavements and associated infrastructure across the site;
- The construction of a new terminal building and a small welfare building to provide facilities for terminal operational and administration staff, lorry drivers and passengers, together with a small workshop;
- The construction of a UK Border Force building with check in area;
- The provision of necessary infrastructure such as substations and frequency converters;
- An internal vehicle access bridge linking the North and Central Storage Areas which will cross over Robinson Road (an existing port road) and ABP controlled railway track;
- Improvements to the internal road layout within the Port together with improvements to East Gate comprising the widening of the existing entrance; and
- Off-site environmental enhancements involving the improvement of an existing area of woodland and the provision of intertidal habitat.

1.2.5 **The consenting route** – As the IERRT development comprises the - "alteration of harbour facilities" and the effect of that alteration "is expected to be to increase by at least the relevant quantity per year the quantity of material the embarkation or disembarkation of which the facilities are capable of handling" – the "relevant quantity" in the case of IERRT being 250,000 units per year, (Planning Act 2008, section 24(2)) - the proposed development will be taken forward as a Nationally Significant Infrastructure Project (NSIP). In light of this, ABP has submitted to the Secretary of State for Transport an application for a DCO for authority to construct and then operate the proposed development. Additional consents and approvals that are required for the construction and operation of the proposed development will, with the agreement of the appropriate consenting bodies, be incorporated within the final DCO.

1.2.6 ABPmer has been commissioned to undertake an HRA of the IERRT project. The information within this HRA will assist the Competent Authority (in this case the Secretary of State for Transport) when undertaking an Appropriate Assessment, in accordance with the provisions of Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) (commonly referred to as the 'Habitats Regulations').[1]

1.2.7 This HRA has been informed by the outcomes of the nature conservation and marine ecology assessment (Chapter 9 of Volume 1 of the ES – Application Document Reference number 8.2.9). A description of the proposed development is included in Chapter 2 of the ES (Application Document Reference number 8.2.2)and further details of the construction and operational methodology on which this assessment is based on is included in Chapter 3 of the ES (Application Document Reference number 8.2.3).

1 Following the UK leaving the EU, these have been modified by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

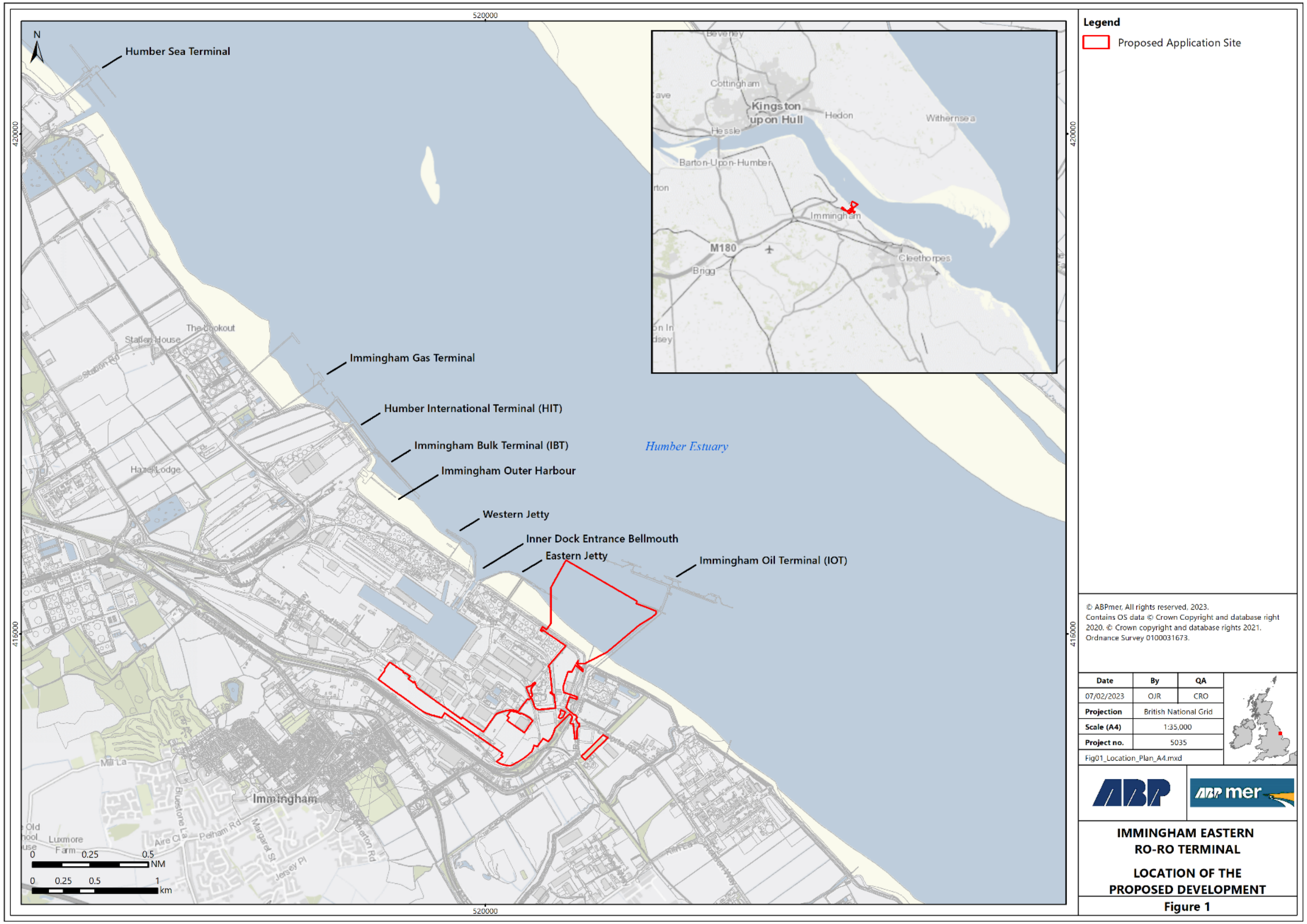

Figure 1. Location of the proposed development

1.3 Need for a Habitats Regulations Assessment

1.3.1 The requirements of Council Directive 92/43/EEC (as amended) on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') and Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') have been transposed into UK legislation through, most recently, the Habitats Regulations.

1.3.2 The Habitats Regulations provide for the protection of European designated sites including Special Areas of Conservation (SACs), Sites of Community Importance (SCIs), candidate SACs (cSACs) and Special Protection Areas (SPAs). According to Paragraph 181 of the National Planning Policy Framework (NPFF), in England these regulations also apply to Ramsar sites (designated under the 1971 Ramsar Convention for their internationally important wetlands), possible SACs (pSAC), potential Special Protection Areas (pSPA), and proposed Ramsar sites and any sites identified, or required, as compensatory measures for adverse effects on any of the aforementioned sites. Collectively, these sites are referred to as European/Ramsar sites in this HRA (unless they are referring specifically only to European sites and/or Ramsar sites alone).

1.3.3 As Competent Authority, the Secretary of State for Transport is required to take account of the Habitats Regulations and produce an AA for any plans or projects that have the potential to directly and/or indirectly affect European/Ramsar sites. As summarised above, Regulation 63(1) of the Habitats Regulations states that:

"A competent authority, before deciding to undertake, or give any consent, permission, or other authorisation for a plan or project which:

> *a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects); and*
> *b) is not directly connected with or necessary to the management of the site*

must make an appropriate assessment of the implications for the site in view of that site's conservation objectives".

1.3.4 The decision as to whether an AA is required is based on an assessment of likely significant effect (LSE). LSE is recognised as being an objective judgement or a statement that the anticipated effects of the proposal will be more than trivial (i.e., that the anticipated changes resulting from a proposal have the potential to impact on an interest feature of a European/Ramsar site). If a project (or plan) could have an LSE on a European/Ramsar site, it does not automatically follow that an impact will occur. The decision of LSE is purely an indication of the need for an AA.

1.3.5 In an AA, it is necessary to determine whether the project or plan would result in an adverse effect on the integrity (AEOI) of the European/Ramsar site(s) in view of the site's conservation objectives. The integrity of a site has been defined as the "coherence of its ecological structure and function, across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated" (HM Government, 2019).

1.3.6 Where it cannot be demonstrated that a project will not have an AEOI, or there is insufficient certainty of an avoidance of an adverse effect, the activities can only proceed under a derogation. In this case it must be demonstrated that there are no more suitable (less damaging) alternatives, that there are Imperative Reasons of Overriding Public Interest (IROPI) sufficient to justify the proposed project and that suitable compensatory measures have been identified to ensure that adequate compensation, usually in the form of replacement habitat, has been provided to protect the overall coherence of the Natura 2000 network (i.e., European/Ramsar sites) (PINS, 2022).

1.3.7 The decision as to whether the integrity of the site is adversely affected will be made by the Secretary of State for Transport as Competent Authority, in consultation with Natural England.

1.3.8 The HRA process for NSIPs comprises a three stages process, as detailed in the PINS Advice Note 10 (PINS, 2022):

- **Stage 1. Screening** – check if the proposal is likely to have a significant effect on the European site(s)'s conservation objectives, both alone or in combination with other plans or projects. At this stage, and in light of the decision of the Court in the case of (People Over Wind and Sweetman v Coillte Teoranta (Case C-323/17)), mitigation measures proposed for the purpose of avoiding or minimising risk to a European site should not be taken into account. If a conclusion of no LSE is reached for all/the European site(s), their qualifying features having been fully taken into account, it is not necessary to proceed to the next stage of HRA.
- **Stage 2. Appropriate assessment (AA)** – assess the implications of the proposal for the qualifying features of the European site(s), in view of the site(s)' conservation objectives and identify ways to avoid or minimise any effects.
- **Stage 3. Derogation** – consider if proposals that would have an AEOI of a European site(s) qualify for an exemption. There are three tests to this stage to be followed in order: are there alternative solutions? ; is the proposal IROPI? ; and have satisfactory compensatory measures been secured? Each test must be passed in sequence for a derogation to be granted.

1.4 Report structure

1.4.1 This report has been structured as follows:

- **Section 1: Introduction** provides a brief description of the IERRT project and an overview of the need for an HRA;
- **Section 2: Consultation** presents the outcome of the consultation that has been undertaken to date, along with how it has influenced the HRA;
- **Section 3: Stage 1 - Screening** reviews the location of the proposed development in relation to European/Ramsar sites and the potential for it to result in an LSE on the interest features of these sites;
- **Section 4: Stage 2 – Appropriate Assessment** reviews the potential for the proposed development to result in an AEOI on the interest features of European/ Ramsar sites, including in-combination effects;
- **Section 5: Conclusions** presents a brief summary of the findings of this report.

2 Consultation

2.1.1 Consultation as to the assessment of effects on European/Ramsar sites and interest features as a result of the construction and operation of the IERRT project has been undertaken with the Environment Agency, Natural England and the Marine Management Organisation (MMO). Pre-application consultation meetings have been held as follows:

- Meetings with Natural England on 7 February 2022, 16 March 2022, 28 April 2022, 28 July 2022;
- Meetings with the MMO on 24 February 2022, 7 April 2022, 3 October 2022 (also with Cefas); and
- Meeting with the Environment Agency on 29 November 2021, 20 May 2022.

2.1.2 These meetings together with the outcomes of the formal scoping process, as well as any feedback received in response to the publication of the Preliminary Environmental Information Report (PEIR) (see Appendix 4.2 Supplementary Consultation (Application Document Reference number 8.4.4 (b)), have also been taken into account and provide part of the evidence base which has been used to inform the HRA.

2.1.3 The outcome of the consultation exercise that has been undertaken to date relating to the HRA, along with how it has influenced the HRA, is presented in **Table 1**. Other topic-specific comments are included in the individual ES chapters (e.g., Chapter 9: Nature Conservation and Marine Ecology (Application Document Reference number 8.2.9)).

Table 1. Summary of consultation responses relating to HRA.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
PINS	Scoping Opinion, October 2021 Table ID 4.3.2	The ES should include an assessment of indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes caused by the presence of piled structures which could affect all marine ecological receptors or information demonstrating agreement with the relevant consultation bodies and the absence of a Likely Significant Effect (LSE).	This has been considered in the Stage 1 – Screening included in Section 3.1 of the HRA. Piling alone has only localised effects on physical processes. Modelling has been completed based on all aspects of the marine works and these results have informed the assessment of changes to qualifying habitats and species as a result of changes to hydrodynamic and sedimentary processes (see Section 4.5).
PINS Natural England	Scoping Opinion, October 2021 Table ID 4.3.3 Appendix 2 Natural England response	The ES should include an assessment of changes in water and sediment quality during piling which could affect all marine ecological receptors or information demonstrating agreement with the relevant consultation bodies and the absence of an LSE.	This has been considered in the Stage 1 – Screening included in Section 3.1 of the HRA. Piling alone would have very limited localised effects on water and sediment quality. The potential effects on qualifying habitats and species from non-toxic (suspended sediment) and toxic contamination is considered in the AA in Sections 4.8 and 4.9 respectively.
PINS	Scoping Opinion, October 2021 Table ID 4.3.6	The ES should include an assessment of water quality impacts during dredging/dredge disposal and operational berth vessel movements on marine mammals or information demonstrating agreement with the relevant consultation bodies and the absence of an LSE.	This has been considered in the Stage 1 – Screening included in Section 3.1 of the HRA. The potential effects on qualifying habitats and species from non-toxic (suspended sediment) and toxic contamination is considered in the AA in Sections 4.8 and 4.9 respectively.
PINS	Scoping Opinion, October 2021	The Applicant's attention is drawn to the comments from Natural England, where they highlight the potential for effects on	Potential effects on the Greater Wash SPA have been considered in the Stage 1 – Screening included in Section 3.1 of the HRA.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
Natural England	Table ID 4.3.8 Appendix 2 Natural England response	North Killingholme Haven Pits Site of Special Scientific Interest (SSSI), The Lagoons SSSI and the Greater Wash Special Protection Area (SPA). The ES should clearly present and justify the zones of influence of the Proposed Development. Evidence should be presented of agreement wherever possible with relevant stakeholders, particularly Natural England.	In summary, it is considered highly unlikely that interest features of the Greater Wash SPA will overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to the vicinity of the Port of Immingham. Effects on SSSIs are discussed in Chapter 9 of the ES (Application Document Reference number 8.2.9).
PINS Natural England	Scoping Opinion, October 2021 Table ID 4.3.9 Appendix 2 Natural England response	Natural England has identified the potential for the new piers to lead to changes in foraging and roosting habitat which could affect the ecological function of the mudflats. The ES should either include an assessment of these effects or a justification (supported by evidence) that no LSE would arise as a result of this effect pathway.	This has been considered in the Stage 1 – Screening and Stage 2 – Appropriate Assessment included in Sections 3.1 and 4.10 of the HRA respectively.
PINS Natural England	Scoping Opinion, October 2021 Table ID 4.3.10 Appendix 2 Natural England response	Natural England has identified the potential for direct changes to benthic habitats and species beneath the pier structures to affect the ecological function of the mudflats. The ES should either include an assessment of these effects or a justification (supported by evidence) that no LSE would arise as a result of this effect pathway.	This has been considered in the Stage 1 – Screening and Stage 2 – Appropriate Assessment included in Sections 3.1 and 4.6 of the HRA respectively.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
Environment Agency	Scoping Opinion, October 2021 Appendix 2 Environment Agency response Pre-application meeting, 29 November 2021	We note the capital dredge location overlaps with the intertidal habitat, which will result in a loss of intertidal habitat in this location - we would expect the loss to be compensated for.	The loss of habitat has been considered in the Stage 1 – Screening and Stage 2 – Appropriate Assessment included in Sections 3.1 and 4.3 of the HRA respectively. The loss of intertidal habitat as a result of the IERRT project is considered *de minimis* in extent (0.012 ha direct loss and 0.01 ha indirect loss) following a change to the scheme design in order to reduce the loss and consequently is not considered to result in an AEOI on a European/Ramsar site. On this basis, compensatory habitat is not required.
Natural England	Scoping Opinion, October 2021 Appendix 2 Natural England response	Under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) an appropriate assessment (AA) needs to be undertaken. Should a Likely Significant Effect on a European/Internationally designated site be identified or be uncertain, the competent authority may need to prepare an AA, in addition to consideration of impacts through the EIA process.	An HRA has been undertaken (this report).
Natural England	Scoping Opinion, October 2021 Appendix 2 Natural England response	The Environmental Statement (ES) should include a full assessment of the direct and indirect effects of the development on the designated sites' features of special interest and should identify such mitigation measures as may be required in order to	This has been considered in the Stage 1 – Screening and Stage 2 – Appropriate Assessment included in Sections 3 and 4 of the HRA respectively.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		avoid, minimise or reduce any adverse significant effects.	
North Lincolnshire Council Natural Environment Policy Specialist	North Lincolnshire Council scoping response, 28 October 2021	For the in-combination assessment within the HRA, it is advised the applicant makes use of the Humber Nature Partnership In-combination Database.	The database has been reviewed for the in-combination assessment included in Section 4.14 of the HRA.
North East Lincolnshire Council Ecologist	North East Lincolnshire Council scoping response, 23 November 2021	I can confirm that I'm happy with [the approach set out in the Scoping Report]. Interest will lie in the HRA, but protected species and habitats outside of the qualifying features of the Humber Estuary designation have been dealt with here.	An HRA has been undertaken (this report).
Natural England (PI40)	Statutory Consultation 19/01/22 - 23/02/22	*Internationally and nationally designated sites:* The consultation documents do not include a Habitats Regulations Assessment (HRA). It is Natural England's advice that the proposal is not directly connected with or necessary for the management of the European site. You should therefore determine whether the proposal is likely to have a significant effect on any European site, proceeding to the Appropriate Assessment stage where significant effects cannot be ruled out.	An HRA has been undertaken (this report).
Natural England	Statutory Consultation 19/01/22 - 23/02/22	Based on our current understanding of the nature and scale of the development, and the information provided within the	More detailed information on potential effects during the operation phase is provided in the

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		consultation, Natural England broadly agrees with the scope of the assessment set out in Table 9.17 and Table 9.19, within Chapter 9 of the PEIR. However, further justification is needed where impact pathways have been scoped out of further assessment for the operation phase, while the same impact pathway has been scoped in for the construction phase. This is discussed in more detail in the sections below. We recommend you consider potential likely significant effects on international designated sites arising from the impact pathways identified in Table 9.17 and Table 9.19, in addition to any other potential impact pathways identified within this consultation response and during your assessment.	ES (Chapter 9) (Application Document Reference number 8.2.9). An HRA has been undertaken (this report).
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Assessment of loss of intertidal and subtidal habitat:* Natural England notes that the proposed development will result in a loss of 1.65 ha of intertidal habitat as a result of the proposed capital dredge and jetty. In addition, it is assumed that there will be a loss of subtidal habitat as a result of piling associated with the proposed floating pontoons and finger pier structures. The potential for loss of	An HRA has been undertaken (this report). Both the ES and HRA have considered intertidal and subtidal loss including effects on designated features. The loss of intertidal habitat as a result of the proposed development is considered *de minimis* in extent (0.012 ha direct loss and 0.01 ha indirect loss). This is following optimisation of the scheme design in order to reduce the loss and consequently is not considered to result

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		subtidal habitat has not been considered in the PEIR. Natural England advises that the HRA considers the potential for likely significant effects as a result of loss of both intertidal and subtidal habitat. This should include loss of SAC habitat (i.e., Estuaries and Mudflats and sandflats not covered by seawater at low tide) as well as the loss of supporting habitat for SPA bird species.	in an AEOI on a European/Ramsar site (see Section 4.3).
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Assessment of loss of intertidal and subtidal habitat:* Natural England considers that any credible risk of a measurable loss of marine or terrestrial habitat, no matter how small, from within a European site is a 'likely significant effect' and the full significance of its impact on site integrity should be screened-in and further tested by an Appropriate Assessment. It is Natural England's advice that a lasting and irreparable loss of European Site habitat will prevent a conclusion of no adverse effect on site integrity being reached, unless an Appropriate Assessment can clearly ascertain otherwise.	The HRA (this report) has assessed the potential for an AEOI on a European/Ramsar site integrity as a result of the proposed development. The loss of intertidal habitat as a result of the proposed development is considered *de minimis* in extent (following a change to the scheme design in order to reduce the loss) and consequently is not considered to result in an AEOI on a European/Ramsar site (see Section 4.3).
Natural England	Statutory Consultation 19/01/22 -23/02/22	*Assessment of loss of intertidal and subtidal habitat:* We note that section 9.8.172 states that, in the context of the Humber Estuary SPA, the loss of 1.65 ha	The HRA (this report) has assessed the potential for an AEOI on a European/Ramsar site as a result of the proposed development.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		of intertidal habitat as a result of the proposed development is considered negligible. Natural England advises that further assessment is required within an Appropriate Assessment.	The loss of intertidal habitat as a result of the proposed development is considered *de minimis* in extent (following a refinement to the scheme design) and consequently is not considered to result in AEOI on a European/Ramsar site (see Section 4.3).
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Appropriate Assessment:* An appropriate assessment should be made in view of the European sites' conservation objectives, which provides a list of attributes contributing to site integrity that can provide a checklist for the assessment process, the detailed supplementary advice and advice on operations should also inform the conclusion.	An HRA has been undertaken (this report) in view of the European sites' conservation objectives (see **Table 6**) and with the supplementary advice and advice on operations used to inform the assessment.
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Assessment of impacts on fish:* At this time, Natural England have not fully considered the potential impacts on fish species due to lack of expertise availability. We will provide detailed comments on the ES. We note however that the assessment has correctly identified fish species included in the Humber Estuary SAC designation; namely sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis*. When assessing the likely significant effect on the SAC, Natural England advises you have consideration for the	An HRA has been undertaken alongside the ES (this report). This considers the impact on lamprey at different life stages.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		potential impacts on lamprey species at the different life stages.	
Natural England	Statutory Consultation 19/01/22-23/02/22	*Assessment of impacts on fish:* Section 9.8.130 states that works will take place between 7 am and 7 pm, therefore reducing the risk to migratory fish. This has not been included as mitigation in section 9.9. It is our advice that night time working is beneficial to lamprey species and therefore should be considered mitigation.	River lamprey migrate at night (Environment Agency, 2013) and so it is assumed that the Natural England statement 'It is our advice that night time working is beneficial to lamprey species and therefore should be considered mitigation' is an error. Restricting piling at night is proposed as a mitigation measure (see Table 22 of this HRA).
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Assessment of impacts on coastal waterbirds:* Table 9.16 indicates that SPA qualifying species have been highlighted in bold. It is not clear why some species are not highlighted; curlew, grey plover, mallard and teal are all important component species of the Humber Estuary SPA waterbird assemblage feature. Impacts to all the SPA bird species, whether they are individually qualifying features or as part of the waterbird assemblage should be assessed within the HRA. As a guideline, impacts on all SPA bird species which are present on the project site in numbers over 1 per cent of the estuary population (not just over 10 per cent) have the potential to undermine the conservation objectives and should	Species listed as SPA assemblage species within the citation have been highlighted with the symbol † in the ES (Chapter 9, Table 9.19) (Application Document Reference number 8.2.9). The HRA (this report) considers all SPA bird species which are present on the project site in numbers over 1% of the estuary population. However, for SPA species where only one single bird observation represents > 1% of the estuary population (based on the data for Sector B presented in Table 9.19 in Chapter 9 of the ES (Application Document Reference number 8.2.9)), such as Greenshank, they are not considered further in the assessment.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		therefore be subject to further assessment in the HRA.	
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Assessment of impacts on coastal waterbirds:* Natural England agrees with the scope of assessment of potential impacts to coastal waterbirds during construction and advises that the potential impact pathways included in Table 9.17 should be considered in the HRA.	These pathways are considered in the HRA (this report) in Section 4.
Natural England	Statutory Consultation 19/01/22-23/02/22	*Assessment of impacts on coastal waterbirds:* Section 9.8.228 discusses the potential for operational disturbance to coastal birds using the nearby intertidal mudflat as a result of vessel movements and people around the berthing infrastructure. Natural England advises that the assessment should also consider the potential for disturbance as a result of wheeled cargo moving from the berthing infrastructure to the terminal areas, which are expected to occur directly above and adjacent to the intertidal mudflat.	This pathway is considered in the HRA (this report) in Section 4.
Natural England	Statutory Consultation 19/01/22 -23/02/22	*Assessment of impacts on coastal waterbirds:* We welcome the proposed avoidance/mitigation measures set out in section 9.9. The specifics of these measures should be detailed in the Code of Construction Practice (CoCP) and Ecological Management Plan (EMP) which	Mitigation measures are detailed within the Construction Environmental Management Plan (CEMP) (Application Document Reference number 9.2) and are referred to in the HRA (this report) in Section 4.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		will need to be agreed with Natural England.	
Natural England	Statutory Consultation 19/01/22 - 23/02/22	*Assessment of impacts on coastal waterbirds:* Section 9.9.6 identifies mitigation measures to reduce disturbance to coastal waterbirds during construction, namely soft start piling and cold weather restrictions. Please note that these mitigation measures rely on availability of alternative intertidal areas for feeding and roosting birds. This should be considered in more detail within the Appropriate Assessment.	The availability of alternative intertidal areas for feeding and roosting birds is considered in Section 9.8 of Chapter 9 of the ES (Application Document Reference number 8.2.9) and in Section 4.10 of this HRA.
Natural England	Statutory Consultation 19/01/22 -23/02/22	*Assessment of impacts on coastal waterbirds:* Section 9.9.8 proposes an adaptive monitoring and management strategy to address disturbance of waterbirds during the operational phase. Whilst it would be interesting to see the results of a programme of monitoring of disturbance related to port operations, Natural England does not recommend reliance on a 'monitor and manage' approach which we have found can be very difficult to implement. There are a number of issues such as the setting of appropriate targets when additional mitigation measures would be required and separating out the disturbance effects of this development from current port	The application of an adaptive monitoring and management strategy has not been included in the HRA given Natural England's concerns relating to the implementation of such a strategy. Instead, screens will be used to reduce potential disturbance on a precautionary basis during operation (see Section 4.9 of this HRA). If mitigation was deemed necessary as part of an adaptive approach, it is likely that this would have involved the implementation of screens.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		activity. The surveys are proposed to take place twice per month, so provide a 'snap shot' of port activity, which may miss a very disturbing event, which would trigger additional mitigation measures. This aspect should be considered in more detail within the Appropriate Assessment and additional mitigation measures proposed, if it cannot be shown that there will not be an adverse effect on the integrity of the designated site.	
Natural England (PI40)	Statutory Consultation 19/01/22 -23/02/22	Construction Phase: The potential for air quality impacts to the Humber Estuary SPA, SAC and Ramsar from construction dust and site plant emissions should be assessed in the HRA.	Consideration was given to the impacts of construction dust and emissions at Stage 1 - Screening and given the scale and nature of the works the potential for LSE was excluded. Further information on this pathway is presented in Chapter 9 of the ES (Application Document Reference number 8.2.9).
Natural England (PI40)	Statutory Consultation 19/01/22 -23/02/22	Operational Phase: Natural England recommends that the ES and HRA consider whether there is likelihood of the operational traffic acting in combination with other plans or projects.	The HRA has considered the potential for in-combination effects with other reasonably foreseeable development in the area in relation to operational road traffic emissions (see Section 4.14).
Natural England (PI40)	Statutory Consultation 19/01/22 -23/02/22	Operational Phase: It is not clear whether vessels will pass within 200m of sensitive habitats when moving through the estuary. This should be clarified in the ES and HRA.	The HRA has considered the potential for in-combination effects with other reasonably foreseeable development in the area in relation to operational vessel emissions (see Section 4.14).

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
			Vessels will be required to route to and from the IERRT project using the Humber Estuary Main Navigational Fairway. At no point on this route will vessels associated with the operation of the IERRT pass within 200 m of an air quality sensitive habitat.
Natural England (PI40)	Statutory Consultation 19/01/22 -23/02/22	We therefore advise that ammonia from traffic and marine vessels should be included for assessment in the HRA.	The HRA has considered the potential for in-combination effects with other reasonably foreseeable development in the area in relation to operational vessel emissions (see Section 4.14). Ammonia emissions have been included in the assessment for appropriate sources on habitats reported in the HRA (this report) (see Section 4.7).
Natural England (PI40)	Statutory Consultation 19/01/22 -23/02/22	Natural England's guidance accepts the use of the significance threshold of 1000 Annual Average Daily Traffic (or the levels of emissions being <1 per cent of the critical level/ load), however, this does not exclude the requirement for an assessment of the potential impacts in combination with other plans or projects. Therefore, Natural England recommends that the ES and HRA consider whether there is likelihood of the operational traffic acting in combination with other plans or projects.	The HRA has considered the potential for in-combination effects with other reasonably foreseeable development in the area in relation to operational vessel and traffic emissions (see Section 4.14).

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
Natural England	Pre-application meeting, 7 February 2022.	The meeting provided an overview of the IERRT project, the marine ecology assessment approach, the site-specific surveys and a discussion on potential impacts relating to habitat loss/change and bird disturbance. As part of the meeting ABP highlighted that they will continue to optimise the marine design (dredge berth pocket) and layout of marine infrastructure with a view to avoiding or at least minimising any loss of intertidal habitat. Natural England suggested that potential mitigation for bird disturbance could involve opportunities for reducing activities that are causing disturbance elsewhere on the Humber as this could potentially make other areas of the estuary more attractive to birds.	The HRA (this report) – has been completed taking on board consultee comments from the meeting. Mitigation has been incorporated where relevant, for example in relation to disturbance of coastal waterbirds in Section 4.10.
Natural England	Pre-application meeting, 16 March 2022.	The meeting provided an update of the IERRT project, a summary of the future site-specific surveys and a discussion on potential impacts relating to habitat loss/change and bird disturbance. Proposed mitigation measures in construction and operation for potential bird disturbance were also discussed.	The HRA (this report) has been completed taking on board consultee comments from the meeting. Mitigation has been incorporated where relevant, for example in relation to disturbance of coastal waterbirds in Section 4.10.
Natural England	Pre-application meeting, 28 April 2022	The meeting provided a further update of the IERRT project as well as a discussion on potential impacts relating to habitat loss/change and bird disturbance.	Chapter 9 of the ES (Application Document Reference number 8.2.9) and the HRA (this report) have been completed taking on board consultee comments from the meeting.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
Natural England	Natural England response to pre-application meeting minutes (28 July 2022), 3 October 2022	Natural England provided comments following the meeting held on 28 July 2022 and the meeting minutes.	The HRA has been completed taking on board comments raised in Natural England's response.
Environment Agency (PI34)	Statutory Consultation 19/01/22 - 23/02/22	We have considered this Chapter of the preliminary assessment for elements of marine ecology, which fall under the Environment Agency's remit. We agree with the scoped in elements of Table 9.17, which are being taken forward in the assessment. We note that there will be a loss of 1.64 ha of intertidal habitat, which has been identified as high to moderate vulnerability, and acknowledged for its importance to supporting coastal birds. The Environment Agency strongly encourages compensation for this loss.	The HRA (this report) has assessed the potential for an adverse effect on site integrity as a result of the proposed development. The loss of intertidal habitat as a result of the proposed development is considered *de minimis* in extent (0.012 ha direct loss and 0.01 ha indirect loss) following optimisation of the scheme design in order to reduce the loss and consequently is not considered to result in AEOI on a European/Ramsar site (see Section 4.3). On this basis, compensatory habitat is not required.
DFDS (P17, P122, P139).	Statutory Consultation 19/01/22 - 23/02/22	The project would be built into the Humber Estuary Ramsar/SAC/SPA and will therefore almost certainly have an adverse effect on the integrity of the site. Chapter 4 of the PEIR does not adequately demonstrate need for the project, rather setting out predicted demand for Ro-Ro traffic without examining whether existing capacity could meet it.	The HRA (this report) has assessed the potential for an adverse effect on site integrity as a result of the proposed development. The loss of intertidal habitat as a result of the proposed development is considered *de minimis* in extent (following refinements to the scheme) and consequently is not considered to result in AEOI on a European/Ramsar site (see Section 4.3). On this basis, it is not

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		If the project is to go ahead in a Natura 2000 site, ABP must demonstrate there are imperative reasons of overriding public importance that it does so, and that compensatory land is provided. At present, none of these have been demonstrated to a satisfactory degree. In particular there are other installations on the Humber that could accommodate these works with less harm to the Natura 2000 site.	necessary to demonstrate IROPI and compensatory habitat is not required.
North Lincolnshire Council (P138)	Statutory Consultation 19/01/22 - 23/02/22	The Natural Environment Policy Specialist has advised that, in terms of landscape and terrestrial ecology, the proposal is not likely to have any significant effects of relevance to North Lincolnshire. Furthermore, the approach proposed for the EIA and the Habitat Regulations Assessment (HRA) is supported, as amended by the advice of Natural England. For the in-combination assessment within the HRA, it is advised that the applicant makes use of the Humber Partnership In-combination Database.	Humber Partnership In-combination Database has been used to inform the HRA In-combination Assessment (Section 4.13).
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	It is Natural England's advice that the proposal is not directly connected with or necessary for the management of the European site. You should therefore determine whether the proposal is likely to	It has been determined that the IERRT project is likely to have a significant effect on the Humber Estuary EMS, and a HRA has been undertaken (this report).

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		have a significant effect on any European site, proceeding to the Appropriate Assessment stage where significant effects cannot be ruled out.	
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Natural England advises that the HRA should consider the potential for likely significant effects as a result of loss and change in both intertidal and subtidal habitat. This should include loss of SAC habitat (i.e., Estuaries and Mudflats and sandflats not covered by seawater at low tide) as well as the loss of supporting habitat for SPA bird species. If it is considered necessary to include in the final application the additional impact protection measures, then this should also be included in the Habitats Regulations Assessment.	The HRA (this report) has considered the potential for loss (both direct and indirect) and change to intertidal and subtidal habitats and has been assessed in the context of SAC features (‘Estuaries’ and ‘Mudflats and sandflats not covered by seawater at low tide’) as well as the loss of supporting habitat for SPA bird species. The HRA (this report) has considered the additional impact protection measures.
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Natural England considers that any credible risk of a measurable loss of marine or terrestrial habitat, no matter how small, from within a European site is a ‘likely significant effect’ and the full significance of its impact on site integrity should be screened-in and further tested by an Appropriate Assessment. It is Natural England’s advice that a lasting and irreparable loss of European Site	All predicted loss (both direct and indirect) and change to intertidal and subtidal habitats has been screened into the AA stage.

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		habitat will prevent a conclusion of no adverse effect on site integrity being reached, unless an Appropriate Assessment can clearly ascertain otherwise.	
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Natural England advises that further assessment is required within an Appropriate Assessment and we will give our statutory advice at that stage.	Noted.
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	The appropriate assessment should be made in view of the European sites' conservation objectives, which provides a list of attributes contributing to site integrity that can provide a checklist for the assessment process, the detailed supplementary advice and advice on operations should also inform the conclusion.	The AA has been made in in view of the European sites' conservation objectives and also has been informed by the supplementary advice and advice on operations.
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Plans or projects that should be considered in the in-combination assessment include the following: The incomplete or non-implemented parts of plans or projects that have already commenced; Plans or projects given consent or given effect but not yet started; Plans or projects currently subject to an application for consent or proposed to be given effect;	The specified types of projects are considered in the cumulative and in-combination effects assessment. Immingham Green Energy Terminal has been included in the list of projects to assess. The assessment is provided in Section 4.14 of the HRA (this report).

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
		Projects that are the subject of an outstanding appeal; Ongoing plans or projects that are the subject of regular review; Any draft plans being prepared by any public body; Any proposed plans or projects published for consultation prior to application. Chapter 20 of the PEIR provides a list of projects that would be included in an assessment of the potential in-combination effects, if deemed necessary. Natural England broadly agrees with the selection criterion. When assessing the effects on designated sites, Natural England recommends that the search radius be measured from the nearest point on the designated site to the proposal being assessed, or the nearest area of sensitive habitat, if known. This would likely identify those proposals which are likely to affect overlapping geographic extents within the designated site in question. Natural England notes that the Immingham Green Energy Terminal has not been included in table 20.4 in the PEIR.	

Consultee	Reference, Date	Summary of Response	How Comments Have been Addressed in this HRA
Natural England (PI 22)	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	Natural England have advised previously that the applicant also refer to Natural England's guidance on the assessment of road traffic emissions under the Habitats Regulations. To re-iterate: Construction phase The potential for air quality impacts to the Humber Estuary SPA, SAC and Ramsar from construction dust and site plant emissions should be assessed in the HRA. Operational phase Refer to Natural England's previous response dated 23rd February 2022.	Noted. Consideration was given to the impacts of construction dust and emissions at Stage 1 - Screening and given the scale and nature of the works the potential for LSE was excluded. Further information on this pathways is presented in Chapter 9 of the ES (Application Document Reference number 8.2.9).

3 Stage 1 - Screening

3.1 Identification of sites and features screened into the assessment

3.1.1 In accordance with PINS Advice Note 10 (PINS, 2022), the first stage of the HRA involves considering if the plan or project is likely to have a significant effect on interest features of a European/Ramsar site either alone or in-combination with other plans or projects.

3.1.2 The entire Humber Estuary is designated as a SAC and a SPA under the Habitats and Birds Directives. It is also classified as a 'Ramsar site' under the Ramsar Convention due to the presence of internationally important wetlands. These designations form the Humber Estuary European Marine Site (EMS). In addition, following advice from Natural England (**Table 1**), there is the potential for the Greater Wash SPA, which is located approximately 20 km from the proposed development, to be affected as it is designated for a range of seabird and diving bird species. The location of these sites in relation to the proposed development is shown on **Figure 2**.

3.1.3 The qualifying interest features and justification as to their inclusion or exclusion from the Stage 1 screening assessment is provided in **Table 2**. The judgement as to whether a site or feature needs to be considered is based on the available baseline information of the location, ecology and/or behaviour of interest features provided in the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9), the detailed description of the proposed development provided in Chapter 2 of the ES (Application Document Reference number 8.2.2), and the activities involved during the construction and operational phase of the proposed development included in Chapter 3 of the ES (Application Document Reference number 8.2.3).

Table 2. Identification of European/Ramsar sites and qualifying features relevant to the Screening assessment

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
Humber Estuary SAC	H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks	✓	Feature is present in the vicinity of the disposal site.
	H1130. Estuaries	✓	Feature is present within the footprint of the IERRT project.
	H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats	✓	Feature is present within the footprint of the IERRT project.
	H1150. Coastal lagoons	×	Two qualifying coastal lagoons areas are present within the Humber Estuary SAC boundary (Humberston Fitties and Northcoates Lagoon which are located over 15 km and 20 km respectively from the proposed IERRT development). These sites are outside any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham.
	H1310. Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand	×	Based on the current geographic extent and location of Natural Environment and Rural Communities Act (2006) Section 41 habitats of principal importance (Natural England, 2022) the nearest saltmarsh habitat is located approximately 3 km to the northwest of the IERRT project at Killingholme within the Humber Estuary Site of Special Scientific Interest (SSSI) Unit 093 – HIT to Second Jetty. This is outside any potential direct or indirect marine changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham.
	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	✓	As described above the nearest saltmarsh habitat is located approximately 3 km to the northwest of the IERRT project and outside of nay potential direct or indirect marine changes resulting from the construction and operational

Site	Qualifying features	Justification (✓ requires consideration, ✗ not relevant to the screening assessment)	
			activities. However Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) is sensitive to N deposition or NOx from operational marine vessel/ road vehicle emissions and requires consideration in relation to his pathway only.
	H2110. Embryonic shifting dunes	✗	Based on the current geographic extent and location of Natural Environment and Rural Communities Act (2006) Section 41 habitats of principal importance (Natural England, 2022), the nearest coastal sand dunes within the Humber SAC are located more than 12 km southwest of the IERRT project at Cleethorpes. This is outside any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham.
	H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with Marram	✗	
	H2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland	✗	
	H2160. Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn	✗	
	S1095. *Petromyzon marinus*; Sea lamprey	✓	Sea lamprey are recorded in the estuary and are known to also move through the estuary during spawning migrations (as summarised in Table 9.16 of the ES). This species may be present in the vicinity of the proposed development.
	S1099. *Lampetra fluviatilis*; River lamprey	✓	River lamprey are recorded in the estuary and are known to also move through the estuary during spawning migrations (as summarised in Table 9.16 of the ES). Their growth phase is primarily restricted to estuarine waters. This species may be present in the vicinity of the proposed development.
	S1364. *Halichoerus grypus*; Grey seal	✓	The nearest established breeding colony for grey seals is located over 25 km away at Donna Nook. In addition, small numbers have been observed hauling out on mudflat at Sunk Island (on the north bank of the Humber Estuary) which is located approximately 4 km north east from the proposed development and around 3-4 km from the dredge disposal site (including

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
			transit routes). Whilst not sensitive at their haul out sites, grey seals may be present in the estuary in the vicinity of the Port of Immingham.
Humber Estuary SPA	A021 *Botaurus stellaris*; Great bittern (Non-breeding)	×	The Humber region supports both breeding and wintering Great Bittern. Based on the extensive bird data available for the Humber Estuary, Great Bittern is recorded within reedbed habitats such as around Blacktoft Sands, Far Ings and North Killingholme Haven clay pits (see Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). These areas are outside of any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham (see Section 9.2 and Section 9.8 of Chapter 9 of the ES (Application Document Reference number 8.2.9)). Furthermore, this species does not normally occur on open mudflat habitat and has not been recorded in the Immingham Outer Harbour (IOH) bird monitoring that has been undertaken in the Immingham area (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	A021 *Botaurus stellaris*; Great bittern (Breeding)	×	
	A048 *Tadorna tadorna*; Common shelduck (Non-breeding)	✓	Common Shelduck have been regularly recorded on the foreshore in the area of the proposed development in the location specific surveys (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)	×	Marsh Harriers breed in the Humber region and are also recorded during passage periods and the winter. Based on the extensive bird data available for the Humber Estuary (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)), Marsh Harrier primarily forage around reed beds and marshes in coastal areas as well as farmland near wetland and are recorded relatively frequently in the Immingham region (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)). However, the species is not recorded hunting over mudflats for prey species and, therefore, does not overlap any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
	A082 *Circus cyaneus*; Hen harrier (Non-breeding)	×	Hen Harrier is a winter visitor and passage migrant on the Humber. Based on the extensive bird data available for the Humber Estuary (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)), this species roosts and forages primarily in areas of saltmarsh and reedbed as well as open habitats such as arable fields and grassland. This species is only rarely recorded in the Immingham area.
	A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)	×	Wintering populations of Pied Avocet are typically recorded in the inner estuary in the largest numbers (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)). This species is recorded in the Immingham region but is considered rare in the vicinity of the proposed development, for example only two individuals have been recorded in the relevant Count Sector B in the IOH monitoring between 2010/11 and 2021/22 (see Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES).
	A132 *Recurvirostra avosetta*; Pied avocet (Breeding)	×	Pied Avocet are not known to breed on the foreshore in the Immingham area. This species is recorded in the Immingham region but is considered rare in the vicinity of the proposed development, for example only two individuals have been recorded in the relevant Count Sector B in the IOH monitoring between 2010/11 and 2021/22 (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)). The area is, therefore, considered to be of very limited functional value for the species.
	A140 *Pluvialis apricaria*; European golden plover (Non-breeding)	×	The Humber Estuary is one of the most important sites in the UK for Golden Plover with the species primary recorded roosting on mudflats and other intertidal habitats in the region (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9))). While this species is widely distributed through the estuary, the species is only very infrequently recorded in vicinity of the proposed development, for example only one single individual was recorded in the relevant Count Sector B in the IOH monitoring between 2016/17 and 2021/22 (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)). The area is, therefore, considered to be of very limited functional value for the species.

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
	A143 *Calidris canutus*; Red knot (Non-breeding)	✓	Low numbers of Knot have been recorded regularly in the area in the location specific surveys (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	A149 *Calidris alpina*; Dunlin (Non-breeding)	✓	Dunlin have been regularly recorded on the foreshore in the area of the proposed development in the location specific surveys (see Section 9.6 of Chapter 9 of the ES).
	A151 *Philomachus pugnax*; Ruff (Non-breeding)	×	The Humber Estuary is considered an important site for passage Ruff. Important areas of the Humber for Ruff are the intertidal mudflats and adjacent lagoons of Alkborough Flats and Blacktoft Sand (see Table 9.18 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). This species is more rarely recorded in the outer Humber Estuary and typically shows a preference for more sheltered sections of the inner Humber Estuary. This species is rarely recorded on mudflat habitat in the Immingham area, for example only one individual has been recorded in the relevant Count Sector B in the IOH monitoring between 2010/11 and 2021/22. The area is, therefore, considered to be of very limited functional value for the species.
	A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)	✓	Black-tailed Godwit have been regularly recorded on the foreshore in the area of the proposed development in the location specific surveys (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)	✓	Low numbers of Bar-tailed Godwit have been recorded in the location specific surveys (see Section 9.6 of Chapter 9 of the ES).
	A162 *Tringa totanus*; Common redshank (Non-breeding)	✓	Common Redshank have been regularly recorded on the foreshore in the area of the proposed development in the location specific surveys (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	A195 *Sterna albifrons*; Little tern (Breeding)	×	Little Tern breed at Easington Lagoon, which is located approximately 20 km from the proposed development, with data suggesting this species forages within 5 km of nesting sites (Woodward *et al.*, 2019). This species is considered very rare within the Immingham area.

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
	Waterbird assemblage	✓	The waterbird assemblage includes species which are regularly recorded on the foreshore in the area of the proposed development (Dunlin, Black-tailed Godwit, Redshank and Shelduck) and those which are recorded in lower numbers in the area (Knot and Bar-tailed Godwit).
Humber Estuary Ramsar	Criterion 1 – natural wetland habitats that are of international importance: Near-natural estuary with component habitats, specifically dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	✓	The Criterion 1 interest feature includes habitats which are present within the footprint of the IERRT project (estuarine waters, intertidal mud and sand flats) and saltmarsh which is sensitive to N deposition or NOx from operational marine vessel/ road vehicle emissions only.
	Criterion 3 – supports populations of plants and/or animal species of international importance: Breeding colony of grey seals *Halichoerus grypus* at Donna Nook.	✓	The nearest established breeding colony for grey seals is located over 25 km away at Donna Nook. In addition, small numbers have been observed hauling out on mudflat at Sunk Island (on the north bank of the Humber Estuary) which is located approximately 4 km north east from the proposed development and around 3-4 km from the dredge disposal site (including transit routes). Whilst not sensitive at their haul out sites, grey seals may be present in the estuary in the vicinity of the Port of Immingham.
	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl.	✓	Species that form part of Criterion 5 waterbird assemblage of the Humber Ramsar site, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher have been recorded in relatively low numbers in the location specific surveys (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance:	✓	Species that form part of Criterion 6 of the Humber Ramsar site, specifically Dunlin, Black-tailed Godwit, Redshank and Shelduck, are regularly recorded on the foreshore in location specific surveys in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regulaly

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
	Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering).		occur in the area (see Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: River lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*.	✓	River and sea lamprey are recorded in the estuary and are known to also move through the estuary during spawning migrations (as summarised in Table 9.16 of the ES). River lamprey growth phase is primarily restricted to estuarine waters. This species may be present in the vicinity of the proposed development.
Greater Wash SPA	A001 *Gavia stellata*; Red-throated diver (Non-breeding)	×	The Humber Estuary supports relatively low numbers of wintering Red-throated Diver although it is acknowledged these could form part of the population occurring in the Greater Wash SPA. However, data suggests that Red-throated Diver are rarely recorded inshore in the Port of Immingham area with this species considered to be highly sensitive to vessel movements and typically avoid areas with high shipping intensity (Natural England and JNCC, 2016). On that basis, it is considered that this interest feature of the Greater Wash SPA will not overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham.
	A065 *Melanitta nigra*; Common scoter (Non-breeding)	×	The Humber Estuary supports passage and wintering Common Scoter and it is acknowledged these could form part of the population occurring in the Greater Wash SPA. However, data suggests that Common Scoter are rarely recorded inshore in the Port of Immingham area with this species considered to be highly sensitive to vessel movements and typically avoid areas with high

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
			shipping intensity (Natural England and JNCC, 2016). Therefore, this interest feature of the Greater Wash SPA will not overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham.
	A177 *Hydrocoloeus minutus*; Little gull (Non-breeding)	×	Little Gull are rarely recorded in the Port of Immingham area (Natural England and JNCC, 2016) and, therefore, this interest feature of the Greater Wash SPA will not overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham (see Section 9.2 and Section 9.8 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).
	A191 *Sterna sandvicensis*; Sandwich tern (Breeding)	×	The Humber Estuary does not overlap with the foraging ranges of nesting Sandwich Terns from the breeding colonies of the Greater Wash SPA (the maximum foraging range of Sandwich Tern recorded is 80 km with the breeding colonies located over 90 km away on the North Norfolk coast). Most foraging activity also occurs much closer to the nesting colonies (Woodward *et al*., 2019; Natural England and JNCC, 2016). Therefore, it is highly unlikely this interest feature will overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham
	A193 *Sterna hirundo*; Common tern (Breeding)	×	The Humber Estuary does not overlap with the foraging ranges of nesting Common Terns from the breeding colonies of the Greater Wash SPA (the maximum foraging range of Common Tern recorded is 30 km with the breeding colonies located over 90 km away on the North Norfolk coast). Most foraging activity also occurs much closer to the nesting colonies (Woodward *et al*., 2019; Natural England and JNCC, 2016). Therefore, it is highly unlikely this interest feature will overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the

Site	Qualifying features	Justification (✓ requires consideration, × not relevant to the screening assessment)	
			proposed development which are limited to within the vicinity of the Port of Immingham.
	A195 *Sternula albifrons*; Little tern (Breeding)	×	Little Tern forages within 5 km of nesting sites (Woodward *et al*., 2019) and, therefore, this interest feature of the Greater Wash SPA will not overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the proposed development which are limited to within the vicinity of the Port of Immingham (see Section 9.2 and Section 9.8 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).

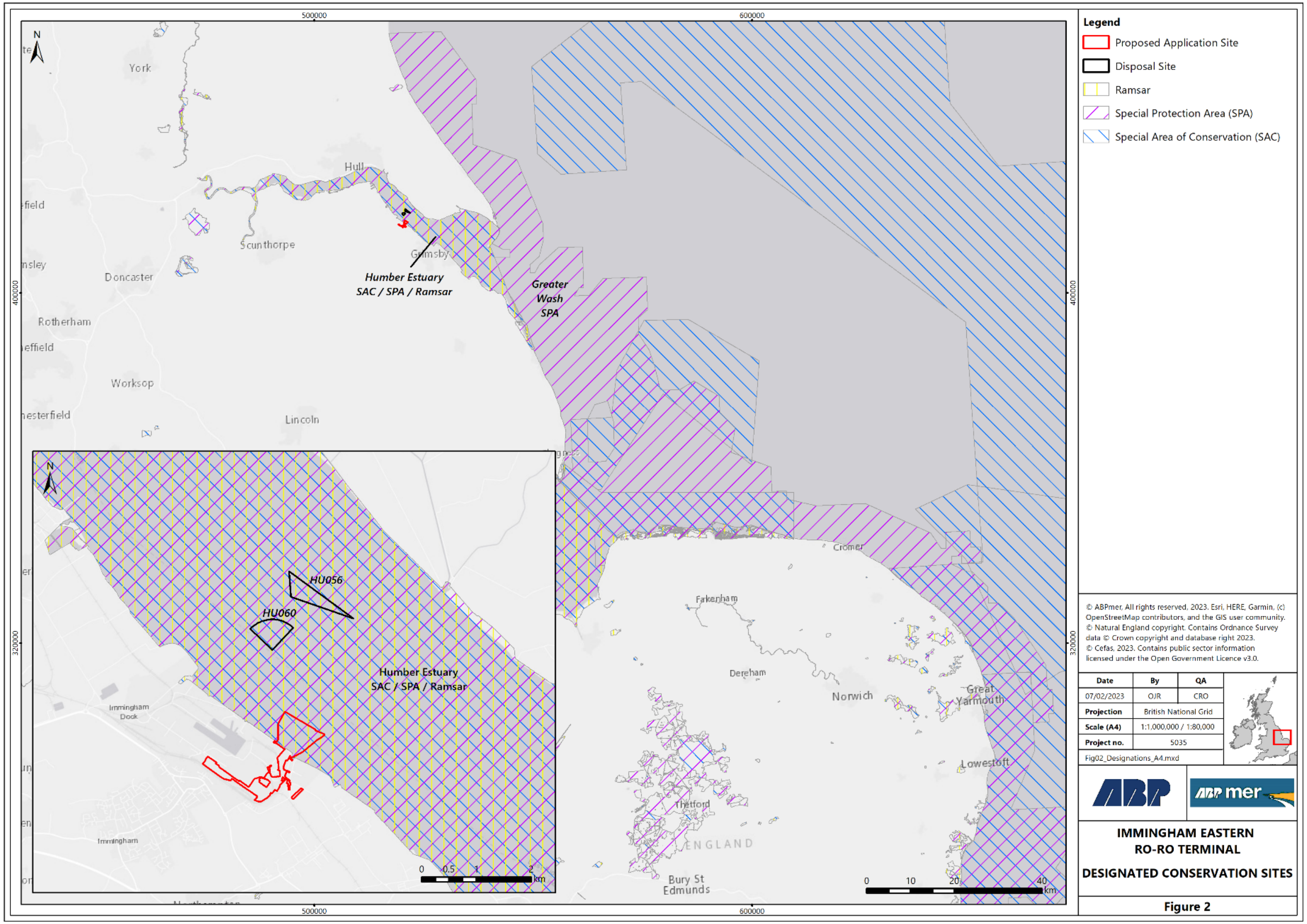

Figure 2. Location of designated sites

Table 3. Potential impacts that could result in LSE on features of the Humber Estuary SAC

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
Construction	Direct loss of intertidal habitat as a result of capital dredging and the piles	Capital dredge and piling	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	Capital dredging will cause a direct, albeit very small loss of intertidal habitat which will be changed to subtidal habitat as a result of the deepening. Piling will also result in the small loss of intertidal.
	Direct loss of subtidal habitat as a result of the piles	Piling	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	Piling will also result in the small loss of subtidal.
	Direct changes to benthic habitats and species as result of seabed	Capital dredge	H1140: Mudflats and sandflats not covered by seawater at low tide	Yes	Capital dredging causes the direct physical removal of marine sediments from the dredge footprint, resulting in the modification of existing marine habitats. The impacts to benthic fauna associated with the dredged material include changes to abundance and

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	removal during dredging		H1130: Estuaries		distribution through damage, mortality or relocation to a disposal site.
	Direct changes to benthic habitats and species as a result of sediment deposition	Piling	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	No	Piling has the potential to result in the localised resuspension of sediment as a result of seabed disturbance. Sediment that settles out of suspension back onto the seabed as result of piling is expected to be negligible and benthic habitats and species are not expected to be sensitive to this level of change. This impact pathway is therefore, not considered further in the HRA.
		Capital dredge	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	Capital dredging has the potential to result in localised physical disturbance and smothering of seabed habitats and species (where the sediment settles out of suspension back onto the seabed).
		Dredge disposal	H1110. Sandbanks which are slightly covered by sea water all the time	Yes	Dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			H1130: Estuaries		
	Indirect loss or change to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes	Marine works (capital dredging and piles)	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	The capital dredge and pile structures have the potential to result in changes to hydrodynamic and sedimentary processes (e.g., flow rates, accretion and erosion patterns). Marine invertebrates inhabiting sand and mud habitat show different tolerance ranges to physiological stresses caused by tidal exposure and tidal elevation and, therefore, hydrodynamic and bathymetric changes caused by the dredging could affect the quality of marine habitats and change the distribution of marine species.
		Dredge disposal	H1110. Sandbanks which are slightly covered by sea water all the time H1130: Estuaries	Yes	The disposal of dredged material at the marine disposal site has the potential to result in changes to hydrodynamic and sedimentary processes (e.g., water levels, flow rates, changes to tidal prism, accretion and erosion patterns). Marine invertebrates inhabiting sand and mud habitat show different tolerance ranges to physiological stresses caused by tidal exposure and tidal elevation and, therefore, hydrodynamic and bathymetric changes caused by the disposal could affect the quality of marine habitats and change the distribution of marine species.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	Changes in water and sediment quality on benthic habitats and species	Piling	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	No	The negligible, highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) associated with bed disturbance during piling is considered unlikely to produce adverse effects in any species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols. This impact pathway is therefore, not considered further in the HRA.
		Capital dredge	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	Changes in water quality during capital dredging could impact benthic habitats and species through an increase in suspended sediment concentrations (SSC) and the release toxic contaminants bound in sediments.
		Dredge disposal	H1110. Sandbanks which are slightly covered by sea water all the time	Yes	Changes in water quality could occur during dredged material disposal through the deposition of material causing elevated SSC and contaminant levels. This could potentially impact on benthic habitats and species.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			H1130: Estuaries		
	The potential introduction and spread of non-native species	Construction, dredging and dredge disposal	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries H1110. Sandbanks which are slightly covered by sea water all the time	Yes	Non-native species have the potential to be transported into the local area as a result of construction, dredging and dredge disposal activity.
	Physical change to habitats resulting from the deposition of airborne pollutants	Construction	H1330: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	No	The majority of the SAC habitats closest to the construction site are marine habitats and are therefore not sensitive to changes in air quality due to dust smothering or marine vessel/ road vehicle emissions during construction. The nearest saltmarsh habitat (H1330) is approximately 3 km north-west of the site. The assessment has concluded that due to the transient, intermittent and temporary nature of construction marine

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					vessel emissions, and the distance from the nearest sensitive habitat, there will be no likely significant effects on SAC habitats (see Chapter 13: Air Quality (Application Document Reference number 8.2.13)). Similarly, the assessment has not identified any potential for LSE arising from construction road vehicle emissions (see Chapter 13: Air Quality).
	Direct loss or changes to migratory fish habitat	Piling	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	No	There is the potential for impacts to fish as a result of habitat loss due to installation of piles and the footprint of the proposed development. However, the direct footprint of the piling only covers a highly localised area with the mobile nature of lamprey allowing them to utilise nearby areas. This impact pathway is, therefore, not considered further in the HRA.
		Capital dredge	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	No	Capital dredging has the potential to result in seabed disturbance and smothering of seabed habitats and species. However, the capital dredge will not overlap with the spawning grounds of lamprey which are further upstream in freshwater habitat. Both species are recorded in the estuary at other life stages with the growth phase of river lamprey primarily restricted to estuaries and both species also move through the estuary

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					during spawning migrations. Therefore, given the high mobility of both river and sea lamprey (and also the parasitic fish prey of these species), lamprey will easily be able to avoid the zone of influence of the dredging and utilise other nearby areas with the footprint of dredging only represent a small proportion of the ranges of lamprey. This impact pathway is, therefore, not considered further in the HRA.
		Dredge disposal	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*		Disposal at the marine disposal site will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats. However, the capital dredge will not overlap with the spawning grounds of lamprey which are further upstream in freshwater habitat. Both species are recorded in the estuary at other life stages with the growth phase of river lamprey primarily restricted to estuaries and both species also move through the estuary during spawning migrations. Therefore, given the high mobility of both river and sea lamprey (and also the parasitic fish prey of these species), lamprey will easily be able to avoid the zone of influence of the dredging and utilise other nearby areas with the footprint of dredging only represent a small proportion of

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					the ranges of lamprey. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on migratory fish species	Piling	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	No	The expected highly localised and temporary changes in suspended sediment levels (described in more detail in the Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)) and related changes in sediment bound contaminants and dissolved oxygen (described in more detail in the Water and Sediment Quality assessment in Chapter 8 of the ES (Application Document Reference number 8.2.8)) associated with bed disturbance during piling are considered highly unlikely to produce adverse effects in any migratory fish species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
		Capital dredge	S1095: Sea lamprey *Petromyzon marinus*	Yes	Changes in water quality during capital dredging could impact migratory fish species through an increase in SSC and the release of toxic contaminants bound in sediments.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			S1099: River lamprey *Lampetra fluviatilis*		
		Dredge disposal	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	Yes	Changes in water quality could occur during dredged material disposal through the deposition of material causing elevated SSC and contaminant levels. This could potentially impact on migratory fish species.
	Underwater noise effects on migratory fish species	Piling	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	Yes	During piling, there is the potential for noise disturbance to fish. Percussive (impact) and vibro piling will produce underwater noise above background conditions and at a level that may cause a risk of injury and behavioural changes to migratory fish in the vicinity of the proposed development.
		Capital dredge	S1095: Sea lamprey *Petromyzon marinus*	Yes	Elevated underwater noise and vibration levels caused by the action of the dredger could potentially affect migratory fish.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			S1099: River lamprey *Lampetra fluviatilis*		
		Dredge disposal	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	Yes	Underwater noise and vibration levels caused by the movement of the dredger to and from the disposal site could potentially affect migratory fish.
	Direct loss or changes in marine mammal foraging habitat	Construction (piling, capital dredge and dredge disposal)	S1364: Grey seal *Halichoerus grypus*	No	There is the potential for impacts to marine mammals as a result of changes to marine mammal foraging habitat and prey resources. However, the footprint of the proposed development only covers a highly localised area that constitutes a negligible fraction of the known ranges of local marine mammal populations. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on marine mammals	Piling	S1364: Grey seal *Halichoerus grypus*	No	The negligible, highly localised and temporary changes in suspended sediment levels (described in more detail in the Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)) and related changes in sediment

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					bound contaminants and dissolved oxygen (described in more detail in the Water and Sediment Quality assessment in Chapter 8 of the ES (Application Document Reference number 8.2.8)) associated with bed disturbance during piling is considered highly unlikely to produce adverse effects in any marine mammal species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
		Capital dredge	S1364: Grey seal *Halichoerus grypus*	No	The plumes resulting from dredging are expected to have a relatively minimal and local effect on SSC in the vicinity of the proposed development (see Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)). Marine mammals are well adapted to turbid conditions and, therefore, not sensitive to the scale of changes in SSC predicted during capital dredging (Todd *et al.*, 2015). The extent of sediment dispersal is not expected to cause significant elevations in water column contamination (Chapter 8 of the ES (Application Document Reference number 8.2.8)). In addition, the temporary and

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					localised changes in water column contamination levels are considered unlikely to produce any lethal and sub-lethal effects in these highly mobile species (the concentrations required to produce these effects are generally acquired through long-term, chronic exposure to prey species in which contaminants have bioaccumulated) (Todd *et al.*, 2015). Furthermore, potential for accidental spillages will also be negligible during all phases through the application of established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
		Dredge disposal	S1364: Grey seal *Halichoerus grypus*	No	The plumes resulting from dredge disposal are expected to have a relatively minimal and local effect on SSC (described in more detail in the Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)). Marine mammals are well adapted to turbid conditions and, therefore, not sensitive to the scale of changes in SSC predicted during disposal (Todd *et al.*, 2015). The extent of sediment dispersal is not expected to cause significant elevations in water column contamination (described in more detail in the Water and Sediment Quality assessment in Chapter 8 of

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					the ES (Application Document Reference number 8.2.8)). In addition, the temporary and localised changes in water column contamination levels are considered unlikely to produce any lethal and sub-lethal effects in these highly mobile species (the concentrations required to produce these effects are generally acquired through long-term, chronic exposure to prey species in which contaminants have bioaccumulated) (Todd *et al.*, 2015). Furthermore, potential for accidental spillages will also be negligible during construction through the application of established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
	Collision risk to marine mammals	Construction, dredging and dredge disposal	S1364: Grey seal *Halichoerus grypus*	No	Vessels involved in construction and dredging/dredge disposal will be mainly stationary or travelling at low speeds (2-6 knots), making the risk of collision very low. Although all types of vessels may collide with marine mammals, vessels traveling at speeds over 10 knots are considered to have a much higher probability of causing lethal injury (Schoeman *et al.*, 2020). Furthermore, the region is already characterised by heavy shipping traffic. The additional movements due to construction activity (including capital

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					dredging) will only constitute a small increase in vessel traffic in the area which will also be temporary in nature. In general, incidents of mortality or injury of marine mammals caused by vessels remain a relatively rare occurrence in UK waters (ABP Research 1999; CSIP, 2020). For example, out of 144 post mortem examinations carried out on cetaceans in 2018, only two (1.4 %) were attributed to boat collision with the biggest causes of mortality including starvation and by-catch, although some incidents are likely to remain unreported (CSIP, 2020). In addition, marine mammals foraging within the Humber Estuary region will routinely need to avoid collision with vessels and are, therefore, considered adapted to living in an environment with high levels of vessel activity. This impact pathway is, therefore, not considered further in the HRA.
	Underwater noise effects on marine mammals	Piling	S1364: Grey seal *Halichoerus grypus*	Yes	Percussive (impact) and vibro piling will produce underwater noise above background conditions and at a level that may cause a risk of injury and behavioural changes to marine mammals if they are present in the vicinity of the proposed development. There is, therefore, considered to be a potential for LSE

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					on the grey seal feature both alone and in-combination with other plans and projects.
		Capital dredge	S1364: Grey seal *Halichoerus grypus*	Yes	Elevated noise and vibration levels caused by the action of the dredger could potentially affect marine mammals by inducing adverse behavioural reactions.
		Dredge disposal	S1364: Grey seal *Halichoerus grypus*	Yes	Elevated noise and vibration levels caused by the movement of the dredger to and from the disposal site could potentially affect marine mammals by inducing adverse behavioural reactions.
	Visual disturbance of hauled out seals	Construction, dredging and dredge disposal	S1364: Grey seal *Halichoerus grypus*	No	The nearest established breeding colony for grey seals is located over 25 km away at Donna Nook. Approximately 10 to 15 grey seals were also observed hauling out on mudflat at Sunk Island (on the north bank of the Humber Estuary) during the project specific benthic surveys as detailed in Appendix 9.1 to the ES. This haul out site is located approximately 4 km north east from the proposed development and around 3-4 km from the dredge disposal sites (including transit routes). No seal haul out sites are known to occur nearer to the proposed development.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Seals which are hauled out on land, either resting or breeding, are considered particularly sensitive to visual disturbance (Hoover-Miller *et al*, 2013). The level of response of seals is dependent on a range of factors, such as the species at risk, age, weather conditions and the degree of habituation to the disturbance source. Hauled out seals have been recorded becoming alert to powered craft at distances of up to 800 m although seals generally only disperse into the water at distances <150-200 m (Wilson, 2014; Mathews, *et al*., 2016; Henry and Hammill, 2001; Strong and Morris, 2010). For example, in a study focusing on a colony of grey seals on the South Devon coast, vessels approaching at distances between 5 m and 25 m resulted in over 64 % of seals entering the water, but at distances of between 50 m and 100 m only 1 % entered the water (Curtin *et al*., 2009). Recent disturbance research has also found no large-scale redistribution of seals after disturbance with most seals returning to the same haul out site within a tidal cycle (Paterson *et al.,* 2019).

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Based on this evidence, seals hauled out on the intertidal habitats of Sunk Island (located on the opposite bank to the proposed development) are out of the zone of influence of any potential visual disturbance effects as a result of dredging, dredge disposal or construction activity. This impact pathway is, therefore, not considered further in the HRA.
Operation	Direct changes to benthic habitats and species beneath marine infrastructure due to shading	Operation	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	Changes in sunlight levels as a result of shading due to marine infrastructure has the potential, albeit minimal, to cause changes to the benthic community occurring in an area.
	Changes to intertidal habitats and species as a result of the movement of Ro-Ro vessels during operation	Berth operations	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	There is potential for physical disturbance and erosion to the foreshore nearby to the proposed development as a result of the movement of Ro-Ro vessels and other ships using the berths.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	Changes to benthic habitats and species as result of seabed removal during dredging	Maintenance dredging	H1140: Mudflats and sandflats not covered by seawater at low tide H1130: Estuaries	Yes	Maintenance dredging causes the direct physical removal of marine sediments from the dredge footprint, resulting in the modification of existing marine habitats. The impacts to benthic fauna associated with the dredged material include changes to abundance and distribution through damage, mortality or relocation to a disposal site. Given that the dredge footprint has not previously been subject to any maintenance dredging, there is, therefore, considered to be a potential, albeit minimal, for LSE.
	Changes to seabed habitats and species as a result of sediment deposition	Maintenance dredging and disposal	H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide H1110. Sandbanks which are slightly covered by sea water all the time	No	Maintenance dredge and dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats. As a result of a less intensive dredge programme (and an overall lower predicted dredge volume), future maintenance dredging will result in smaller changes in SSC and sedimentation (within the dredge plumes and at the disposal site) as compared to the capital dredge. Deposition of sediment as a result of dredging will be highly localised and similar to background variability. The benthic species occurring within and near to the

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					dredge area typically consist of burrowing infauna (such as polychaetes, oligochaetes or bivalves), which are considered tolerant to some sediment deposition. The predicted millimetric changes in deposition are, therefore, considered unlikely to cause smothering effects. In addition, the species recorded in the benthic invertebrate surveys are fast growing and/or have rapid reproductive rates which allow populations to typically rapidly recolonise disturbed habitats, many within a few months following the disturbance events (Ashley and Budd, 2020; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). Clay Huts licensed disposal site (HU060) will be used for maintenance disposal as per the existing maintenance dredge licence. The disposal site is located in the mid channel and is subject to regular natural physical disturbance (and associated scouring) as a result of very strong tidal flows. This disposal site is already used for the disposal of maintenance dredge arisings (millions of wet tonnes of dredge sediment are disposed of at HU060 annually) which will also cause some

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					disturbance due to sediment deposition. This is reflected in a generally impoverished assemblage at the disposal site. The benthic species recorded include mobile infauna (such as errant polychaetes e.g., *Arenicola* spp. and amphipods) which are able to burrow through sediment. They are, therefore, considered tolerant to some sediment deposition. In addition, characterising species typically have opportunistic life history strategies, with short life histories (typically two years or less), rapid maturation and the production of large numbers of small propagules which makes them capable of rapid recoverability should mortality as a result of smothering occur (Ashley and Budd, 2020; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016; Tyler-Walters and Garrard, 2019). On this basis, any effects are considered to be temporary and short term. This impact pathway is, therefore, not considered further in the HRA.
	Indirect changes to seabed habitats and	Maintenance dredging and disposal	H1130: Estuaries	No	The predicted physical processes impacts from future maintenance dredging will be similar to that which already arises from the

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	species as a result of changes to hydrodynamic and sedimentary processes		H1140: Mudflats and sandflats not covered by seawater at low tide H1110. Sandbanks which are slightly covered by sea water all the time		ongoing maintenance of the existing Immingham berths. Maintenance dredging has the potential to result in changes to hydrodynamic and sedimentary processes (e.g., water levels, flow rates, changes to tidal prism, accretion and erosion patterns). However, as described in more detail in the Physical Processes assessment (Chapter 7 of the ES (Application Document Reference number 8.2.7)), only changes in hydrodynamic and sedimentary processes that are of a negligible magnitude are predicted. These changes will not be discernible against natural processes at nearby intertidal habitats. Furthermore, the predicted changes are not expected to modify existing subtidal habitat types found in the area. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on benthic habitats and species	Maintenance dredge and dredge disposal	H1130: Estuaries H1140: Mudflats and sandflats not covered by	No	Changes in water quality (as summarised in Chapter 8 of the ES (Application Document Reference number 8.2.8)) are also expected to be lower than for the capital dredge and similar to existing maintenance dredging. Elevated SSCs due to maintenance dredging and dredge disposal are considered to be of a

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			seawater at low tide H1110. Sandbanks which are slightly covered by sea water all the time		magnitude that can occur naturally or as a result of existing maintenance dredging/disposal and sediment plumes resulting from dredging are also considered to dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time (less than a single tidal cycle). Naturally very high SSCs typically occur year-round in the Humber Estuary, particularly during the winter months when storm events disturb the seabed and on spring tides. The estuarine benthic communities recorded in the region are considered tolerant to this highly turbid environment (De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). Magnitude of change is therefore assessed as negligible. The results of the sediment contamination sampling are summarised above and the Water and Sediment Quality chapter (Chapter 8 of the ES (Application Document Reference number 8.2.8)). In summary, low levels of contamination were found in the samples and there is no reason to believe the sediment will

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					be unsuitable for disposal in the marine environment. During maintenance dredging and dredge disposal, sediment will be rapidly dispersed in the water column. Therefore, the already low levels of contaminants in the dredged sediments will be dispersed further. The probability of changes in water quality occurring at the disposal site is considered to be low and the overall exposure to change is considered to be negligible. The sensitivity of subtidal habitats and species to contaminants is assessed as low to moderate because, although contaminants can cause toxicity in subtidal communities, the concentrations of contaminants required to produce both lethal and sub-lethal effects are generally high (although responses vary considerably between species). This impact pathway is, therefore, not considered further in the HRA.
	Non-native species transfer during vessel operations	Vessel operations	H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	Yes	Non-native species have the potential to be transported into the local area on the hulls of vessels during operation. Non-native invasive species also have the potential to be transported via vessel ballast water.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			H1110. Sandbanks which are slightly covered by sea water all the time		
	Physical change to habitats resulting from the deposition of airborne pollutants	Operation	H1330: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes (NOx and N deposition)	As discussed in respect of construction impacts, the majority of the SAC habitats closest to site are marine environments and therefore not sensitive to N deposition or NOx from operational marine vessel/ road vehicle emissions. Predicted operational N deposition and NOx at five receptors within the SAC are presented in Table 13.15 in Chapter 13: Air Quality (Application Document Reference number 8.2.13). Annual mean NOx and N deposition exceed 1% of the Critical Load screening threshold at three of the SAC receptors, and therefore likely significant effects from this pathway cannot be screened out. Predicted NH3 and NH3 derived N deposition at the same five SAC receptors are presented in Table 13.16 in Chapter 13: Air Quality (Application Document Reference number 8.2.13). The predicted NH3 concentrations are below 1% of the Critical Level threshold at all receptors and

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					likely significant effects are therefore screened out from this pathway.
	Changes to migratory fish habitat	Maintenance dredge and dredge disposal	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	No	Maintenance dredging and dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats. However, the maintenance dredge will not overlap with the spawning grounds of lamprey which are further upstream in freshwater habitat. Both species are recorded in the estuary at other life stages with the growth phase of river lamprey primarily restricted to estuaries and both species also move through the estuary during spawning migrations. Therefore, given the high mobility of both river and sea lamprey (and also the parasitic fish prey of these species), lamprey will easily be able to avoid the zone of influence of the dredging and utilise other nearby areas with the footprint of dredging only represent a small proportion of the ranges of lamprey. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on migratory fish	Maintenance dredge and dredge disposal	S1095: Sea lamprey *Petromyzon marinus*	No	Changes in water quality (as summarised in Chapter 8 of the ES (Application Document Reference number 8.2.8)) are also expected to be lower than for the capital dredge and similar to existing maintenance dredging.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			S1099: River lamprey *Lampetra fluviatilis*		With specific respect to lamprey, these species are known to migrate through estuaries with high SSC (including the Humber Estuary). Elevated SSCs due to dredging are considered to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. Sediment plumes resulting from dredging and dredge disposal are also considered to dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time (less than a single tidal cycle) as described in more detail in the Physical Processes assessment (Chapter 7 of the ES (Application Document Reference number 8.2.7)). Therefore, lamprey would also be able to avoid the temporary sediment plumes. Based on these factors there is therefore considered limited potential for migrating fish to be adversely affected by the predicted changes in SSC. With respect to sediment contamination, generally low levels of contamination were found in the sediment contamination samples as presented in the Water and Sediment Quality assessment in Chapter 8 of the ES

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					(Application Document Reference number 8.2.8). Based on this sampling data, the overall level of contamination in the proposed dredge area is considered to be low and the sediment plume would be expected to rapidly dissipate by the strong tidal currents in the area. Significant elevations in the concentrations of contaminants within the water column are not anticipated. This impact pathway is, therefore, not considered further in the HRA.
	Underwater noise effects on migratory fish	Vessel operations including maintenance dredge and dredge disposal	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	No	Vessel movements during operation may also result in disturbance through changes in underwater noise and vibration (see Table 9.25 in Section 9.8 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). However, only mild behavioural responses in close proximity to the Ro-Ro or dredging vessels are anticipated with noise levels unlikely to be discernible above ambient levels in the wider Humber Estuary area. This impact pathway is, therefore, not considered further in the HRA.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	Underwater noise effects on marine mammals	Maintenance dredge and dredge disposal	S1364: Grey seal *Halichoerus grypus*	No	Vessel movements during operation may also result in disturbance through changes in underwater noise and vibration (see Table 9.25 in Section 9.8 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). However, only mild behavioural responses in close proximity to the Ro-Ro or dredging vessels are anticipated with noise levels unlikely to be discernible above ambient levels in the wider Humber Estuary area. This impact pathway is, therefore, not considered further in the HRA.
	Visual disturbance of hauled out seals	Vessel operations, maintenance dredge and dredge disposal	S1364: Grey seal *Halichoerus grypus*	No	The nearest established breeding colony for grey seals is located over 25 km away at Donna Nook. Approximately 10 to 15 grey seals were also observed hauling out on mudflat at Sunk Island (on the north bank of the Humber Estuary) during the project specific benthic surveys as detailed in Appendix 9.1 to the ES. This haul out site is located approximately 4 km north east from the proposed development. No seal haul out sites are known to occur nearer to the proposed development. Seals which are hauled out on land, either resting or breeding, are considered

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					particularly sensitive to visual disturbance (Hoover-Miller *et al*, 2013). The level of response of seals is dependent on a range of factors, such as the species at risk, age, weather conditions and the degree of habituation to the disturbance source. Hauled out seals have been recorded becoming alert to powered craft at distances of up to 800 m although seals generally only disperse into the water at distances <150-200 m (Wilson, 2014; Mathews, *et al*., 2016; Henry and Hammill, 2001; Strong and Morris, 2010). For example, in a study focusing on a colony of grey seals on the South Devon coast, vessels approaching at distances between 5 m and 25 m resulted in over 64 % of seals entering the water, but at distances of between 50 m and 100 m only 1 % entered the water (Curtin *et al*., 2009). Recent disturbance research has also found no large-scale redistribution of seals after disturbance with most seals returning to the same haul out site within a tidal cycle (Paterson *et al.,* 2019). Based on this evidence, seals hauled out on the intertidal habitats of Sunk Island (located on the opposite bank to the proposed development) are out of the zone of influence

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					of any potential visual disturbance effects as a result of maintenance dredging and vessel operations. This impact pathway is, therefore, not considered further in the HRA.
	Collision risk to marine mammals	Vessel operations	S1364: Grey seal *Halichoerus grypus*	No	Vessels using the berths during operation will be typically approaching at slow speeds (2-4 knots) and maintenance dredging/dredge disposal will be mainly stationary or travelling at low speeds (2-6 knots), making the risk of collision very low. Although all types of vessels may collide with marine mammals, vessels traveling at speeds over 10 knots are considered to have a much higher probability of causing lethal injury (Schoeman *et al.*, 2020). Furthermore, the region is already characterised by heavy shipping traffic. The additional operational vessel movements resulting from the proposed development will only constitute a small increase in vessel traffic in the area on a typical day (up to six additional Ro-Ro vessel movements per day at the Port of Immingham, as well as tugs) which represents approximately a 3 % increase in vessel traffic in the study area. There will also be maintenance dredger and barge movements but that is estimated to only be necessary approximately three to four times a year.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					In general, incidents of mortality or injury of marine mammals caused by vessels remain a relatively rare occurrence in UK waters (ABP Research 1999; CSIP, 2020). For example, out of 144 post mortem examinations carried out on cetaceans in 2018, only two (1.4 %) were attributed to boat collision with the biggest causes of mortality including starvation and by-catch, although some incidents are likely to remain unreported (CSIP, 2020). In addition, marine mammals frequently foraging within the region will routinely need to avoid collision with vessels and are, therefore, considered adapted to living in an environment with high levels of vessel activity. This impact pathway is, therefore, not considered further in the HRA.

Table 4. Potential impacts that could result in LSE on features of the Humber Estuary SPA

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
Construction	Loss or change to coastal waterbird habitat	Piling	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A149: Dunlin *Calidris alpina alpina* (Non-breeding) A162: Common Redshank *Tringa*	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Piling will cause a direct loss of a small area of intertidal habitat (0.012 ha). This loss will be highly localised. However, given the protection afforded to the mudflat that is utilised by feeding waterbirds in this area, there is, therefore, considered to be a

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			totanus (Non-breeding) Waterbird assemblage		potential for LSE on the waterbird features highlighted above.
		Capital dredge	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A149: Dunlin *Calidris alpina alpina* (Non-breeding)	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Capital dredging will cause a direct, albeit minimal, loss of intertidal habitat as well as potential changes which could cause

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage		changes to the prey resources available for coastal waterbirds. Whilst the changes are minimal potential LSE on the waterbird features highlighted above cannot be discounted.
	Noise and visual disturbance to coastal waterbirds	Construction activity (including capital dredging)	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). During construction, there is the potential for airborne noise and visual disturbance to

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			A149: Dunlin *Calidris alpina alpina* (Non-breeding) A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage		affect coastal waterbirds. There is, therefore, considered to be a potential for LSE on the waterbird features highlighted above both alone and in-combination with other plans and projects.
Operation	Direct changes to coastal waterbird foraging and roosting habitat as a result of marine infrastructure	Berth operations	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A156: Black-tailed Godwit *Limosa*	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			limosa islandica (Non-breeding) A149: Dunlin *Calidris alpina alpina* (Non-breeding) A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage		Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Marine infrastructure associated with the proposed development (raised jetty structure, linkspan etc.) could potentially cause direct damage or reduced functionality to waterbird feeding and roosting habitat. There is, therefore, considered to be a potential for LSE on the waterbird features highlighted above.
	Noise and visual disturbance to coastal waterbirds	Berth operations	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica*	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A149: Dunlin *Calidris alpina alpina* (Non-breeding) A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage		paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). During operation, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds. There is, therefore, considered to be a potential for LSE on the waterbird features highlighted above.

Table 5. Potential impacts that could result in LSE on features of the Humber Estuary Ramsar

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
Construction	Direct loss of intertidal habitat as a result of capital dredging and the piles	Capital dredge and piling	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Capital dredging will cause a direct, albeit negligible loss of intertidal habitat which will be changed to subtidal habitat as a result of the deepening. Piling will also result in the small loss of intertidal.
	Direct loss of subtidal habitat as a result of the piles	Piling	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine	Yes	Piling will also result in a loss, albeit minimal, of subtidal. This impact pathway has, therefore, been scoped into the assessment.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		
	Direct changes to benthic habitats and species as result of seabed removal during dredging	Capital dredge	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Capital dredging causes the direct physical removal of marine sediments from the dredge footprint, resulting in the modification of existing marine habitats. The impacts to benthic fauna associated with the dredged material include changes to abundance and distribution through damage, mortality or relocation to a disposal site.
	Direct changes to benthic habitats and species as a result of sediment deposition	Piling	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats:	No	Piling has the potential to result in the localised resuspension of sediment as a result of seabed disturbance. Sediment that settles out of suspension back onto the seabed as result of piling is expected to be negligible and benthic habitats and species are not expected to be sensitive to this level of change. This impact

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		pathway is therefore, not considered further in the HRA.
		Capital dredge	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Capital dredging has the potential to result in localised physical disturbance and smothering of seabed habitats and species (where the sediment settles out of suspension back onto the seabed).
		Dredge disposal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary	Yes	Dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		
	Indirect loss or change to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes	Marine works (capital dredging and piles)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	The capital dredge and pile structures have the potential to result in changes to hydrodynamic and sedimentary processes (e.g., flow rates, accretion and erosion patterns). Marine invertebrates inhabiting sand and mud habitat show different tolerance ranges to physiological stresses caused by tidal exposure and tidal elevation and, therefore, hydrodynamic and bathymetric changes caused by the dredging could affect the quality of marine habitats and change the distribution of marine species.
		Dredge disposal	Criterion 1 – natural wetland habitats that are of international importance:	Yes	The disposal of dredged material at the marine disposal site has the potential to result in changes to hydrodynamic and sedimentary processes (e.g., water levels, flow rates, changes to tidal prism,

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		accretion and erosion patterns). Marine invertebrates inhabiting sand and mud habitat show different tolerance ranges to physiological stresses caused by tidal exposure and tidal elevation and, therefore, hydrodynamic and bathymetric changes caused by the disposal could affect the quality of marine habitats and change the distribution of marine species.
	Changes in water and sediment quality on benthic habitats and species	Piling	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	No	The negligible, highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) associated with bed disturbance during piling is considered unlikely to produce adverse effects in any species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols. This impact pathway is therefore, not considered further in the HRA.
		Capital dredge	Criterion 1 – natural wetland habitats that are	Yes	Changes in water quality during capital dredging could impact benthic habitats

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		and species through an increase in SSC and the release toxic contaminants bound in sediments. with other plans and projects.
		Dredge disposal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Changes in water quality could occur during dredged material disposal through the deposition of material causing elevated SSC and contaminant levels. This could potentially impact on benthic habitats and species.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	The potential introduction and spread of non-native species	Construction, dredging and dredge disposal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Non-native species have the potential to be transported into the local area as a result of construction, dredging and dredge disposal activity.
	Physical change to habitats resulting from the deposition of airborne pollutants	Construction	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats,	No	The majority of the Ramsar habitats closest to the construction site are marine habitats and are therefore not sensitive to changes in air quality due to dust smothering or marine vessel/ road vehicle emissions during construction. The nearest saltmarsh habitat (H1330) is approximately 3 km north-west of the site. The assessment has concluded that due to the transient, intermittent and temporary nature of construction marine vessel emissions, and the distance from the nearest sensitive habitat, there will be

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			saltmarshes, and coastal brackish/saline lagoons.		no likely significant effects on Ramsar habitats (see Chapter 13: Air Quality (Application Document Reference number 8.2.13)). Similarly, the assessment has not identified any potential for LSE arising from construction road vehicle emissions (see Chapter 13: Air Quality (Application Document Reference number 8.2.13)).
	Direct loss or changes to migratory fish habitat	Piling	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	No	There is the potential for impacts to fish as a result of habitat loss due to installation of piles and the footprint of the proposed development. However, the direct footprint of the piling only covers a highly localised area with the mobile nature of lamprey allowing them to utilise nearby areas. This impact pathway is, therefore, not considered further in the HRA.
		Capital dredge	Criterion 8 – Internationally important source of food for fishes, spawning grounds,	No	Dredging by trailer suction hopper dredger has the potential to result in the direct uptake of fish and fish eggs by the action of the draghead (entrainment).

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		Backhoe dredging can also directly remove fish and fish eggs in the bucket. In addition, capital dredging has the potential to result in seabed disturbance and smothering of seabed habitats and species. However, the capital dredge will not overlap with the spawning grounds of lamprey which are further upstream in freshwater habitat. Both species are recorded in the estuary at other life stages with the growth phase of river lamprey primarily restricted to estuaries and both species also move through the estuary during spawning migrations. Therefore, given the high mobility of both river and sea lamprey (and also the parasitic fish prey of these species), lamprey will easily be able to avoid the zone of influence of the dredging and utilise other nearby areas with the footprint of dredging only represent a small proportion of the ranges of lamprey. This impact pathway is, therefore, not considered further in the HRA.
		Dredge disposal	Criterion 8 – Internationally important source of food for fishes,	No	Disposal at the marine disposal site will result in the deposition of sediments which has the potential to cause physical

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		disturbance and smothering of seabed habitats. However, the capital dredge will not overlap with the spawning grounds of lamprey which are further upstream in freshwater habitat. Both species are recorded in the estuary at other life stages with the growth phase of river lamprey primarily restricted to estuaries and both species also move through the estuary during spawning migrations. Therefore, given the high mobility of both river and sea lamprey (and also the parasitic fish prey of these species), lamprey will easily be able to avoid the zone of influence of the dredging and utilise other nearby areas with the footprint of dredging only represent a small proportion of the ranges of lamprey. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on migratory fish species	Piling	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path:	No	The expected highly localised and temporary changes in suspended sediment levels (described in more detail in the Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)) and related changes in sediment bound

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		contaminants and dissolved oxygen (described in more detail in the Water and Sediment Quality assessment in Chapter 8 of the ES (Application Document Reference number 8.2.8)) associated with bed disturbance during piling are considered highly unlikely to produce adverse effects in any fish species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
		Capital dredge	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal	Yes	Changes in water quality during capital dredging could impact migratory fish species through an increase in SSC and the release of toxic contaminants bound in sediments.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			waters and their spawning areas.		
		Dredge disposal	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	Yes	Changes in water quality could occur during dredged material disposal through the deposition of material causing elevated SSC and contaminant levels. This could potentially impact on migratory fish species.
	Underwater noise effects on migratory fish species	Piling	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	Yes	During piling, there is the potential for noise disturbance to fish. Percussive (impact) and vibro piling will produce underwater noise above background conditions and at a level that may cause a risk of injury and behavioural changes to fish in the vicinity of the proposed development.
		Capital dredge	Criterion 8 – Internationally important source of food for fishes, spawning grounds,	Yes	Elevated underwater noise and vibration levels caused by the action of the dredger could potentially affect migratory fish.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		
		Dredge disposal	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	Yes	Underwater noise and vibration levels caused by the movement of the dredger to and from the disposal site could potentially affect migratory fish.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	Direct loss or changes in marine mammal foraging habitat	Construction (piling, capital dredge and dredge disposal)	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	There is the potential for impacts to marine mammals as a result of changes to marine mammal foraging habitat and prey resources. However, the footprint of the proposed development only covers a highly localised area that constitutes a negligible fraction of the known ranges of local marine mammal populations. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on marine mammals	Piling	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	The negligible, highly localised and temporary changes in suspended sediment levels (described in more detail in the Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)) and related changes in sediment bound contaminants and dissolved oxygen (described in more detail in the Water and Sediment Quality assessment in Chapter 8 of the ES (Application Document Reference number 8.2.8)) associated with bed disturbance during piling is considered highly unlikely to

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					produce adverse effects in any marine mammal species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
		Capital dredge	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	The plumes resulting from dredging are expected to have a relatively minimal and local effect on SSC in the vicinity of the proposed development (see Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)). Marine mammals are well adapted to turbid conditions and, therefore, not sensitive to the scale of changes in SSC predicted during capital dredging (Todd *et al.*, 2015). The extent of sediment dispersal is not expected to cause significant elevations in water column contamination (Chapter 8 of the ES (Application Document Reference number 8.2.8)). In addition, the temporary and localised changes in water column contamination levels are considered unlikely to produce any lethal and sub-lethal effects in these highly

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					mobile species (the concentrations required to produce these effects are generally acquired through long-term, chronic exposure to prey species in which contaminants have bioaccumulated) (Todd *et al.*, 2015). Furthermore, potential for accidental spillages will also be negligible during all phases through the application of established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
		Dredge disposal	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	The plumes resulting from dredge disposal are expected to have a relatively minimal and local effect on SSC (described in more detail in the Physical Processes assessment in Chapter 7 of the ES (Application Document Reference number 8.2.7)). Marine mammals are well adapted to turbid conditions and, therefore, not sensitive to the scale of changes in SSC predicted during disposal (Todd *et al.*, 2015). The extent of sediment dispersal is not expected to cause significant elevations in water column contamination (described in more detail in the Water and Sediment Quality

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					assessment in Chapter 8 of the ES (Application Document Reference number 8.2.8)). In addition, the temporary and localised changes in water column contamination levels are considered unlikely to produce any lethal and sub-lethal effects in these highly mobile species (the concentrations required to produce these effects are generally acquired through long-term, chronic exposure to prey species in which contaminants have bioaccumulated) (Todd *et al.*, 2015). Furthermore, potential for accidental spillages will also be negligible during construction through the application of established industry guidance and protocols. This impact pathway is, therefore, not considered further in the HRA.
	Collision risk to marine mammals	Construction, dredging and dredge disposal	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus*	No	Vessels involved in construction and dredging/dredge disposal will be mainly stationary or travelling at low speeds (2-6 knots), making the risk of collision very low. Although all types of vessels may collide with marine mammals, vessels traveling at speeds over 10 knots are considered to have a much higher

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.		probability of causing lethal injury (Schoeman *et al.,* 2020). Furthermore, the region is already characterised by heavy shipping traffic. The additional movements due to construction activity (including capital dredging) will only constitute a small increase in vessel traffic in the area which will also be temporary in nature. In general, incidents of mortality or injury of marine mammals caused by vessels remain a relatively rare occurrence in UK waters (ABP Research 1999; CSIP, 2020). For example, out of 144 post mortem examinations carried out on cetaceans in 2018, only two (1.4 %) were attributed to boat collision with the biggest causes of mortality including starvation and by-catch, although some incidents are likely to remain unreported (CSIP, 2020). In addition, marine mammals foraging within the Humber Estuary region will routinely need to avoid collision with vessels and are, therefore, considered adapted to living in an environment with high levels of vessel activity. This impact pathway is,

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					therefore, not considered further in the HRA.
	Underwater noise effects on marine mammals	Piling	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	Yes	Percussive (impact) and vibro piling will produce underwater noise above background conditions and at a level that may cause a risk of injury and behavioural changes to marine mammals in the vicinity of the proposed development.
		Capital dredge	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular	Yes	Elevated noise and vibration levels caused by the action of the dredger could potentially affect marine mammals by inducing adverse behavioural reactions.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			breeding site on the east coast.		
		Dredge disposal	S1364: Grey seal *Halichoerus grypus*	Yes	Elevated noise and vibration levels caused by the movement of the dredger to and from the disposal site could potentially affect marine mammals by inducing adverse behavioural reactions.
	Visual disturbance of hauled out seals	Construction, dredging and dredge disposal	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	The nearest established breeding colony for grey seals is located over 25 km away at Donna Nook. Approximately 10 to 15 grey seals were also observed hauling out on mudflat at Sunk Island (on the north bank of the Humber Estuary) during the project specific benthic surveys as detailed in Appendix 9.1 to the ES. This haul out site is located approximately 4 km north east from the proposed development and around 3-4 km from the dredge disposal sites (including transit routes). No seal haul out sites are known to occur nearer to the proposed development. Seals which are hauled out on land, either resting or breeding, are considered particularly sensitive to visual disturbance (Hoover-Miller *et al*, 2013).

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					The level of response of seals is dependent on a range of factors, such as the species at risk, age, weather conditions and the degree of habituation to the disturbance source. Hauled out seals have been recorded becoming alert to powered craft at distances of up to 800 m although seals generally only disperse into the water at distances <150-200 m (Wilson, 2014; Mathews, *et al*., 2016; Henry and Hammill, 2001; Strong and Morris, 2010). For example, in a study focusing on a colony of grey seals on the South Devon coast, vessels approaching at distances between 5 m and 25 m resulted in over 64 % of seals entering the water, but at distances of between 50 m and 100 m only 1 % entered the water (Curtin *et al*., 2009). Recent disturbance research has also found no large-scale redistribution of seals after disturbance with most seals returning to the same haul out site within a tidal cycle (Paterson *et al*., 2019). Based on this evidence, seals hauled out on the intertidal habitats of Sunk Island (located on the opposite bank to the

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					proposed development) are out of the zone of influence of any potential visual disturbance effects as a result of dredging, dredge disposal or construction activity. This impact pathway is, therefore, not considered further in the HRA.
	Loss or change to coastal waterbird habitat	Piling	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)).

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Piling will cause a direct loss of intertidal habitat. This loss will be highly localised. However, given the protection afforded to the mudflat that is utilised by feeding waterbirds in this area, there is, therefore, considered to be a potential for LSE on the waterbird features highlighted above.
		Capital dredge	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)).

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Capital dredging will cause a direct, albeit minimal, loss of intertidal habitat as well as potential changes which could cause changes to the prey resources available for coastal waterbirds. There is, therefore, considered to be a potential for LSE on the waterbird features highlighted above.
	Noise and visual disturbance to coastal waterbirds	Construction activity (including capital dredging)	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			tailed Godwit, Bar-tailed Godwit (overwintering)		(Application Document Reference number 8.2.9)). During construction, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds. There is, therefore, considered to be a potential for LSE on the waterbird features highlighted above.
Operation	Direct changes to benthic habitats and species beneath marine infrastructure due to shading	Operation	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Changes in sunlight levels as a result of shading due to marine infrastructure has the potential to cause changes to the benthic community occurring in an area.
	Changes to intertidal habitats and species as a	Berth operations	Criterion 1 – natural wetland habitats that are of international importance:	Yes	There is potential for physical disturbance and erosion to the foreshore nearby to the proposed development as

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	result of the movement of Ro-Ro vessels during operation		The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		a result of the movement of Ro-Ro vessels and other ships using the berths.
	Changes to benthic habitats and species as result of seabed removal during dredging	Maintenance dredging	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Maintenance dredging causes the direct physical removal of marine sediments from the dredge footprint, resulting in the modification of existing marine habitats. The impacts to benthic fauna associated with the dredged material include changes to abundance and distribution through damage, mortality or relocation to a disposal site. Given that the dredge footprint has not previously been subject to any maintenance dredging, there is, therefore, considered to be a potential for LSE on this feature.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	Changes to seabed habitats and species as a result of sediment deposition	Maintenance dredging and disposal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	No	Maintenance dredge and dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats. As a result of a less intensive dredge programme (and an overall lower predicted dredge volume), future maintenance dredging will result in smaller changes in SSC and sedimentation (within the dredge plumes and at the disposal site) as compared to the capital dredge. Deposition of sediment as a result of dredging will be highly localised and similar to background variability. The benthic species occurring within and near to the dredge area typically consist of burrowing infauna (such as polychaetes, oligochaetes or bivalves), which are considered tolerant to some sediment deposition. The predicted millimetric changes in deposition are, therefore, considered unlikely to cause smothering effects. In addition, the species recorded in the benthic invertebrate surveys are fast growing and/or have rapid

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					reproductive rates which allow populations to typically rapidly recolonise disturbed habitats, many within a few months following the disturbance events (Ashley and Budd, 2020; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). Clay Huts licensed disposal site (HU060) will be used for maintenance disposal as per the existing maintenance dredge licence. The disposal site is located in the mid channel and are subject to regular natural physical disturbance (and associated scouring) as a result of very strong tidal flows. This disposal site is already used for the disposal of maintenance dredge arisings (millions of wet tonnes of dredge sediment are disposed of at HU060 annually) which will also cause some disturbance due to sediment deposition. This is reflected in a generally impoverished assemblage at the disposal site.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					The benthic species recorded include mobile infauna (such as errant polychaetes e.g., *Arenicola* spp. and amphipods) which are able to burrow through sediment. They are, therefore, considered tolerant to some sediment deposition. In addition, characterising species typically have opportunistic life history strategies, with short life histories (typically two years or less), rapid maturation and the production of large numbers of small propagules which makes them capable of rapid recoverability should mortality as a result of smothering occur (Ashley and Budd, 2020; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016; Tyler-Walters and Garrard, 2019). On this basis, any effects are considered to be temporary and short term. This impact pathway is, therefore, not considered further in the HRA.
	Indirect changes to seabed habitats and species as a result of	Maintenance dredging and disposal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example	No	The predicted physical processes impacts from future maintenance dredging will be similar to that which already arises from the ongoing maintenance of the existing Immingham berths.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	changes to hydrodynamic and sedimentary processes		of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		Maintenance dredging has the potential to result in changes to hydrodynamic and sedimentary processes (e.g., water levels, flow rates, changes to tidal prism, accretion and erosion patterns). However, as described in more detail in the Physical Processes assessment (Chapter 7 of the ES (Application Document Reference number 8.2.7)), only changes in hydrodynamic and sedimentary processes that are of a negligible magnitude are predicted. These changes will not be discernible against natural processes at nearby intertidal habitats. Furthermore, the predicted changes are not expected to modify existing subtidal habitat types found in the area. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on benthic habitats and species	Maintenance dredge and dredge disposal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary	No	Changes in water quality (as summarised in Chapter 8 of the ES (Application Document Reference number 8.2.8)) are also expected to be lower than for the capital dredge and similar to existing maintenance dredging.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		Elevated SSCs due to maintenance dredging and dredge disposal are considered to be of a magnitude that can occur naturally or as a result of existing maintenance dredging/disposal and sediment plumes resulting from dredging are also considered to dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time (less than a single tidal cycle). Naturally very high SSCs typically occur year-round in the Humber Estuary, particularly during the winter months when storm events disturb the seabed and on spring tides. The estuarine benthic communities recorded in the region are considered tolerant to this highly turbid environment (De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). Magnitude of change is therefore assessed as negligible. The results of the sediment contamination sampling are summarised above and the Water and Sediment

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Quality chapter (Chapter 8 of the ES (Application Document Reference number 8.2.8)). In summary, low levels of contamination were found in the samples and there is no reason to believe the sediment will be unsuitable for disposal in the marine environment. During maintenance dredging and dredge disposal, sediment will be rapidly dispersed in the water column. Therefore, the already low levels of contaminants in the dredged sediments will be dispersed further. The probability of changes in water quality occurring at the disposal site is considered to be low and the overall exposure to change is considered to be negligible. The sensitivity of subtidal habitats and species to contaminants is assessed as low to moderate because, although contaminants can cause toxicity in subtidal communities, the concentrations of contaminants required to produce both lethal and sub-lethal effects are generally high (although responses vary considerably between species). This impact pathway is, therefore, not considered further in the HRA.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	Non-native species transfer during vessel operations	Vessel operations	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Yes	Non-native species have the potential to be transported into the local area on the hulls of vessels during operation. Non-native invasive species also have the potential to be transported via vessel ballast water.
	Physical change to habitats resulting from the deposition of airborne pollutants	Operation	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats,	Yes (NOx and N deposition)	As discussed in respect of construction impacts, the majority of the Ramsar habitats closest to site are marine environments and therefore not sensitive to N deposition or NOx from operational marine vessel/ road vehicle emissions. Predicted operational N deposition and NOx at five receptors within the SAC are presented in Table 13.15 in Chapter 13: Air Quality (Application Document Reference number 8.2.13). Annual mean NOx and N deposition show minor exceedances of the 1% of the Critical

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			saltmarshes, and coastal brackish/saline lagoons.		Load screening threshold at three of the Ramsar receptors, and therefore likely significant effects from this pathway cannot be screened out. Predicted NH3 and NH3 derived N deposition at the same five Ramsar receptors are presented in Table 13.16 in Chapter 13: Air Quality (Application Document Reference number 8.2.13). The predicted NH3 concentrations are below 1% of the Critical Level threshold at all receptors and likely significant effects are therefore screened out from this pathway.
	Changes to migratory fish habitat	Maintenance dredge and dredge disposal	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal	No	Maintenance dredging and dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats. However, the maintenance dredge will not overlap with the spawning grounds of lamprey which are further upstream in freshwater habitat. Both species are recorded in the estuary at other life stages with the growth phase of river lamprey primarily restricted to estuaries and both species also move through the estuary during spawning migrations.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
			waters and their spawning areas.		Therefore, given the high mobility of both river and sea lamprey (and also the parasitic fish prey of these species), lamprey will easily be able to avoid the zone of influence of the dredging and utilise other nearby areas with the footprint of dredging only represent a small proportion of the ranges of lamprey. This impact pathway is, therefore, not considered further in the HRA.
	Changes in water and sediment quality on migratory fish	Maintenance dredge and dredge disposal	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	No	Changes in water quality (as summarised in Chapter 8 of the ES (Application Document Reference number 8.2.8)) are also expected to be lower than for the capital dredge and similar to existing maintenance dredging. With specific respect to lamprey, these species are known to migrate through estuaries with high SSC (including the Humber Estuary). Elevated SSCs due to dredging are considered to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal.

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Sediment plumes resulting from dredging and dredge disposal are also considered to dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time (less than a single tidal cycle) as described in more detail in the Physical Processes assessment (Chapter 7 of the ES (Application Document Reference number 8.2.7)). Therefore, lamprey would also be able to avoid the temporary sediment plumes. Based on these factors there is therefore considered limited potential for migrating fish to be adversely affected by the predicted changes in SSC. With respect to sediment contamination, generally low levels of contamination were found in the sediment contamination samples as presented in the Water and Sediment Quality assessment in Chapter 8 of the ES (Application Document Reference number 8.2.8). Based on this sampling data, the overall level of contamination in the proposed

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					dredge area is considered to be low and the sediment plume would be expected to rapidly dissipate by the strong tidal currents in the area. Significant elevations in the concentrations of contaminants within the water column are not anticipated. This impact pathway is, therefore, not considered further in the HRA.
	Underwater noise effects on migratory fish	Vessel operations including maintenance dredge and dredge disposal	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	No	Vessel movements during operation may also result in disturbance through changes in underwater noise and vibration (see Table 9.25 in Section 9.8 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). However, only mild behavioural responses in close proximity to the Ro-Ro or dredging vessels are anticipated with noise levels unlikely to be discernible above ambient levels in the wider Humber Estuary area. This impact pathway is, therefore, not considered further in the HRA.
	Underwater noise effects	Maintenance dredge and	Criterion 3 – supports populations of plants	No	Vessel movements during operation may also result in disturbance through changes in underwater noise and

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
	on marine mammals	dredge disposal	and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.		vibration (see Table 9.25 in Section 9.8 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). However, only mild behavioural responses in close proximity to the Ro-Ro or dredging vessels are anticipated with noise levels unlikely to be discernible above ambient levels in the wider Humber Estuary area. This impact pathway is, therefore, not considered further in the HRA.
	Visual disturbance of hauled out seals	Vessel operations, maintenance dredge and dredge disposal	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	The nearest established breeding colony for grey seals is located over 25 km away at Donna Nook. Approximately 10 to 15 grey seals were also observed hauling out on mudflat at Sunk Island (on the north bank of the Humber Estuary) during the project specific benthic surveys as detailed in Appendix 9.1 to the ES. This haul out site is located approximately 4 km north east from the proposed development. No seal haul out sites are known to occur nearer to the proposed development. Seals which are hauled out on land, either resting or breeding, are considered

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					particularly sensitive to visual disturbance (Hoover-Miller *et al*, 2013). The level of response of seals is dependent on a range of factors, such as the species at risk, age, weather conditions and the degree of habituation to the disturbance source. Hauled out seals have been recorded becoming alert to powered craft at distances of up to 800 m although seals generally only disperse into the water at distances <150-200 m (Wilson, 2014; Mathews, *et al*., 2016; Henry and Hammill, 2001; Strong and Morris, 2010). For example, in a study focusing on a colony of grey seals on the South Devon coast, vessels approaching at distances between 5 m and 25 m resulted in over 64 % of seals entering the water, but at distances of between 50 m and 100 m only 1 % entered the water (Curtin *et al*., 2009). Recent disturbance research has also found no large-scale redistribution of seals after disturbance with most seals returning to the same haul out site within a tidal cycle (Paterson *et al.,* 2019).

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					Based on this evidence, seals hauled out on the intertidal habitats of Sunk Island (located on the opposite bank to the proposed development) are out of the zone of influence of any potential visual disturbance effects as a result of maintenance dredging and vessel operations. This impact pathway is, therefore, not considered further in the HRA.
	Collision risk to marine mammals	Vessel operations	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	No	Vessels using the berths during operation will be typically approaching at slow speeds (2-4 knots) and maintenance dredging/dredge disposal will be mainly stationary or travelling at low speeds (2-6 knots), making the risk of collision very low. Although all types of vessels may collide with marine mammals, vessels traveling at speeds over 10 knots are considered to have a much higher probability of causing lethal injury (Schoeman *et al.,* 2020). Furthermore, the region is already characterised by heavy shipping traffic. The additional operational vessel movements resulting from the proposed development will only constitute a small increase in vessel traffic in the area on a

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					typical day (up to six additional Ro-Ro vessel movements per day at the Port of Immingham, as well as tugs) which represents approximately a 3 % increase in vessel traffic in the study area. There will also be maintenance dredger and barge movements but that is estimated to only be necessary approximately three to four times a year. In general, incidents of mortality or injury of marine mammals caused by vessels remain a relatively rare occurrence in UK waters (ABP Research 1999; CSIP, 2020). For example, out of 144 post mortem examinations carried out on cetaceans in 2018, only two (1.4 %) were attributed to boat collision with the biggest causes of mortality including starvation and by-catch, although some incidents are likely to remain unreported (CSIP, 2020). In addition, marine mammals frequently foraging within the region will routinely need to avoid collision with vessels and are, therefore, considered adapted to living in an environment with high levels of vessel activity. This impact pathway is,

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					therefore, not considered further in the HRA.
	Direct changes to coastal waterbird foraging and roosting habitat as a result of marine infrastructure	Berth operations	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Marine infrastructure associated with the proposed development (raised jetty structure, linkspan etc.) could potentially cause direct damage or reduced

Phase	Impact Pathways/ Potential Effects	Project activity	Feature	Potential for LSE	Justification
					functionality to waterbird feeding and roosting habitat.
	Noise and visual disturbance to coastal waterbirds	Berth operations	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	Yes	Dunlin, Black-tailed Godwit, Redshank and Shelduck are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot and Bar-tailed Godwit also regularly occur in the area (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). Species that form part of waterbird assemblage of the Humber SPA, such as Curlew, Turnstone, Mallard, Teal, Ringed Plover and Oystercatcher are recorded in relatively low numbers in the surveys (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). During operation, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds.

3.2 Transboundary screening

3.2.1 Under Regulation 32 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations) and based on the information that ABP provided in the Scoping Report (ABPmer, 2021), PINS is of the view that the proposed development is likely to have a significant effect on the environment in a European Economic Area (EEA) State (PINS, 2022).

3.2.2 In reaching this view, PINS has applied the precautionary approach as explained in PINS Advice Note 12 (PINS, 2022), and taken into account the information supplied by ABP at the time of scoping.

3.2.3 In PINS' view, the trade routes associated with the IERRT, combined with the overlap of the proposed development with European/Ramsar sites, could lead to potential impacts on bird populations associated with EEA States (PINS, 2022).

3.2.4 The following species associated with populations in EEA states are interest features of the Humber Estuary SPA:

- Red knot (*Calidris canutus*) comprising 6.3 % of the Northeastern Canada/Greenland/Iceland/North western Europe populations; and
- Black-tailed godwit (*Limosa limosa*) comprising 2.6 to 3.2 % of the Icelandic breeding population.

3.2.5 The following species associated with populations in EEA states are interest features of the Humber Estuary Ramsar:

- Golden plover representing 2.2 % of the Iceland and Faroes/East Atlantic population; and
- Black-tailed godwit comprising 2.6 to 3.2 % of the Iceland/West Europe populations.

3.2.6 On this basis, the EEA States of Iceland and Denmark have been notified of these potential transboundary issues by PINS.

3.2.7 Black-tailed Godwit are regularly recorded on the foreshore in the area of the proposed development, and lower numbers of Knot also regularly occur in the area (see Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9). As detailed in **Table 4**, there is considered to be a potential for LSE on these interest features both alone and in-combination with other plans and projects and, therefore, these interest features have been taken forward into the assessment stage of the HRA (Section 4).

3.2.8 Although Golden Plover is widely distributed through the Humber Estuary, this species is only very infrequently recorded in vicinity of the proposed development, for example only one single individual was recorded in the relevant Count Sector B in the Immingham Outer Harbour (IOH) monitoring between 2016/17 and 2020/21 (see paragraphs 9.6.80 to 9.6.94 in Section 9.6 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9)). The area is, therefore, considered to be of very limited functional value for the species. On this basis, there is considered to be no potential for an LSE on this interest feature either alone or in-combination with other plans and projects and, therefore, this interest feature is not considered further in the HRA.

3.3 Screening conclusion

3.3.1 The screening review has determined that there are likely significant effects on European/Ramsar sites and qualifying features as a result of the proposed development, both alone or in combination with other plans or projects, and an AA by the Competent Authority is therefore likely to be required. There is a requirement to progress to the next stage of the HRA (Section 4).

3.3.2 Considering all impact pathways as detailed in Table 3 the proposed development has the potential to result in an LSE on the following European/Ramsar sites and features, and these have been taken forward into the Appropriate Assessment stage:

- Humber Estuary SAC:
- H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks;
- H1130. Estuaries;
- H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats;
- H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (air quality effects only);
- S1095. *Petromyzon marinus*; Sea lamprey;
- S1099. *Lampetra fluviatilis*; River lamprey; and
- S1364. *Halichoerus grypus*; Grey seal.
- Humber Estuary SPA:
- A048 *Tadorna tadorna*; Common Shelduck (Non-breeding);
- A143 *Calidris canutus*; Red knot (Non-breeding);
- A149 *Calidris alpina alpina*; Dunlin (Non-breeding);
- A156 *Limosa limosa islandica*; Black-tailed Godwit (Non-breeding);
- A157 *Limosa lapponica*; Bar-tailed Godwit (Non-breeding);
- A162 *Tringa totanus*; Common Redshank (Non-breeding); and
- Waterbird assemblage.
- Humber Estuary Ramsar site:
- Criterion 1 – natural wetland habitats that are of international importance;
- Criterion 3 – supports populations of plants and/or animal species of international importance;
- Criterion 5 – Bird Assemblages of International Importance;
- Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance; and
- Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path.

3.3.3 It should be noted that with respect to maintenance dredging, this activity already falls within the consent granted by the current marine licence for the disposal of maintenance dredge material from the Port of Immingham (L/2014/00429/2). The level of maintenance dredging and disposal required at IERRT during the operational phase is anticipated to be required around three to four times a year (though this will be dependent on a range of factors - see Chapter 3 of the ES (Application Document Reference number 8.2.3)).

3.3.4 The frequency and volume of material deposited at the disposal site from each load will not change compared with current maintenance dredging activities as the same plant and methods are proposed to be used. Furthermore, the volume of material that will need to be maintenance dredged from the IERRT berth pocket will be lower than the volumes of capital dredge material. Overall, the changes brought about as a result of the maintenance dredge and disposal of maintenance dredge material during operation will be comparable to that which already arises from the ongoing maintenance of the existing Immingham berths (see Section 9.8 of the Nature Conservation and Marine Ecology Chapter 9 of the ES (Application Document Reference number 8.2.9) for a more detailed description of potential effects). There is, therefore, considered to be no potential for LSE to result on the interest feature either alone or in-combination with other plans and projects with respect to pathways relating to sediment deposition, water quality, changes to physical processes and underwater noise as summarised in **Table 3**, **Table 4** and **Table 5**. However, there is considered to be the potential for an LSE due to potential habitat changes resulting from the removal of seabed material during maintenance dredging (given that the dredge footprint has not previously been subject to maintenance dredging).

4 Stage 2 – Appropriate Assessment

4.1 Overview

4.1.1 In accordance with PINS Advice Note 10 (PINS, 2022), at Stage 1, ABP (as the applicant) has concluded that LSE on European site(s) and qualifying features are considered to exist, either alone or in combination with other plans or projects and an AA by the Competent Authority is likely to be required. In line with this guidance the assessment has documented Stage 1 (in Section 3 above) and now moves to Stage 2 (AA) (this Section 4).

4.1.2 This second stage of the HRA involves undertaking an assessment of the potential effects on the integrity of the European/Ramsar sites and interest features that have been screened into the assessment in view of the site's conservation objectives (see **Table 6**). Where there are potential adverse effects, a review of mitigation options is carried out and mitigation measures are identified with a view to avoiding or minimising the effects. If, despite the identified measures of mitigation, there still remains a potential AEOI, the HRA must progress to Stage 3.

4.1.3 The potential effects on interest features of European/Ramsar sites that have been screened into the AA (see Section 3.3) have been reviewed and are presented in this section. This assessment has been carried out in the context of the nature and scale of the proposed development, the geographic location relative to the interest features of European/Ramsar sites and the ecology, behaviour and sensitivities of the interest features to these environmental pressures/changes.

4.1.4 PINS Advice Note 10 (PINS, 2022) recommends that all relevant information is presented in a summary table which identifies all European sites and qualifying features and each pathway of effect which has been considered at each HRA Stage (screening, AA/IROPI and the derogations, as applicable). It is recommended that this exercise is undertaken for each phase of the proposed development (construction, operation, decommissioning, as relevant). A summary table containing this information is provided in Appendix B.

Table 6. Qualifying interest features screened into the assessment and conservation objectives of European/Ramsar sites

Site	Features Screened In	Conservation Objectives
Humber Estuary SAC	▪ H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks; ▪ H1130. Estuaries; ▪ H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats; ▪ H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (air quality effects only); ▪ S1095. *Petromyzon marinus*; Sea lamprey; ▪ S1099. *Lampetra fluviatilis*; River lamprey; and ▪ S1364. *Halichoerus grypus*; Grey seal.	With regard to the natural habitats and/or species for which the site has been designated, and subject to natural change; 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 habitats of qualifying species rely; ▪ The populations of qualifying species; and ▪ The distribution of qualifying species within the site.
Humber Estuary SPA	▪ A048 *Tadorna tadorna*; Common Shelduck (Non-breeding); ▪ A143 *Calidris canutus*; Red knot (Non-breeding); ▪ A149 *Calidris alpina alpina*; Dunlin (Non-breeding); ▪ A156 *Limosa limosa islandica*; Black-tailed Godwit (Non-breeding); ▪ A157 *Limosa lapponica*; Bar-tailed Godwit (Non-breeding);	With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified, and subject to natural change; Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; ▪ The extent and distribution of the habitats of the qualifying features;

Site	Features Screened In	Conservation Objectives
	▪ A162 *Tringa totanus*; Common Redshank (Non-breeding); and ▪ Waterbird assemblage.	▪ The structure and function of the habitats of the qualifying features; ▪ The supporting processes on which the habitats of the qualifying features rely; ▪ The population of each of the qualifying features; and ▪ The distribution of the qualifying features within the site.
Humber Estuary Ramsar site	▪ Criterion 1 – natural wetland habitats that are of international importance; ▪ Criterion 3 – supports populations of plants and/or animal species of international importance; ▪ Criterion 5 – Bird Assemblages of International Importance; ▪ Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance; and ▪ Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path.	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 on the Habitats Regulations relating to HRAs extend to Ramsar sites, Natural England considers the Conservation Advice packages for the overlapping European Marine Site designations to be, in most cases, sufficient to support the management of the Ramsar interests. See the conservation objectives for Ramsar interest features covered by overlapping the Humber Estuary SAC and Humber Estuary SPA.
* Denotes a priority natural habitat or species		

Source: JNCC (2022); Natural England (2017; 2021a; 2021b; 2022).

4.2 Assessment of effects

4.2.1 The assessment has been structured based on the following key impact pathways screened into the AA:

- **Section 4.3: Physical loss of habitat and associated species**
  - The potential effects of the direct loss of qualifying intertidal habitat;
  - The potential effects of the direct loss of intertidal habitat on qualifying species;
  - The potential effects of the direct loss of qualifying subtidal habitat features; and
  - The potential effects due changes to waterbird foraging and roosting habitat as a result of the presence of marine infrastructure during operation on qualifying species.

- **Section 4.4: Physical damage through disturbance and/or smothering of habitat**
  - The potential effects of changes to qualifying habitats as result of the removal of seabed material during capital dredging;
  - The potential effects of changes to qualifying species as result of the removal of seabed material during capital dredging;
  - The potential effects of changes to qualifying habitats as a result of sediment deposition during capital dredging;
  - The potential effects of changes to qualifying habitats as a result of sediment deposition during capital dredge disposal;
  - The potential effects of changes to qualifying habitats as result of the removal of seabed material during maintenance dredging; and
  - The potential effects of changes to qualifying intertidal habitats as a result of the movement of Ro-Ro vessels during operation.

- **Section 4.5: Physical loss or damage of habitat through alterations in physical processes**
  - Indirect loss or change to qualifying habitats and species as a result of changes to hydrodynamic and sedimentary processes as a result of the marine works; and
  - Indirect changes to qualifying habitats as a result of changes to hydrodynamic and sedimentary processes during capital dredge disposal.

- **Section 4.6: Direct changes to qualifying habitats beneath marine infrastructure due to shading**
  - Direct changes to qualifying habitats beneath marine infrastructure due to shading.

- **Section 4.7: Physical change to habitats resulting from the deposition of airborne pollutants**

  - Physical change to qualifying habitats resulting from the deposition of N and NOx from marine vessel and road vehicle emissions during operation.

- **Section 4.8: Non-toxic contamination through elevated SSC**

  - The potential effects of elevated SSC during capital dredging on qualifying habitats and species; and
  - The potential effects of elevated SSC during capital dredge disposal on qualifying habitats and species

- **Section 4.9: Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases**

  - The potential effects of the release of contaminants during capital dredging on qualifying habitats and species; and
  - The potential effects of the release of contaminants during capital dredge disposal on qualifying habitats and species.

- **Section 4.10: Airborne noise and visual disturbance**

  - The potential effects of airborne noise and visual disturbance during construction on qualifying species; and
  - The potential effects of airborne noise and visual disturbance during operation on qualifying species.

- **Section 4.11: Disturbance through underwater noise and vibration**
  - The potential effects of underwater noise and vibration during piling on qualifying species; and
  - The potential effects of underwater noise and vibration during capital dredge and dredge disposal on qualifying species.

- **Section 4.12: Biological disturbance due to potential introduction and spread of non-native species**

  - The potential effects of the introduction and spread of non-native species during construction on qualifying habitats; and
  - The potential effects of the introduction and spread of non-native species during operation on qualifying habitats.

4.2.2 Each of the above pathways has then been structured based on the following sub-sections:

- ***General scientific context:*** A review of the best available scientific evidence on the pathway to provide contextual information;
- ***Summary of potential effects:*** This section provides a description of the potential effects on receptors relevant to the qualifying feature;

- ***Mitigation:*** For those pathways for which mitigation is required a description of the measures will be provided; and
- ***Assessment of the potential for an AEOI:*** The potential effects will be considered in the context of relevant conservation objectives for the particular qualifying feature and the best scientific evidence on the pathway to reach a conclusion on the potential for an AEOI.

4.2.3 The information presented in this report relating to each pathway should also be reviewed in the context of the baseline information provided in Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9).

4.2.4 Consideration of intra-project combined effects is provided in Section 4.12 of this HRA.

4.2.5 An in-combination assessment considering other relevant plans/projects is then provided in Section 4.13 of this HRA.

4.3 Physical loss of habitat and associated species

The potential effects of the direct loss of qualifying intertidal habitat

General scientific context

4.3.1 The impact of direct habitat loss can involve building over marine habitats (such as reclamation) or the permanent physical removal of substratum and associated organisms from the seabed. Direct habitat loss can also occur due to deepening as a result of dredging causing a change from an intertidal to a subtidal environment.

4.3.2 Intertidal habitats are sensitive to physical loss at locations where new structures are introduced onto the seabed (i.e., within the development ‘footprint’ of these structures). The significance of such losses will vary on a site-by-site basis in response to differences in the extent and duration of the losses as well as the relative value of the habitats in question. The value of the habitats is, in turn, reflected by the species that are present and level of statutory and non-statutory protection afforded to them. As any effects are very much dependent upon site specific considerations, a generic scientific review is not appropriate in this case and the focus of the assessment is based on site-specific considerations.

Summary of effects

4.3.3 The IERRT development will result in the direct loss of 0.012 ha of intertidal habitat. This direct loss is due to the following:

- Capital dredging which has the potential to cause a direct loss of 0.006 ha of intertidal habitat which will become subtidal habitat as a result of the deepening; and
- Piling, which will cause a direct loss of 0.006 ha of intertidal mudflat habitat.

4.3.4 It should be noted that the potential direct loss of intertidal habitat due to the capital dredge is located on the side slope of the proposed dredge pocket. The existing slope in this area is similar in gradient to the 1 in 4 dredge slope that is proposed for the IERRT project (see Chapter 2 and Chapter 3 of the ES (Application Document Reference numbers 8.2.2 and 8.2.3 respectively)). Furthermore, the amount of material that needs to be dredged within the berth pocket in this location is limited. It is, therefore, anticipated that the existing slope will remain stable and will not require further dredging to maintain navigational safety, resulting in no direct habitat loss from the capital dredge. Nevertheless, this assessment accounts for a potential loss of 0.006 ha as a worst case scenario and on a precautionary basis.

4.3.5 Dredging will also cause a direct change in intertidal habitat. This is assessed in more detail in Section 4.4 in the sub-sections entitled '*The potential effects of changes to qualifying habitats as result of the removal of seabed material during capital dredging'* (Paragraphs 4.4.11 to 4.4.16) and *'The potential effects of changes to qualifying habitats as a result of sediment deposition during capital dredging'* (Paragraphs 4.4.30 to 4.4.33).

4.3.6 The project-specific intertidal benthic survey recorded sandy mud habitat within and near to the proposed dredge footprint characterised by nematodes, the oligochaetes *Tubificoides benedii*, the mud shrimp *Corophium volutator*, the gastropod mudsnail *Peringia ulvae*, tellins including Baltic tellin *Limecola balthica* and the polychaetes *Hediste diversicolor* and *Pygospio elegans*. All the species recorded from the samples in this area were considered commonly occurring in the region and considered typical of the community recorded on mudflats in the nearby area (Appendix 9.1 of the ES; ABPmer, 2009; IECS, 2010; Able UK Limited, 2021). Species such as *Corophium volutator, Peringia ulvae, Limecola balthica* and polychaetes are prey items for a range of coastal waterbirds. The potential effects of the loss of intertidal habitat and prey resources for waterbirds is discussed in greater detail in Section in the sub-section titled *'The potential effects of the direct loss of intertidal habitat on qualifying species'* (Paragraphs 4.3.12 to 4.3.19).

4.3.7 The combined worst case intertidal habitat loss as a result of the capital dredge and piling represents approximately 0.000033 % the Humber Estuary SAC and approximately 0.000128 % of the 'mudflats and sandflats not covered by seawater at low tide' feature of the Humber Estuary SAC[2].

4.3.8 This loss also represents 0.000032 % of the Humber Estuary SPA/Ramsar[3]. When considering this in the context of intertidal area, the area of loss

2 Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022a)
3 Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022b)

represents approximately 0.000135 % of intertidal foreshore habitats[4] and approximately 0.000188 % of mudflat[5] within the SPA/Ramsar.

4.3.9 Furthermore, the potential intertidal loss resulting from the capital dredging (noting that this is considered a worst case as explained above) would consist of a very narrow strip on the lower shore around the sublittoral fringe (see Figure 2.1 in Volume 2 of the ES (Application Document Reference number 8.3.2)). This potential loss is considered to be of a similar scale to that which can occur due to natural background changes in mudflat extent in the local region (e.g., due to seasonal patterns in accretion and erosion or following storm events). The loss of habitat due to piling will also be highly localised. These *de minimis* changes in mudflat extent are of a magnitude which will not change the overall structure or functioning of the nearby mudflats within the Port of Immingham area or more widely in the Humber Estuary.

Mitigation

4.3.10 Mitigation is not relevant to and as a consequence, not required for this impact pathway.

Assessment of the potential for an AEOI

4.3.11 Based on the evidence provided above and the rationale provided in **Table 7**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

[4] Based on using the 'Intertidal Substrate Foreshore (England and Scotland)' data layer (https://magic.defra.gov.uk/Metadata_for_MAGIC/SPIRE%20intertidal%20substrate%20foreshore.pdf

[5] Based on using mudflat data layer of the Priority Habitat Inventory (England) (https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england).

Table 7. The potential for an AEOI due to the direct loss of qualifying intertidal habitat

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1140: Mudflats and sandflats not covered by seawater at low tide	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	The potential effects have been considered in the context of the site's conservation objectives. As discussed above, the loss in intertidal habitat is *de minimis* in extent and considered negligible in the context of the amount of similar habitat in the region (and as a proportion of the SAC/Ramsar site). On this basis any change to the '*extent and distribution of qualifying natural habitats*' conservation objective is considered inconsequential. A loss on this scale is also considered to be insignificant in terms of the '*the structure and function (including typical species) of qualifying natural habitats'* conservation objective.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

The potential effects of the direct loss of intertidal habitat on qualifying species

General scientific context

4.3.12 The quality of intertidal habitat as a feeding resource for waterbirds can be highly variable both spatially and temporally (Mander *et al*., 2013). Higher energetic costs for waterbirds could occur in areas where habitat change has caused a reduction in prey distribution and density. This may affect local populations in the long-term through impacts on individual fitness (survival, body condition and fecundity) (Bowgen, 2016).

4.3.13 Habitat loss can also result in increased densities of birds already using a site, increasing the potential for interference competition (Santos *et al*., 2005; Bowgen, 2016). Loss of intertidal habitat could displace birds and cause them to redistribute either locally or to neighbouring sites (Gunnarsson *et al*., 2005). This in turn might affect the birds at those sites through competition and density-dependent mortality. Redshank displaced following the construction of an amenity barrage at Cardiff Bay (South Wales), for example, experienced a poorer body condition and had a lower survival rate after they moved (Burton *et al*., 2006). Lambeck (1991) found that Oystercatchers displaced following large-scale habitat loss in the Delta region of The Netherlands experienced significantly higher mortality than those originally ringed elsewhere in the Delta, it is presumed as a result of the increased densities in recipient areas.

Summary of effects

4.3.14 The development will result in the direct loss of 0.012 ha of intertidal habitat due to the following:

- Capital dredging will potentially cause a direct loss of 0.006 ha of intertidal habitat which will be changed to subtidal habitat as a result of the deepening; and
- The piles will cause a direct loss of 0.006 ha of intertidal mudflat habitat.

4.3.15 As explained in paragraph 4.3.4 this represents a worst case scenario. This loss represents 0.000032 % of the Humber Estuary SPA/Ramsar[6]. When considering this in the context of intertidal area, the area of loss represents approximately 0.000135 % of intertidal foreshore habitats[7] and approximately 0.000188 % of mudflat[8] within the SPA.

4.3.16 The predicted intertidal losses relating to the capital dredging consist of very narrow strips on the lower shore around the sublittoral fringe. These losses are considered to be of a similar scale to that which can occur due to natural

6 Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022b)

7 Based on using the 'Intertidal Substrate Foreshore (England and Scotland)' data layer (https://magic.defra.gov.uk/Metadata_for_MAGIC/SPIRE%20intertidal%20substrate%20foreshore.pdf

8 Based on using mudflat data layer of the Priority Habitat Inventory (England) (https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england).

background changes in mudflat extent in the local region (e.g., due to seasonal patterns in accretion and erosion or following storm events). The loss of habitat due to piling will also be highly localised. These *de minimis* changes in mudflat extent are also of a magnitude that will not change the overall structure or functioning of the nearby mudflats within the Port of Immingham area or more widely in the Humber Estuary.

4.3.17 In terms of functional value, the foreshore in the Port of Immingham area is used by a range of species for feeding including Black-tailed Godwit, Dunlin, Redshank, Shelduck, Oystercatcher, Curlew, Teal and Mallard (Table 9.19 and Table 9.20 in Chapter 9 of the ES (Application Document Reference number 8.2.9)). Many of these birds feed clustered around the tideline and will follow the tideline as it pushes up and down the shore on flood and ebb tides respectively[9]. These species could, therefore, potentially be feeding in the predicted areas of habitat loss, albeit minimal habitat loss as explained above, during low water periods. In addition, however, the predicted direct areas of intertidal habitat loss are themselves only exposed during low water spring tidal phases (remaining underwater during neap tidal phases) under current (pre-dredge) conditions. As a consequence, these very small areas remain largely inundated with water and are only uncovered for a very short duration.

4.3.18 To put this into context, consideration has been given to the proportion of time that the areas of loss are available to feed over the course of a year. Based on tide gauge data at Immingham in 2020, the areas of direct loss were completely submerged for over 99 % of the time. These areas of direct loss, therefore, currently provide almost no feeding opportunities for coastal waterbirds. Furthermore, the spatial extent of loss represents a barely measurable and inconsequential reduction in available habitat for these mobile species even at a local scale.

4.3.19 On this basis, it can be concluded that any change to prey resources for birds feeding in the local area will be negligible and individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) will not be affected.

Mitigation

4.3.20 Mitigation is not relevant to and is as a consequence not required for this impact pathway.

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9 Wading birds can often concentrate their foraging efforts in newly exposed or covered areas during ebbing and rising tides (when sediments were wet or still covered by a thin layer of water). It is thought that that moving tidal waterline briefly creates particular suitable conditions for waders (invertebrates move deeper in the substate or become less as the tide falls and the substrate dries (as well as showing less surface cues) (Granadeiro *et al*., 2006; Pienkowski, 1983).

Assessment of the potential for an AEOI

4.3.21 Based on the evidence provided above and the rationale provided in **Table 8**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 8. The potential for an AEOI due to the direct loss of intertidal habitat on qualifying species

Site	Features	Potential AEOI	Justification
Humber Estuary SPA	A048; Common Shelduck (Non-breeding) *Tadorna tadorna*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	The potential effects have been considered in the context of the site's conservation objectives. The predicted intertidal habitat loss will not cause changes to '*the populations of each of the qualifying features*' conservation objective. This is because the scale of loss is not considered to be of a magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected. The '*distribution of the qualifying features within the site*' conservation objective will not be affected as the predicted loss is *de minimis* in extent and of a scale that would not cause changes in local distribution. The footprint of predicted habitat loss under existing conditions already provides very limited feeding opportunities due to the low elevation position on the shore and *de minimis* extent. This loss is considered negligible in the context of available feeding habitat even at a local scale along the eastern frontage of the port. The effects of the habitat loss will also be highly limited in terms of the overall wider functionality of the local mudflats for feeding birds. On this basis, any change to the '*structure and function of the habitats of the qualifying features*' conservation objective is considered inconsequential.
	A143: Red Knot (Non-breeding) *Calidris canutus*		
	A149: Dunlin *Calidris alpina alpina* (Non-breeding)		
	A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)		
	A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica*		
	A162: Common Redshank *Tringa totanus* (Non-breeding)		
	Waterbird assemblage		
Humber Estuary Ramsar site	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)		
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		

Site	Features	Potential AEOI	Justification
			The loss in intertidal habitat is considered negligible in the context of the amount of similar habitat in the region (and as a proportion of the SPA/Ramsar). On this basis any change to the '*extent and distribution of the habitats of the qualifying features'* conservation objectives is considered inconsequential.

The potential effects of the direct loss of qualifying subtidal habitat

General scientific context

4.3.22 The impact of direct habitat loss can involve building over marine habitats (such as reclamation) or the permanent physical removal of substratum and associated organisms from the seabed.

4.3.23 Subtidal habitats are sensitive to physical loss at locations where new structures are introduced onto the seabed (i.e., within the development 'footprint' of these structures). The significance of such losses will vary on a site-by-site basis in response to differences in the extent and duration of the losses as well as the relative value of the habitats in question. The value of the habitats is, in turn, reflected by the species that are present and level of statutory and non-statutory protection afforded to them. As any effects are very much dependent upon site specific considerations, a generic scientific review is not appropriate in this case and the focus of the assessment is based on site-specific considerations.

Summary of effects

4.3.24 Piling in the subtidal area will result in the direct loss of 0.027 ha of seabed habitat. This habitat represents approximately 0.000074 % of the Humber Estuary SAC. However, a small amount of subtidal habitat will potentially be gained following the dredging of the existing intertidal (described in Paragraph 4.3.14).

4.3.25 The project-specific subtidal survey (Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9) and Appendix 9.1 of the ES (Application Document Reference number 8.4.9 (a))) recorded a benthic community characterised by nematodes, the mudshrimp *Corophium volutator*, polychaetes (such as *Streblospio shrubsolii Polydora cornuta Tharyx* spp. and *Nephtys* spp), oligochaetes *Tubificoides* spp. and barnacle *Amphibalanus improvise*s. These characterising species dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at most of the sample stations. The loss in subtidal habitat as a result of the piles is considered negligible in the context of extent of the overall amount of similar marine habitats found locally in the Humber Estuary. All the species recorded were considered commonly occurring and not protected. Furthermore, faunal assemblage recorded are also considered characteristic of subtidal habitats found more widely in this section of the Humber Estuary (ABPmer, 2009; IECS, 2010; Able UK Limited, 2021).

4.3.26 The loss of subtidal habitats due to piling will be highly localised. The *de minimis* changes in subtidal habitat extent is of a magnitude which will not change the overall structure or functioning of the subtidal habitats within the Port of Immingham area or more widely in the Humber Estuary.

Mitigation

4.3.27 Mitigation is not relevant to and is as a consequence not required for this impact pathway.

Assessment of the potential for an AEOI

4.3.28 Based on the evidence provided above and the rationale provided in **Table 9**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 9. The potential for an AEOI due to the direct loss of qualifying subtidal habitat

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	The potential effects have been considered in the context of the site's conservation objectives. As discussed above, the loss in subtidal habitat as a result of the piles is considered to be negligible in the context of the amount of similar habitat in the region and as a proportion of the SAC/Ramsar. As a consequence, this loss is inconsequential in terms of '*the extent and distribution of qualifying natural habitats'* conservation objective. A loss on this scale is also considered to be insignificant in terms of the '*the structure and function (including typical species) of qualifying natural habitats'* conservation objective.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

The potential effects due to changes to waterbird foraging and roosting habitat as a result of the presence of marine infrastructure during operation on qualifying species

4.3.29 For clarity it should be noted that this pathway relates to potential changes to foraging and roosting habitat as a result of the physical presence of marine infrastructure. The potential effects of the direct loss of intertidal habitat on qualifying species is assessed in Paragraphs 4.3.12 to 4.3.28.

4.3.30 It should also be noted that this pathway specifically relates to the structures themselves rather than human activity on the infrastructure which is assessed in Section 4.10. However, it is acknowledged that such effects are likely to some extent to be interrelated.

General scientific context

4.3.31 Any port and harbour development has the potential to cause reduced functionality to waterbird feeding and roosting habitat due to port infrastructure.

4.3.32 Waterbirds often show a preference for foraging in open spaces with clear sightlines when feeding so that scanning distances can be maximised. On this basis, certain species of coastal waterbirds might show a reluctance to approach tall anthropogenic structures or those that create enclosed spaces. One of the main reasons for not approaching a structure is thought to be the same as waders avoiding feeding near high banks, tall hedges/trees and in enclosed spaces (such as small fields surrounded by trees) (Milsom *et al.,* 1998), i.e., they are trying to avoid any sudden attack by a predator that may be hiding in or behind the structure. Just as raptors often exploit tall structures to aid prey detection, species that may be targeted by raptors would naturally avoid tall structures to minimise predation risk. Many waders and waterfowl may avoid areas in which their sightlines are reduced, even though in certain circumstances this may reduce the quantity of high-quality foraging habitat available to them or access to important roosting sites. However, it is often difficult to separate the direct impact of the structure from other factors associated with development, such as human activity causing potential disturbance stimuli (see Section 4.10) (Walters *et al*., 2014).

4.3.33 The addition of anthropogenic structures to coastal waters can also result in a new habitat for colonising epibiota (such as mussels, periwinkles, limpets and barnacles) which are considered prey items for certain wading birds such as Turnstone, Oystercatcher and Purple Sandpiper. Certain species (such as Turnstone) are also regularly recorded feeding on epifaunal species which have colonised anthropogenic structures in the intertidal such as jetties and coastal defences (Naylor *et al*., 2017).

4.3.34 Coastal waterbirds also regularly roost on a variety of artificial structures in harbours and ports including pontoons, platforms, sea walls and dolphins (mooring structures) (Jackson *et al*., 2021; Jackson, 2017; Cutts, 2021).

Species commonly recorded in the UK using such structures include gulls, Cormorants and waders such as Dunlin, Turnstone and Oystercatchers. Factors that can influence the level of use by waterbirds of artificial roosting structures include the proximity to nearby feeding grounds, the level of human disturbance and perceived predator risk.

Summary of effects

4.3.35 Marine infrastructure associated with the proposed development (raised jetty structure, linkspan etc.) will not prevent any direct access to established roosting habitat used by coastal waterbirds in the area. This includes the outfall pipe which is used by roosting Cormorants and gulls and the derelict concrete structures present on the mudflat used by Turnstone and gulls.

4.3.36 The approach jetty will be an open piled structure with large gaps between each of the piles (approximately 12 m) and between the jetty deck and the foreshore seabed (i.e., the mudflat surface) (3 m to 8 m). This will minimise the enclosed feel and allow birds feeding near the structure to maintain sightlines. It should be noted that observations from the ornithology surveys in the area suggest that birds regularly feed in very close proximity to both the Eastern Jetty (approximately 250 m from the proposed development) and the Immingham Oil Terminal approach jetty (approximately 50 m from the proposed development) - which are both similar open piled structures - with species such as Redshank, Dunlin, Turnstone regularly recorded underneath jetties and Curlew, Shelduck and Black-tailed Godwit approaching them relatively closely. On this basis, birds would be expected to show similar highly localised responses to structures associated with the proposed development with responses ranging from no avoidance for some species to potentially some local avoidance (i.e., directly underneath or in close proximity) for other species. This is unlikely, however, to change the overall distribution of waterbirds more widely along the foreshore fronting Immingham.

4.3.37 Based on the above, birds would be expected to feed below or very close to the proposed development's approach jetty and indeed other infrastructure on the foreshore - none of which will prevent direct access to established roosting habitat. As a consequence, any avoidance of marine infrastructure is expected to be limited (and highly localised) and is unlikely to change the overall distribution of waterbird assemblages more widely on the foreshore in the local area.

Mitigation

4.3.38 As a consequence, mitigation is not relevant to nor is it required for this impact pathway.

Assessment of the potential for an AEOI

4.3.39 Based on the evidence provided above and the rationale provided in **Table 10**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 10. The potential for an AEOI on qualifying species due to changes to waterbird foraging and roosting habitat as a result of the presence of marine infrastructure

Site	Features	Potential AEOI	Justification
Humber Estuary SPA	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, these species would be expected to feed close to the approach jetty and other infrastructure on the foreshore. As a consequence, direct access to established roosting habitat will be neither impeded nor prevented. It follows, therefore, that any avoidance of marine infrastructure is expected to be limited (and localised) and is unlikely to change the overall distribution of waterbird assemblages more widely on the foreshore in the local area. As a consequence, any change to '*the distribution of the qualifying features within the site'* and '*structure and function of the habitats of the qualifying features*' conservation objectives are considered inconsequential. The predicted effects are considered unlikely to cause any changes to '*the population of each of the qualifying features'* conservation objective because the scale of change is not of a magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected.
	A149: Dunlin *Calidris alpina alpina* (Non-breeding) A162: Common Redshank *Tringa totanus* (Non-breeding)	In the context of the site's conservation objectives, there is considered to be no potential	Based on the information provided above, this species would be expected to feed under or very close to the approach jetty and other infrastructure on the foreshore with no direct access to established roosting habitat prevented. Therefore, any avoidance of marine infrastructure is expected to be limited (and highly localised) and is unlikely to change the overall

Site	Features	Potential AEOI	Justification
		AEOI on the qualifying interest features.	distribution of waterbird assemblages more widely on the foreshore in the local area. As a consequence, any change to '*the distribution of the qualifying features within the site'* and '*structure and function of the habitats of the qualifying features*' conservation objectives are considered inconsequential. The predicted effects are considered unlikely to cause any changes to '*the population of each of the qualifying features'* conservation objective because the scale of change is not of a magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected.
	Waterbird assemblage	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, assemblage species would be expected to feed under or close to the approach jetty and other infrastructure on the foreshore with no direct access to established roosting habitat prevented. Therefore, any avoidance of marine infrastructure is expected to be limited (and localised) and is unlikely to change the overall distribution of waterbird assemblages more widely on the foreshore in the local area. As a consequence, any change to '*the distribution of the qualifying features within the site'* and '*structure and function of the habitats of the qualifying features*' conservation objectives are considered inconsequential. The predicted effects are considered unlikely to cause any changes to '*the population of each of the qualifying features'* conservation objective because the scale of change is not of a

Site	Features	Potential AEOI	Justification
			magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected.
Humber Estuary Ramsar site	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, coastal waterbird features would be expected to feed under or close to the approach jetty and other infrastructure on the foreshore with no direct access to established roosting habitat prevented. Therefore, any avoidance of marine infrastructure is expected to be limited (and localised) and is unlikely to change the overall distribution of waterbird assemblages more widely on the foreshore in the local area. As a consequence, any change to '*the distribution of the qualifying features within the site'* and '*structure and function of the habitats of the qualifying features*' conservation objectives are considered inconsequential. The predicted effects are considered unlikely to cause any changes to '*the population of each of the qualifying features'* conservation objective because the scale of change is not of a magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected.

4.4 Physical damage through disturbance and/or smothering of habitat

The potential effects of changes to qualifying habitats as result of the removal of seabed material during capital dredging

4.4.1 For clarity it should be noted this pathway relates to potential changes to subtidal and intertidal habitat as a result of the physical removal of sediment material from the seabed. The potential effects of the direct loss of intertidal habitat are assessed in Paragraphs 4.3.1 to 4.3.11.

General scientific context

4.4.2 Dredging causes a direct physical removal of sediments, causing a modification to existing subtidal and intertidal habitats. This impacts benthic fauna associated with the dredged material including changes to abundance and distribution through damage, mortality or relocation to a disposal site, which may impact habitat quality.

4.4.3 The speed of recovery of the temporarily disturbed areas is dependent on the scale and timing of the disturbance, the life histories of species and the stability and diversity of the benthic community present. For example, while the opportunistic bivalve *Abra* spp. is vulnerable to physical disturbance (due to its fragile shell), the species is considered to have a high recoverability due to a high fecundity and larval dispersal rate (Marine Ecological Surveys Limited, 2008; De-Bastos, 2016a). Furthermore, a regularly disturbed sedimentary habitat with a low diversity benthic assemblage is likely to recover more quickly (i.e., return to its disturbed or 'environmentally-stressed' baseline condition) than a stable habitat with a pre-existing mature and diverse assemblage (Johnson *et al*., 2017).

4.4.4 In general, where studies have been undertaken to understand the effects of physical disturbance, they have shown recolonisation of deposited sediments by benthic species to be quite rapid. Sites are initially colonised by short lived, fast growing, opportunistic species ('r-selected') that are tolerant of high levels of disturbance; infaunal species dominate, particularly polychaetes worms. In time, these are succeeded by longer lived, slower growing species with a lower tolerance for disturbance (Newell *et al*., 1998; Tillin *et al*., 2011). Rates of recovery reported in reviewed literature suggest that a recovery time of six to 24 months is characteristic of many mobile sands and estuarine muds where frequent disturbance of the deposits precludes the establishment of long-lived communities (Tillin *et al*., 2019; De-Bastos, 2016b). In contrast, a community of sands and gravels may take two to three years to establish, depending on the proportion of sand and level of environmental disturbance by waves and currents (Newell *et al*., 1998; Bolam *et al*., 2003).

Summary of effects

4.4.5 It is estimated that a maximum of 190,000 m³ of material in total will be removed as a result of the dredge over a maximum area estimated at being in the order of 70,000 m² (see Chapter 2, Section 2.3 of the ES (Application Document Reference number 8.2.2)). It is expected that the majority or all of the material will be removed with a backhoe dredger, although some material may also be removed by trailer suction hopper dredger (TSHD).

4.4.6 The dredging will lead to changes to 6.8 ha of subtidal habitat as a direct result of the physical removal of subtidal sediment, as well as a change to 0.003 ha of intertidal which will become lower in elevation (but remain intertidal) due to the dredging of the slope of the dredge pocket. These habitat changes are assessed in this section.

Changes to subtidal habitats and species

4.4.7 Following the capital dredge, the dredge pockets will provide a similar habitat to that occurring under pre-dredge conditions as a result of sediment deposition. The baseline benthic surveys predominantly recorded surface sediment within and near to the dredge footprints with a high silt content (i.e., mud and sandy mud) (Section 9.6 of Chapter 9 and Appendix 9.1 of the ES (Application Document Reference number 8.2.9)). Modelling predicts that accretion of silt in the order of 10-15 cm would be expected to occur within a matter of months within the dredge footprint (as summarised in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). This would provide a suitable depth for colonisation[10] and return the surface layer of the seabed in the dredge footprint to its existing sediment character (i.e., fine sediment with a high silt content) which would then be expected to be recolonised by a similar assemblage to baseline conditions.

4.4.8 The speed of recolonisation is expected to occur over a relatively short period of time based on an understanding of the benthic community present in the area and the life history strategies of the species. The project-specific subtidal survey (Section 9.6 of Chapter 9 and Appendix 9.1 of the ES (Application Document Reference number 8.2.9)) recorded a generally impoverished benthic community which is likely to reflect the existing high levels of physical disturbance in the area due to strong tidal currents and sediment movement.

4.4.9 Samples were characterised by nematodes, the mudshrimp Corophium volutator, polychaetes (such as Streblospio shrubsolii Polydora cornuta Tharyx spp. and Nephtys spp.), oligochaetes Tubificoides spp. and barnacle Amphibalanus improvises. These characterising species dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at most of the sample stations. These species are typically fast growing and/or have rapid reproductive rates which allow populations to fully re-establish in typically less than 1-2 years and for some species within a few months (De-Bastos and Hill, 2016; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). The benthic communities would, therefore, be expected to recolonise the dredge footprint relatively quickly.

10 The majority of marine infauna is known to occur in the upper few centimetres of sediment (Kingston, 2001; Reuscher *et al.,* 2019).

All the species recorded are commonly occurring and not protected. In addition, the faunal assemblage recorded is considered characteristic of subtidal habitats found more widely in this section of the Humber Estuary (ABPmer, 2009; IECS, 2010; Able UK Limited, 2021). Subtidal habitats in the area around the Port of Immingham are considered to be typically of limited ecological value.

4.4.10 It should be noted that this assessment specifically relates to the effects of the capital dredge. The frequency of dredging required as part of maintenance dredging, however, will mean that the seabed in the berths is likely to be disturbed on a regular basis once the proposed development is operational. Changes to benthic habitats and species as result of the removal of seabed material during maintenance dredging is assessed in Paragraphs 4.4.45 to 4.4.48.

Changes to intertidal habitats and species

4.4.11 A very small area of lower shore intertidal habitat at the top edge of the dredge slope will become steepened and slightly lower in the tidal frame as a result of the dredging (0.003 ha). The habitat will, however, remain intertidal mudflat.

4.4.12 As noted above (Paragraph 4.3.4), it is anticipated that the existing slope will remain stable and will not require further dredging to maintain navigational safety. This will, therefore, result in no direct change to intertidal habitat from the capital dredge. Nevertheless, this assessment accounts for a 0.003 ha change calculated on a worst case and precautionary basis.

4.4.13 The habitat change represents approximately 0.000055% of the Humber Estuary SAC and approximately 0.000213% of the 'mudflats and sandflats not covered by seawater at low tide' feature of the Humber Estuary SAC[11].

4.4.14 It should be noted that habitat change at this *de minimis* scale is in the range of local natural variability and is expected to be immeasurable in real terms when taking account of the variation in water levels, wave climate and accuracy of the modelled bathymetry.

4.4.15 The speed of recolonisation following dredging is expected to occur over a relatively short period of time based on an understanding of the benthic community present in the area and the life history strategies of the species. The project-specific intertidal survey (Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9) and Appendix 9.1 of the ES (Application Document Reference number 8.4.9 (a))) recorded a benthic community characterised by nematodes, the oligochaetes *Tubificoides benedii* and *Enchytraeidae* spp., the mud shrimp *Corophium volutator*, the gastropod mudsnail *Peringia ulvae*, Baltic tellin *Limecola balthica* and the polychaetes *Hediste diversicolor* and *Pygospio elegans*. All the species recorded within the site specific intertidal benthic survey in the local area are

11 Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022a).

commonly occurring. These species are also typically fast growing and/or have rapid reproductive rates which allow populations to fully re-establish in typically less than 1-2 years and for some species within a few months (Ashley and Budd, 2020; Tillin and Rayment, 2016). The benthic communities would, therefore, be expected to recolonise this area of intertidal change relatively rapidly.

4.4.16 While the lowering could result in some localised changes to infaunal composition, the key commonly recorded species recorded on the foreshore in the project-specific surveys are found at a range of shore heights from the sublittoral fringe to the upper shore and are considered relatively tolerant to changes in emergence which do not alter the extent of the intertidal (Ashley and Budd, 2020; Tillin and Rayment, 2016). Therefore, characterising species and ecological structure will be similar to baseline condition. On this basis, there is no reason to suggest that this lower elevation mudflat will be ecologically poorer or provide a lower functionality.

Mitigation

4.4.17 Mitigation is not relevant to this impact pathway and is, therefore, not required.

Assessment of the potential for an AEOI

4.4.18 Based on the evidence provided above and the rationale provided in **Table 11**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 11. The potential for an AEOI due to changes to qualifying habitats as result of the removal of seabed material during capital dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	The capital dredge will not cause a change in habitat type (i.e., it will remain subtidal habitat with a similar substrate type) and therefore '*the extent and distribution of qualifying natural habitats'* conservation objective will not change. Following dredging, the subtidal habitat would be expected to be recolonised relatively rapidly by a broadly similar invertebrate assemblage to baseline conditions. On this basis, the '*structure and function (including typical species) of qualifying natural habitats*' conservation objective would be expected not to change. Any '*Supporting processes on which qualifying natural habitats and habitats of qualifying species rely'* are also not expected to change as a direct result of sediment removal.
	H1140: Mudflats and sandflats not covered by seawater at low tide	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	As discussed above, the *de minimis* predicted intertidal habitat change due to the lowering in elevation of intertidal around the dredge pocket is considered to be in the range of local natural variability and is predicted to be immeasurable in real terms when taking account of the variation in water levels, wave climate and accuracy of the modelled bathymetry. This highly localised change will not alter the overall structure or functioning of the nearby mudflats within the Port of Immingham area or more widely in the Humber Estuary. Furthermore, the recoverability of the intertidal community following this change is expected to be relatively rapid with key characterising species likely to be similar to baseline conditions (given that many of the species occur at a range of shore heights from the sublittoral fringe to the upper shore). Based on these considerations, there is no reason to suggest

Site	Features	Potential AEOI	Justification
			that this lower elevation mudflat will be ecologically poorer or provide a lower functionality in terms of prey resources for waterbirds. On this basis '*the structure and function (including typical species) of qualifying natural habitats'* conservation objective will not be affected. The change in intertidal habitat is considered negligible in the context of the amount of similar habitat in the region (and as a proportion of the SAC). On this basis any change to the '*extent and distribution of qualifying natural habitats'* conservation objective is considered inconsequential.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	With respect to intertidal mud, and as discussed above, the *de minimis* predicted intertidal habitat change due to the lowering in elevation of intertidal around the dredge pocket is considered to be in the range of local natural variability and is predicted to be immeasurable in real terms when taking account of the variation in water levels, wave climate and accuracy of the modelled bathymetry. This highly localised change will not alter the overall structure or functioning of the nearby mudflats within the Port of Immingham area or more widely in the Humber Estuary. Furthermore, the recoverability of the intertidal community following this change is expected to be relatively rapid with key characterising species likely to be similar to baseline conditions (given that many of the species occur at a range of shore heights from the sublittoral fringe to the upper shore). Based on these considerations, there is no reason to suggest that this lower elevation mudflat will be ecologically poorer or provide a lower functionality in terms of prey resources for waterbirds. On this basis '*the structure and function (including typical species) of qualifying natural habitats'* conservation objective will not be affected.

Site	Features	Potential AEOI	Justification
			The change in intertidal habitat is considered negligible in the context of the amount of similar habitat in the region (and as a proportion of the SAC). On this basis any change to the '*extent and distribution of qualifying natural habitats'* conservation objective is considered inconsequential. With respect to subtidal habitats, the capital dredge will not cause a change in habitat type (i.e., it will remain subtidal habitat with a similar substrate type) and therefore '*the extent and distribution of qualifying natural habitats'* conservation objective will not change. Following dredging, the subtidal habitat would be expected to be recolonised relatively rapidly by a broadly similar invertebrate assemblage to baseline conditions. On this basis, the '*structure and function (including typical species) of qualifying natural habitats*' conservation objective would be expected not to change. Any '*Supporting processes on which qualifying natural habitats and habitats of qualifying species rely'* are also not expected to change as a direct result of sediment removal.

The potential effects of changes to qualifying species as result of the removal of seabed material during capital dredging

General scientific context

4.4.19 The quality of intertidal habitat as a feeding resource for waterbirds can be highly variable both spatially and temporally (Mander *et al*., 2013). Higher energetic costs for waterbirds could occur in areas where habitat change has caused a reduction in prey distribution and density. This may affect local populations in the long-term through impacts on individual fitness (survival, body condition and fecundity) (Bowgen, 2016).

4.4.20 Habitat change can also result in increased densities of birds already using a site, increasing the potential for interference competition (Santos *et al*., 2005; Bowgen, 2016). Severe degradation of intertidal habitat could displace birds and cause them to redistribute either locally or to neighbouring sites (Gunnarsson *et al.*, 2005). This in turn might affect the birds at those sites through competition and density-dependent mortality. Redshank displaced following the construction of an amenity barrage at Cardiff Bay (South Wales), for example, experienced a poorer body condition and had a lower survival rate after they moved (Burton *et al*., 2006). Lambeck (1991) found that Oystercatchers displaced following large-scale habitat loss in the Delta region of The Netherlands experienced significantly higher mortality than those originally ringed elsewhere in the Delta, presumably as a result of the increased densities in recipient areas.

Summary of effects

4.4.21 It is anticipated that the proposed development will result in a very small change in an area of lower shore intertidal habitat at the top edge of the dredge slope which will become steepened and slightly lower in the tidal frame as a result of the dredging (0.003 ha) (Paragraph 4.4.12).

4.4.22 The habitat change represents approximately 0.000008 % of the Humber Estuary SPA/Ramsar. When considering this in the context of intertidal, the area of change represents approximately 0.000034 % of intertidal foreshore habitats[12] and approximately 0.000047 % of mudflat[13] within the SPA.

4.4.23 Habitat change at this *de minimis* scale is in the range of local natural variability and is expected to be immeasurable in real terms when taking account of the variation in water levels, wave climate and accuracy of the modelled bathymetry. Any changes in infaunal composition (including prey items) due to the lowering in elevation in this area will be highly localised

[12] Based on using the 'Intertidal Substrate Foreshore (England and Scotland)' data layer (https://magic.defra.gov.uk/Metadata_for_MAGIC/SPIRE%20intertidal%20substrate%20foreshore.pdf

[13] Based on using mudflat data layer of the Priority Habitat Inventory (England) (https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england).

with key characterising species likely to be similar[14]. Furthermore, in reality this *de minimis* area represents an inconsequential change for these mobile species even at a local scale. The location of this change on the lower shore (near the sublittoral fringe) means that any change to the area exposed at each state of the tide for birds to feed or any reduction in the potential time available for feeding within this area will be negligible[15]. On this basis the overall functioning of the mudflat in the area and the prey resources available to coastal waterbirds will not be affected and will not cause a change in bird distribution.

Mitigation

4.4.24 Mitigation is not relevant to this impact pathway nor is it required.

Assessment of the potential for an AEOI

4.4.25 Based on the evidence provided above and the rationale provided in **Table 12**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

14 The key commonly recorded species recorded on the foreshore in the project-specific intertidal benthic surveys included waterbird prey items such as the bivalve *Limecola balthica*, mudshrimp *Corophium volutator* and ragworm *Hediste diversicolor*. These are found at a range of shore heights from the sublittoral fringe to the upper shore and are considered relatively tolerant to changes in emergence which do not alter the extent of the intertidal (Ashley and Budd, 2020; Tillin and Rayment, 2016).

15 Based on tide gauge data at Immingham in 2020, the area of change was completely submerged during the 12-month period for 99 % of the time.

Table 12. The potential for an AEOI due to changes to qualifying species as result of the removal of seabed material during capital dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SPA	A048; Common Shelduck (Non-breeding) *Tadorna tadorna*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	The potential effects have been considered in the context of the site's conservation objectives. The predicted *de minimis* intertidal habitat change will not cause changes to '*the populations of each of the qualifying features'* conservation objective. This is because the scale of change is not considered to be of a magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected. The '*distribution of the qualifying features within the site*' conservation objective will not be affected as any change in distribution would be negligible. The effects of the habitat change will also be negligible in terms of the functionality of the local mudflats for feeding birds and in the context of the amount of similar habitat in the region (and as a proportion of the SPA). On this basis, any change to the '*structure and function of the habitats of the qualifying features'* and *'extent and distribution of the habitats of the qualifying features'* conservation objectives are considered inconsequential.
	A143: Red Knot (Non-breeding) *Calidris canutus*		
	A149: Dunlin *Calidris alpina alpina* (Non-breeding)		
	A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)		
	A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica*		
	A162: Common Redshank *Tringa totanus* (Non-breeding)		
	Waterbird assemblage		
Humber Estuary Ramsar site	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)		
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		

The potential effects of changes to qualifying habitats as a result of sediment deposition during capital dredging

General scientific context

4.4.26 Sediments suspended and dispersed during the marine works, dredging and disposal have the potential to resettle over the seabed. This potential blanketing or smothering of benthic species may cause stress, reduced rates of growth or reproduction and in the worst cases the effects may be fatal (Pineda *et al.,* 2017; Bolam *et al*., 2016).

4.4.27 Habitats within estuarine and coastal environments have highly fluctuating conditions including the resuspension and deposition of sediments on a daily basis (through tidal action), lunar cycles (due to the differing influences of spring and neap tides) and on a seasonal basis (due to storm activity and conditions of extreme waves). Subtidal and intertidal habitats are, therefore, characterised by such perturbations and the biological communities of these environments are well adapted to survival under fluctuating conditions.

4.4.28 If the amount of sediment deposited is too great to allow species to survive burial, then recovery occurs via re-colonisation and/or migration to the new sediment surface (Bolam *et al.,* 2006a; 2006b). In general, the rate of recovery is dependent upon just how stable and diverse the assemblage was in the first place. A regularly disturbed sedimentary habitat with a low diversity benthic assemblage is likely to recover more quickly (i.e., return to its disturbed or 'environmentally-stressed' baseline condition) than a stable habitat with a pre-existing mature and diverse assemblage. A study by Bolam *et al.* (2004), for instance, concluded that the relatively rapid recovery observed at a location on the Crouch Estuary was due to the opportunistic nature of the invertebrate assemblages and the dispersive behaviour of the dominant species that were present before the material was deposited. Furthermore, in cases where the quantity and type of sediment deposited does not differ greatly from natural sedimentation, e.g., of similar particle size, the effects are likely to be relatively small as many of the species are capable of migrating up through the deposited sediments (Budd, 2004).

4.4.29 The Marine Evidence based Sensitivity Assessment (MarESA) approach (Tyler-Walters *et al.,* 2018) found that benthic communities in both sandy and muddy estuarine sediments are typically considered to be tolerant to the deposition of up to 5 cm of fine material in a single event with burrowing species considered able to relocate to preferred depths through this level of deposition. Deposition of greater depths of fine sediment could result in some mortality although evidence suggests that some characterising species are likely to be able to reposition. Bivalve and polychaete species have been reported to migrate through depositions of sediment greater than 30 cm (De-Bastos, 2016a; De-Bastos, 2016b; Ashley, 2016; Tillin, 2016). A previous review by the University of Hull also concluded that benthic invertebrates in sediments are able to adapt and readjust if sediment laid is placed as thin veneers over several days although they can also tolerate moderate amounts (20 cm) of material being deposited at one time (IECS, 2001).

Summary of effects

4.4.30 Sediment changes that are predicted to occur as a result of the capital dredge are considered in more detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). In summary, however, it has been concluded that maximum siltation as a result of the capital dredge within about 100 m up and down the estuary from the edge of the dredge pocket is predicted to be 7 to 8 mm reducing to around 3 mm within approximately 500 m from the dredged pocket. Beyond these areas, deposition levels are predicted to be less than 1 mm. Furthermore, once on the bed, the deposited material will return to the background system i.e., it will be put back into suspension on subsequent peak flood or ebb tides to be further dispersed.

4.4.31 The project-specific intertidal survey (Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.9) and Appendix 9.1 (Application Document Reference number 8.4.9 (a))) recorded a community characterised by nematodes, the oligochaetes *Tubificoides benedii* and *Enchytraeidae* spp., the mud shrimp *Corophium volutator*, the gastropod mudsnail *Peringia ulvae*, Baltic tellin *Limecola balthica* and the polychaetes *Hediste diversicolor* and *Pygospio elegans*. The subtidal survey generally recorded an impoverished benthic community (which is likely to reflect the existing high levels of physical disturbance in the area due to strong near bed tidal currents, sediment transport and ongoing maintenance dredging) characterised by nematodes, the mudshrimp *Corophium volutator,* polychaetes (such as *Streblospio shrubsolii Polydora cornuta Tharyx spp. and Nephtys spp.*), oligochaetes *Tubificoides* spp. and barnacle *Amphibalanus improvises*. These characterising species dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at most of the sample stations. All the species recorded were considered commonly occurring and not protected.

4.4.32 The benthic species occurring within and near to the dredge area typically consist of burrowing infauna (such as polychaetes, oligochaetes or bivalves), which are considered tolerant to some sediment deposition. The predicted millimetric changes in deposition are, therefore, considered unlikely to cause smothering effects as described above. In addition, the species recorded in the benthic invertebrate surveys are fast growing and/or have rapid reproductive rates which allow populations to fully re-establish in typically less than 1-2 years and for some species within a few months (Ashley and Budd, 2020; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016).

4.4.33 Deposition of sediment as a result of capital dredging will be highly localised and similar to background variability. Based on the evidence provided above the intertidal and subtidal habitats within the vicinity of the proposed works are considered to have low sensitivity to smothering. The subtidal and intertidal benthic communities present are well adapted to survival under fluctuating sediment conditions and have high recoverability rates.

Mitigation

4.4.34 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.4.35 Based on the evidence provided above and the rationale provided in **Table 13**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 13. The potential for an AEOI due to changes to qualifying habitats as a result of sediment deposition during capital dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, sediment deposition during capital dredging will be highly localised and similar to background variability away from the direct vicinity of the dredge. Benthic species in the area are considered commonly occurring and also well adapted to survival under fluctuating sediment conditions. These species are also considered to have high recoverability rates. On this basis sediment deposition is not expected to cause a change to the '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. Deposition will also, therefore, not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	H1140: Mudflats and sandflats not covered by seawater at low tide		
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

The potential effects of changes to qualifying habitats as a result of sediment deposition during capital dredge disposal

General scientific context

4.4.36 Scientific evidence on this impact pathway is provided in Paragraphs 4.4.26 to 4.4.29.

Summary of effects

4.4.37 The requirement for disposal of dredged material at sea associated with the proposed development would be fulfilled at licensed disposal sites HU056 and HU060 (see Chapters 2 and 3 of the ES (Application Document Reference numbers 8.2.2 and 9.2.3 respectively)).

4.4.38 An assessment of the sediment changes that are predicted to occur as a result of the capital dredging is presented in more detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). In summary, sedimentation resulting from the disposal plume is predicted to be generally in the range of 4 to 6 mm at distances of several hundred metres from the disposal sites to within approximately 4 km. Further up and down estuary, maximum sedimentation as a result of the disposal activities is generally predicted to be less than 1 to 2 mm.

4.4.39 The disposal sites are located in the mid channel and are subject to regular natural physical disturbance (and associated scouring) as a result of very strong tidal flows. These disposal sites are also used regularly for the disposal of maintenance dredge arisings (for example millions of wet tonnes of dredge sediment are disposed of at HU060 annually) which will also cause some disturbance due to sediment deposition. This is reflected in a generally impoverished assemblage at both disposal sites.

4.4.40 The benthic species recorded within and adjacent to the disposal sites include mobile infauna (such as errant polychaetes e.g., *Arenicola* spp. and amphipods) which are able to burrow through sediment. They are, therefore, considered tolerant to some sediment deposition. In addition, characterising species typically have opportunistic life history strategies, with short life histories (typically two years or less), rapid maturation and the production of large numbers of small propagules which makes them capable of rapid recoverability should mortality as a result of smothering occur (Ashley and Budd, 2020; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016; Tyler-Walters and Garrard, 2019). On this basis, any effects are considered to be temporary and short term.

4.4.41 In summary, deposition in the wider area surrounding the disposal ground is expected to be in the order of millimetres based on the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). Sedimentation of this scale is unlikely to result in significant smothering effects to most faunal species with recoverability expected to be high.

Mitigation

4.4.42 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.4.43 Based on the evidence provided above and the rationale provided in **Table 14**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 14. The potential for an AEOI due to changes to qualifying habitats as a result of sediment deposition during capital dredge disposal

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1110: Sandbanks which are slightly covered by sea water all the time	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, sediment deposition during dredge disposal will be highly localised and similar to background variability away from the direct vicinity of disposal. Benthic species in the area are considered commonly occurring and also well adapted to survival under fluctuating sediment conditions with have high recoverability rates. On this basis sediment deposition is not expected to cause a change to the '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. Deposition will also, therefore, not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	H1130: Estuaries		
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

The potential effects of changes to qualifying habitats as result of the removal of seabed material during maintenance dredging

General scientific context

4.4.44 Scientific evidence on this impact pathway is provided in Paragraphs 4.4.2 to 4.4.4.

Summary of effects

4.4.45 Maintenance dredging causes the direct physical removal of marine sediments from the dredge footprint, resulting in the modification of existing marine habitats. The impacts to benthic fauna associated with the dredged material include changes to abundance and distribution through damage, mortality or relocation to a disposal site.

4.4.46 As summarised in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7), the level of maintenance dredging and disposal required at IERRT during the operational phase is anticipated to be required around three to four times a year (though this will be dependent on a range of factors - see Chapter 3 of the ES (Application Document Reference number 8.2.3)). Volumes of material from maintenance dredging (up to 120,000 m^3 annually, to be dredged as required) of the IERRT berth pocket will be lower than those from the original capital dredge (190,000 m^3).

4.4.47 Maintenance dredging will create similar seabed sedimentary conditions to that occurring following capital dredging due to sediment accretion. Accretion will return the surface layer of the seabed in the dredge footprint to its existing sediment character (i.e., fine sediment with a high silt content) which would then be expected to start to recolonise relatively rapidly by a similar assemblage to baseline conditions[16]. However, maintenance dredging of the berth pockets is expected to cause an ongoing source of seabed disturbance, albeit in these localised areas. It should be noted that no dredging will be required around the jetty structures. Furthermore, the project-specific subtidal survey (Section 9.6 of Chapter 9 of the ES (Application Document Reference number 8.2.3) and Appendix 9.1 (Application Document Reference number 8.4.9 (a))) recorded a generally impoverished benthic community which is likely to reflect the existing high levels of physical disturbance in the area due to strong near bed tidal currents and sediment transport.

16 The project-specific subtidal survey (Section 9.6 and Appendix 9.1 of the ES) recorded a benthic community characterised by nematodes, the mudshrimp *Corophium volutator,* polychaetes (such as *Streblospio shrubsolii Polydora cornuta Tharyx spp and Nephtys spp.*), oligochaetes *Tubificoides spp.* and barnacle *Amphibalanus improvises*. These characterising species dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at most of the sample stations. These species are typically fast growing and/or have rapid reproductive rates which allow populations to fully re-establish in typically less than 1-2 years and for some species within a few months (De-Bastos and Hill, 2016; De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016).

4.4.48 All the species recorded are considered commonly occurring and not protected with the faunal assemblage recorded being considered characteristic of subtidal habitats found more widely in this section of the Humber Estuary (ABPmer, 2009; IECS, 2010; Able UK Limited, 2021). Subtidal habitats in the area around the Port of Immingham are also considered to be typically of limited ecological value.

4.4.49 Subtidal habitats subject to disturbance by maintenance dredging are of low ecological value and the benthic community has low sensitivity to seabed disturbance given the high recoverability rates.

Mitigation

4.4.50 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.4.51 Based on the evidence provided above and the rationale provided in **Table 15**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 15. The potential for an AEOI due to changes to qualifying habitats as a result of as result of the removal of seabed material during maintenance dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	The maintenance dredge will not cause a change in habitat type (i.e., it will remain subtidal habitat with a similar substrate type) and therefore '*the extent and distribution of qualifying natural habitats*' conservation objective will not change. Following dredging, the subtidal habitat would be expected to start being recolonised relatively rapidly although the regular ongoing maintenance dredging is likely to cause a source of ongoing seabed disturbance. However, existing communities are generally impoverished and subject to regular seabed disturbance due to strong near bed currents and sediment transport. Furthermore, the seabed in this area is generally considered to be of low ecological value and the scale of the maintenance dredging as a result of the proposed development will not affect the overall functioning of subtidal habitats in the region. On this basis, any change to the '*structure and function (including typical species) of qualifying natural habitats'* conservation objective would be expected to be negligible. Any 'Supporting processes on which qualifying natural habitats and habitats of qualifying species rely' is not expected to change as a direct result of sediment removal.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

The potential effects of changes to qualifying intertidal habitats as a result of the movement of Ro-Ro vessels during operation

General scientific context

4.4.52 Intertidal mudflats are subjected to successive periods of erosion and sedimentation which are controlled by sediment supply and hydrodynamic factors such as tides, fluvial discharge and wind (Dyer, 1994; O'Brien *et al*., 2000). This erosion and sedimentation can often be intensified by boat traffic (Verney *et al*., 2007).

4.4.53 A vessel travelling through water generates a combination of both short period waves (referred to as a wake, which propagate from the bow and stern sections of the vessel) and long-period waves, which result in surface 'drawdown.' The net effect of these waves, along with propeller-induced turbulence, is referred to as 'shipwash.' Studies have shown shipwash to generate large bottom shear stress values, enhancing the erosion of mudflats (Parchure *et al*., 2001; Verney *et al*., 2007). The severity of these erosion processes is dependent on several factors, including the speed of the vessel, the size of the vessel and the distance between the vessel and ecological features, since the energy in waves is a function of speed and displacement (UK Marine SACs Project, 2001).

4.4.54 Large, fast moving vessels can cause, what are referred to as, high energy events (HEEs), which can result in major erosion processes (erosion of more than 5 mm thickness) (Soulsby *et al*., 1993; Grant and Madsen, 1979; Verney *et al*., 2007). These events increase bottom shear which can result in bed elevation, changes in the sediment type of the seabed and, in severe cases, the loss of habitats and marine benthic communities (Parchure *et al*., 2001; Deloffre *et al*., 2005; Verney *et al*., 2007; Cundy *et al*., 2005). HEEs are observed most frequently under specific conditions such as low water height and amplitude waves (Verney *et al*., 2007). Low-amplitude erosion processes are often observed at very shallow water depths at the beginning of a flood tide and at the end of the ebb tide (Verney *et al*., 2007). The amplitudes and severity of these HEEs demonstrate the importance vessel traffic plays in mudflat dynamics and sediment fluxes.

4.4.55 Additionally, for vessels moving at finite depth in confined channels, depression wakes, or Bernoulli wakes, can become more important at influencing mudflat erosion than other perturbations (Soomere, 2006; Aage *et al*., 2003; Parnell *et al*., 2015). These wakes are often generated by displacement type vessels, such as trawlers and large sailing vessels, and their amplitude increases with an increase in the blocking coefficient (the ratio of the product of the ship width and draught to the cross-sectional area of the channel) and ship velocity. Depression wakes can impact mudflats through morphological changes (Erirf and Soomere, 2004; Zaggia *et al*., 2017).

Summary of effects

4.4.56 There is potential for physical disturbance and erosion to the foreshore nearby to the proposed development as a result of the movement of Ro-Ro vessels and other ships using the berths.

4.4.57 Foreshore erosion can cause a change in elevation and the sediment type of the seabed (e.g., if erosion removes accreted mudflat sediment and exposes coarser sediment) or result in the loss of a habitat in more severe cases (e.g., if the foreshore is completely eroded below a sea wall or other coastal defence).

4.4.58 Vessels approaching the floating pontoons will be approaching at very slow speeds in order to allow berthing. This will keep any shipwash to a minimum. In addition, this section of the Humber Estuary is already subject to high. albeit slow moving, vessel traffic levels with vessels regularly berthing at jetties close to intertidal areas with no known significant erosional effects recorded.

4.4.59 On this basis the effect is considered to be negligible and there are no measurable effects on intertidal habitats from the movement of Ro-Ro vessels during operation.

Mitigation

4.4.60 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.4.61 Based on the evidence provided above and the rationale provided in **Table 16**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 16. The potential for an AEOI due to changes to qualifying intertidal habitats as a result of the movement of Ro-Ro vessels during operation

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above only negligible changes to intertidal mudflats in the vicinity of the berths are expected to occur as a result of physical disturbance due to vessels berthing during operation. On this basis, this pathway is not expected to cause a change to the '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. This pathway will also, therefore, not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

4.5 Physical loss or damage of habitat through alterations in physical processes

Indirect loss or change to qualifying habitats and species as a result of changes to hydrodynamic and sedimentary processes as a result of the marine works

General scientific context

4.5.1 Port or harbour structures (such as piles, breakwaters, coastal defences, jetties or quay walls) can cause changes to hydrodynamics (flow speeds, flow direction, waves, water levels) and seabed morphology (Prum and Iglesis, 2016; Mohanty *et al*., 2012; Kudale, 2010). Such changes have the potential to affect habitat quality and result in changes to the diversity, abundance and biomass of intertidal and subtidal species.

4.5.2 Dredging can cause direct habitat changes resulting from seabed removal and sediment deposition, as well as indirect habitat changes linked to hydrodynamic and sedimentary processes. Deepening or widening of channels during dredging can change seabed bathymetry and potentially alter flow patterns (speed/direction), wave exposure and cause tidal amplification (Van Dijk *et al*., 2019; Bradbury *et al*., 2003; Cox *et al.,* 2003).

4.5.3 These hydrodynamic changes can lead to changes in sediment transport and also patterns of emersion/immersion as well as erosion/accretion of marine sedimentary habitats such as mudflats and sandbanks (Van Dijk *et al.,* 2019). For example, Cox *et al.* (2003) found that saltmarsh retreat was related to an increase in the tidal prism brought about by dredging operations to maintain or increase the depth of the main navigable channel of the Westerschelde Estuary in the Netherlands. The consequent greater frequency with which the high tides reached the edge of the fringing marshes increased the risk of erosion.

4.5.4 Increased flow rates can also increase scouring and bed disturbance of subtidal habitats which can cause a reduction in diversity and an increase in more opportunistic species. In addition, reductions in water flow could increase siltation levels which could change the habitat type of a seabed and lead to sedimentation (Ashley and Budd, 2020). Marine invertebrates inhabiting sand and mud habitat show different tolerance ranges of physiological stresses caused by exposure and tidal elevation. This can lead to 'zonation' (Peterson, 1991). Bathymetric changes caused by dredging could, therefore, change the vertical distribution of marine habitats if post-dredging water depths were outside the range at which specific biotopes exist.

Summary of effects

4.5.5 An assessment of the hydrodynamic and sediment regime changes that are predicted to occur as a result of the marine works are considered in more detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). It should be noted that predicted changes are primarily as a result of the capital dredging with the effects due to the presence of the piles having a negligible, localised effect.

4.5.6 Slight increases to local peak ebb current speed landward of the berth pocket are predicted to cause a limited amount of erosion of the bed along part of the lower intertidal (at the elevation of MLWS) beneath the landward ends of the proposed jetty (Figure 7.18 of the ES (Application Document Reference number 8.3.7)). This will result in a potential indirect loss in the intertidal area (approximately 0.01 ha). The assessment indicates that once the softer upper layer is removed, the harder, more consolidated, underlayer of bed material is unlikely to erode further. This calculation represents a worst-case assessment of potential elevation changes and has been considered on a precautionary basis. The level of predicted change is at the limit of the accuracy of the modelled data and, in real terms, is likely to be immeasurable against the context of natural variability (as a result of storm events, for example).

4.5.7 The combined intertidal habitat loss as a result of the capital dredge and piling represents approximately 0.000027 % the Humber Estuary SAC and approximately 0.000107 % of the 'mudflats and sandflats not covered by seawater at low tide' feature of the Humber Estuary SAC[17].

4.5.8 This loss also represents 0.000027 % of the Humber Estuary SPA/Ramsar[18]. When considering this in the context of intertidal area, the area of loss represents approximately 0.000113 % of intertidal foreshore habitats[19] and approximately 0.000157 % of mudflat[20] within the SPA.

4.5.9 The predicted intertidal loss, albeit assessed on a worst case basis, also consists of a very narrow strip on the lower shore around the sublittoral fringe. This predicted loss would be of a similar scale to that which can occur due to natural background changes in mudflat extent in the local region (e.g., due to seasonal patterns in accretion and erosion or following storm events). It is not considered that this *de minimis* change in mudflat extent will change the overall structure or functioning of the nearby mudflats within the Port of Immingham area or more widely in the Humber Estuary.

4.5.10 In terms of functional value, the foreshore in the Port of Immingham area is used by a range of species for feeding including Black-tailed Godwit, Dunlin, Redshank, Shelduck, Oystercatcher, Curlew, Teal and Mallard (Table 9.19 and Table 9.20 in Chapter 9 of the ES (Application Document Reference number 8.2.9). Many of these birds feed clustered around the tideline and will follow the tideline as it pushes up and down the shore on flood and ebb

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17 Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022a)

18 Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022b)

19 Based on using the 'Intertidal Substrate Foreshore (England and Scotland)' data layer (https://magic.defra.gov.uk/Metadata_for_MAGIC/SPIRE%20intertidal%20substrate%20foreshore.pdf

20 Based on using mudflat data layer of the Priority Habitat Inventory (England) (https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england).

tides respectively. These species could, therefore, be potentially feeding in the in the predicted areas of habitat loss during low water periods. However, the predicted indirect areas of intertidal habitat loss are only exposed during low water spring tidal phases (remaining underwater during neap tidal phases) under current (pre-dredge) conditions. As a consequence, these very small areas already largely remain inundated with water and are only uncovered for a very short duration.

4.5.11 To put this into context, consideration has been given to the proportion of time that the areas of loss are available to feed over the course of a year.. Based on tide gauge data at Immingham in 2020, the area of indirect loss were completely submerged for 99 % of the time. The area of indirect loss, therefore, currently provides almost no feeding opportunities for coastal waterbirds. Furthermore, the spatial extent of loss represents a barely measurable and inconsequential reduction in available habitat for these mobile species even at a local scale.

4.5.12 On this basis, it can be concluded that any change to prey resources for birds feeding in the local area will be negligible and individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) will not be affected.

Mitigation

4.5.13 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.5.14 Based on the evidence provided above and the rationale provided in **Table 17**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 17. The potential for an AEOI due to indirect changes to qualifying habitats and species as a result of changes to hydrodynamic and sedimentary processes as a result of the marine works

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, magnitude of change on marine habitats and species from these highly localised and small scale predicted effects on the hydrodynamic and sedimentary processes is considered to be negligible. On this basis the potential effects are not expected to cause a change to '*the extent and distribution of qualifying natural habitats and* habitats of the qualifying species' conservation objective. The potential effects will also, therefore, not cause any changes to the '*the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	H1140: Mudflats and sandflats not covered by seawater at low tide	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, magnitude of change on marine habitats and species from these highly localised and small scale predicted effects on the hydrodynamic and sedimentary processes is considered to be negligible including predicted erosion on nearby intertidal habitats. On this basis changes to hydrodynamic and sedimentary processes are not expected to cause a change to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. The potential effects will also not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely*' conservation objectives.

Site	Features	Potential AEOI	Justification
Humber Estuary SPA	A048; Common Shelduck (Non-breeding) *Tadorna tadorna*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	The potential effects have been considered in the context of the site's conservation objectives. The predicted intertidal habitat loss will not cause changes to '*the populations of each of the qualifying features'* conservation objective. This is because the scale of loss is not considered to be of a magnitude that would cause changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected. The '*distribution of the qualifying features within the site'* conservation objective will not be affected as the predicted loss is *de minimis* in extent and of a scale that would not causes changes in local distribution. The footprint of predicted habitat loss under pre-dredge conditions already provides very limited feeding opportunities due to the low elevation on the shore and *de minimis* extent. This loss is considered negligible in the context of available feeding habitat even at a local scale along the eastern frontage of the port. The effects of the habitat loss will also be highly limited in terms of the overall wider functionality of the local mudflats for feeding birds. On this basis, any change to the '*structure and function of the habitats of the qualifying features'* conservation objective is considered inconsequential.
	A143: Red Knot (Non-breeding) *Calidris canutus*		
	A149: Dunlin *Calidris alpina alpina* (Non-breeding)		
	A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)		
	A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica*		
	A162: Common Redshank *Tringa totanus* (Non-breeding)		
	Waterbird assemblage		

Site	Features	Potential AEOI	Justification
			The loss in intertidal habitat is considered negligible in the context of the amount of similar habitat in the region (and as a proportion of the SPA/Ramsar). On this basis any change to the ‘*extent and distribution of the habitats of the qualifying features’* conservation objectives is considered inconsequential.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site’s conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, magnitude of change on marine habitats and species from these highly localised and small scale predicted effects on the hydrodynamic and sedimentary processes is considered to be negligible including predicted erosion on nearby intertidal habitats. On this basis changes to hydrodynamic and sedimentary processes are not expected to cause a change to ‘*the extent and distribution of qualifying natural habitats and habitats of the qualifying species’* conservation objective. The potential effects will also not cause any changes to the ‘*the structure and function of qualifying natural habitats*’ or cause modifications to ‘*the supporting processes on which qualifying natural habitats rely*’ conservation objectives.
	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)		The potential effects have been considered in the context of the site’s conservation objectives. The predicted intertidal habitat loss will not cause changes to ‘*the populations of each of the qualifying features’* conservation objective. This is because the scale of loss is not considered to be of a magnitude that would cause

Site	Features	Potential AEOI	Justification
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		changes to the diet or prey consumption of species so that individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Humber Estuary) are affected. The '*distribution of the qualifying features within the site'* conservation objective will not be affected as the predicted loss is *de minimis* in extent and of a scale that would not causes changes in local distribution. The footprint of predicted habitat loss under pre-dredge conditions already provides very limited feeding opportunities due to the low elevation on the shore and *de minimis* extent. This loss is considered negligible in the context of available feeding habitat even at a local scale along the eastern frontage of the port. The effects of the habitat loss will also be highly limited in terms of the overall wider functionality of the local mudflats for feeding birds. On this basis, any change to the '*structure and function of the habitats of the qualifying features'* conservation objective is considered inconsequential. The loss in intertidal habitat is considered negligible in the context of the amount of similar habitat in the region (and as a proportion of the SPA/Ramsar). On this basis any change to the '*extent and distribution of the habitats of the qualifying features'* conservation objectives is considered inconsequential.

Indirect changes to qualifying habitats as a result of changes to hydrodynamic and sedimentary processes during capital dredge disposal

General scientific context

4.5.15 Scientific evidence on this impact pathway is provided in Paragraphs 4.5.1 to 4.5.4.

Summary of effects

4.5.16 An assessment of the hydrodynamic and sediment regime changes that are predicted to occur as a result of the disposal are considered in more detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7).

4.5.17 Local changes to the bathymetry (as a result of material disposal to the bed) within the disposal site will be small in the context of the existing depths. Disposal activity will be targeted to the deeper areas within the site, ensuring that bed level changes are not excessive in any one area, thus, minimising the overall change. As a result, associated changes to the local hydrodynamics (and sediment transport pathways) will be negligible.

4.5.18 These changes are not likely to result in any significant changes to local sediment transport in the region although some localised changes to seabed bathymetry and morphology could occur.

4.5.19 In addition, the predicted changes in flow rates and subtidal seabed morphology are not expected to modify existing subtidal habitat types found in the area (i.e., mobile sand habitats characterised by an impoverished infaunal assemblage).

4.5.20 The indirect loss and changes to subtidal habitats due to changes in hydrodynamic and sedimentary processes as a result of the capital dredge disposal are highly localised and small scale. The subtidal habitats which will be potentially affected are of low ecological value and are considered to be tolerant to the level of change in conditions expected and on this basis the effect is considered to be negligible.

Mitigation

4.5.21 Mitigation is not relevant to this impact pathway and is, as a consequence, not required.

Assessment of the potential for an AEOI

4.5.22 Based on the evidence provided above and the rationale provided in **Table 18**, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 18. The potential for an AEOI due to indirect changes to qualifying habitats as a result of changes to hydrodynamic and sedimentary processes during capital dredge disposal

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1110: Sandbanks which are slightly covered by sea water all the time	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, magnitude of change on marine habitats and species from these highly localised and small scale predicted effects on the hydrodynamic and sedimentary processes is considered to be negligible. Negligible changes in erosion and accretion are predicted to occur on nearby intertidal habitats. On this basis the potential effects are not expected to cause a change to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. The potential effects will also not cause any changes to '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	H1130: Estuaries		
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

4.6 Physical change of habitat and associated species beneath marine infrastructure due to shading

Direct changes to qualifying habitats beneath marine infrastructure due to shading

General scientific context

4.6.1 Artificial shading such as due to pontoons or jetty/pier decking has the potential to cause localised changes to the structure and functioning of biological communities in natural ecosystems (Van Colen *et al*., 2015; Pardal-Souza *et al*., 2017; Tolhurst *et al*., 2020).

4.6.2 In sedimentary habitats microphytobenthos, macrofauna, sediment erodibility and biogeochemical sediment properties are often found to differ significantly between shaded and unshaded sediments (Defew *et al*., 2004; Thrush *et al*., 2014; Tolhurst *et al*., 2020). Microphytobenthos are significant drivers of ecosystem functioning in benthic habitats influencing biogeochemical properties of sediment, food web dynamics (Byers and Grabowski, 2014) and sediment erodibility (Grabowksi *et al*., 2011)). Heavy shading alters microphytobenthos assemblages causing a variety of responses, including changes in biomass, pigment ratios, species richness and diversity (Defew *et al.*, 2004; Tolhurst *et al*., 2020). These changes can therefore have cascading effects on the sediments they inhabit and associated faunal assemblages (Thrush *et al*., 2014; Van Colen *et al*., 2015; Tolhurst *et al*., 2020). For example, Tolhurst *et al*. (2020) found heavy shading of an intertidal mudflat caused directional responses in sediment properties, in line with a decrease in microphytobenthos, including reductions in chlorophyll *a*, colloidal carbohydrate, erosion threshold and total carbohydrate; and increased erosion rate and water retention. This resulted in significant changes in the faunal assemblage, driven by large decreases in oligochaetes and sabellid polychaetes – likely to be a direct response to the reduction of food; either the amount of microphytobenthos, or perhaps bacteria, or meiofauna (Tolhurst *et al*., 2020).

4.6.3 Shading of hard substrates, such as rocky shores and seawalls, can often alleviate stressful conditions associated with temperature and desiccation, caused by emersion during low tide (Blockley, 2007). However, this can also cause shifts in the structure and diversity of biological communities, by reducing macroalgae cover (Blockley and Chapman, 2006; Blockley 2007), increasing the abundance of filter feeding invertebrates and mobile consumers (Takada, 1999; Blockley, 2007), altering sessile assemblages (Williams, 1994) and influencing larval recruitment (Blockley and Chapman, 2006; Pardal-Souza *et al*., 2017). For example, Pardal-Souza *et al*. (2017) found shading to consistently affect the biological community of rocky shores, such that the biomass and cover of macroalgae, and the size of most sedentary grazers, were smaller. Additionally, in the infralittoral fringe there was a shift in dominance from macroalgae to invertebrate filter feeders (Pardal-Souza *et al*., 2017). Larval recruitment was also affected, with oysters and barnacles recruiting more in shaded habitats (Pardal-Souza *et al*., 2017).

Summary of effects

4.6.4 Changes in sunlight levels as a result of shading have the potential to cause changes to the benthic communities leading to a change in habitat quality. In particular, shading can reduce the amount of light available for species that perform photosynthesis such as macroalgae species (seaweeds), macrophytes (such as saltmarsh plants) and microphytobenthos.

4.6.5 The floating pontoons are inevitably likely to cause some shading of subtidal habitats. The project-specific benthic data suggests that a relatively impoverished invertebrate community, consisting predominantly of estuarine oligochaete worms, polychaetes and mobile crustaceans such as amphipods is present in the area. These characterising species live on the seabed or infaunally (in the sediment) and are not directly reliant on light levels to feed (e.g., species are suspension feeders, deposit feeders and predators). However, there may be changes in microphytobenthos abundance on the sediment surface and within the sediment as a result of shading. This could alter food supply and sediment cohesion to deposit feeding species. On this basis, some changes to the benthic community may be observed in terms of a reduction in productivity but the broad faunal assemblage is likely to persist. Furthermore, the highly turbid conditions in the Humber Estuary generally limits the amount of sunlight reaching the seabed in any case and the area impacted will also be highly localised.

4.6.6 The open piled approach jetty and linkspan could cause some shading to intertidal mudflat habitat. Given that these structures will be located several metres above the seabed, however, some natural light would be expected to reach the mudflat from either side of these structures at different times of day. Shading at the level predicted would only be expected to cause negligible changes to the growth rates of macroalgae species (seaweeds) and microphytobenthos occurring on the foreshore. Furthermore, no saltmarsh and only limited macroalgae occurs on mudflats in this area.

4.6.7 The subtidal and intertidal habitats and associated benthic communities are commonly occurring in the region and the effect of shading will be highly localised.

Mitigation

4.6.8 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.6.9 Based on the evidence provided above and the rationale provided in Table 19, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 19. The potential for an AEOI due to direct changes to qualifying habitats beneath marine infrastructure due to shading

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, potential shading effects are considered to be negligible. On this basis the potential effects are not expected to cause a change to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Shading on this scale will also not cause any changes to the *'the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	H1140: Mudflats and sandflats not covered by seawater at low tide		
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

4.7 Physical change to habitats resulting from the deposition of airborne pollutants

Physical change to qualifying habitats resulting from the deposition of N and NOx from marine vessel and road vehicle emissions during operation.

General scientific context

4.7.1 Exhaust emissions from marine vessels and road traffic emissions during the operational phase have the potential to impact on local air quality, with the emission of NO_X (mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere) being the main pollutants of concern in relation to coastal saltmarsh.

4.7.2 Coastal saltmarsh is sensitive to effects from nitrogen deposition as vegetation is nitrogen limited (Mitsch and Gosselink, 2000) and is therefore potentially vulnerable to eutrophication. Effects may be observed as increased graminoid (grasses) biomass, with potentially adverse effects on forbs (APIS, 2022).

4.7.3 The Air Pollution Information System (APIS) defines site-specific Critical Loads relevant to each European site for nitrogen deposition. For the 'estuaries' and 'Atlantic salt meadows' qualifying features of the Humber Estuary SAC, the relevant nitrogen Critical Load class is 'Pioneer, low-mid, mid-upper saltmarshes', with a Critical Load of 20 – 30 kg N/ha/yr (APIS, 2022). This assessment refer to the most stringent (i.e., lower) Critical Load).

4.7.4 Environment Agency guidance (2016) that states that impacts may be considered insignificant ('not significant') where:

- The short-term impact is less than 10% of environmental assessment level for the nature conservation site; and
- The long-term impact is less than 1% of the long-term air quality objective or environmental assessment level for the nature conservation site.

4.7.5 Where the long-term impact at a nature conservation receptor exceeds these criteria, it may also be considered insignificant ('not significant') where:

- The long-term total concentration after the impact is <70% of the air quality objective or environmental assessment level for the nature conservation site.

Summary of effects

4.7.6 The assessment of operational effects on air quality has been carried out in line with the Institute of Air Quality Management (IAQM) 'Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation

Sites' (Holman *et al.*, 2020) and the methodology is detailed in Chapter 13 (Air Quality) of the ES (Application Document Reference number 8.2.13). The assessment considered both onsite and offsite sources, however only the onsite emissions are relevant to coastal saltmarsh. The emissions sources included vessel, land-tug and road traffic emissions.

4.7.7 Operational N deposition and NO_x was predicted at five receptors within the SAC (i.e., the five nearest sensitive saltmarsh habitats to the Site) as shown in Table 22. The locations of the five ecological receptors are illustrated in Figure 13.3 (a) to the ES (Application Document Reference number 8.3.13 (g)).

Table 20. Predicted operational pollutant statistics from onsite sources.

Receptor ID	Annual Mean NO_X ($\mu g/m^3$)		Nitrogen Deposition Rate (kg N/ha/yr)[1]	
	Concentration[2]	Change[3,4]	Deposition Rate[2]	Rate Change[3,4]
Humber Estuary SAC/ SPA (North East Lincolnshire estuary shore and East Riding of Yorkshire estuary shore)				
SAC1	19.9	0.1 (<1%)	**20.5**	<+0.1 (<1%)
SAC2	17.2	0.1 (<1%)	19.2	<+0.1 (<1%)
SAC3	14.7	**0.5 (1.6%)**	19.1	+0.1 (<1%)
SAC4	16.2	**0.5 (1.7%)**	19.1	+0.1 (<1%)
SAC5	16.3	**0.3 (1.0%)**	18.0	<+0.1 (<1%)

Notes:
[1] Nitrogen deposition rate based on NO_2 contributions.
[2] **Bold** values denote and exceedance of the relevant air quality standard.
[3] **Bold** values denote an impact of more than 1% of the air quality standard
[4] From Future baseline 1 only. These receptors are too distant from the modelled road network to be affected by the contribution of in-combination traffic flows.

4.7.8 Operational conditions at the nature conservation sensitive receptors within and adjacent to the IERRT project are summarised as follows:

- Annual mean NO_X concentrations predicted are below the air quality objective at the saltmarsh habitats within the SAC;
- The impact of operational onsite emissions is greater than 1% of the air quality objective for annual mean NO_X at some sections of saltmarsh habitat within the SAC (receptor ID SAC3, SAC4 and SAC5). These impacts cannot be screened as insignificant;
- Nitrogen deposition rates at the saltmarsh habitat within the SAC are close to or are above the relevant Critical Load for that habitat (Exceeds at SAC1 only); and
- The impact of operational onsite emissions is less than 1% of the Critical Load for nitrogen deposition at the saltmarsh habitat within the SAC.

4.7.9 The assessment of onsite emissions sources during the operational phase has demonstrated that the effect of combined emissions is below the air quality objective but exceeds the 1% threshold at three locations. However, the annual mean NO_X concentrations remain below 70% of the air quality standard and therefore the effect of emissions on coastal saltmarsh with the Humber Estuary SAC is considered negligible. Nitrogen deposition should also be considered within the context of nutrient loadings from river and tidal inputs which are likely to be of significantly greater importance for these systems (APIS, 2022).

4.7.10 It is noted that predicted NH_3 and NH_3 derived N deposition at the same five SAC receptors are presented in Table 13.16 in Chapter 13 (Air Quality) of the ES (Application Document Reference number 8.2.13). The predicted NH_3 concentrations are below 1% of the Critical Level threshold at all receptors and likely significant effects were therefore screened out at Stage1.

Mitigation

4.7.11 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.7.12 Based on the evidence provided above and the rationale provided in Table 21, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 21. The potential for an AEOI due to physical change to qualifying habitats resulting from the deposition of N and NOx from marine vessel and road vehicle emissions during operation.

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on the information provided above, air quality effects are considered to be negligible. On this basis the potential effects are not expected to cause a change to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Air quality effects on this scale will also not cause any changes to the *'the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

4.8 Non-toxic contamination through elevated suspended sediment concentrations

The potential effects of elevated SSC during capital dredging on qualifying habitats and species

General scientific context

Elevated SSC: implications for benthic habitats and species

4.8.1 Dredging activities result in the suspension of disturbed sediment (Newell *et al.,* 1998). Macrofauna living in estuarine systems which are subject to naturally high levels of SSCs are considered well adapted to living in highly turbid conditions. An increased level of suspended sediments may result in an increase in food availability and therefore growth and reproduction for surface deposit feeders (such as certain polychaetes) within estuarine environments that rely on a supply of nutrients at the sediment surface. However, food availability would only increase if the additional suspended sediment contained a significant proportion of organic matter, and the population would only be enhanced if food was previously limiting (De-Bastos, 2016b).

4.8.2 Greater energetic costs for benthic species could occur as a result of higher particle loads due to elevated suspended sediments stimulating the secretion of mucus to protect branchial or feeding structures of filter feeding organisms (Perry, 2016). SSCs have been found to have a negative linear relationship with sub-surface light attenuation. Light availability and water turbidity are principal factors in determining depth range at which kelp and other algae are recorded. In addition, certain mobile epistrate feeders (such as the amphipod *Bathyporeia* spp.) feed on diatoms within the sand grains and an increase in suspended solids that consequently reduced light penetration could alter food supply (Tillin *et al*., 2019). However, longer-term changes in turbidity levels rather than temporary elevations are likely to be required to elicit any measurable changes in these species.

4.8.3 Elevated suspended sediment levels can also cause increased scouring and damage of epifaunal species due to the potentially abrasive action of the suspended sediment in flowing water.

4.8.4 Increased suspended sediments may favour the development of suspension feeders such as bivalves over other species. However, it should be noted that many benthic invertebrates can switch feeding modes depending on environmental conditions. The negative effects of suspended sediment may be particularly important during larval settlement in spring, with settling stages potentially being more sensitive to effects such as scour. However, this is generally thought to be of less concern where fauna are adapted to naturally high levels of suspended sediments (Boyd *et al*., 2004).

4.8.5 In addition, the resuspension of sediments containing organic material can cause oxygen depletion within the water column and the subsequent settling of this organic rich sediment can deplete sediment oxygen levels, potentially affecting benthic species. Reductions in dissolved oxygen from suspended sediments as a result of dredging are generally considered to be minimal and short-lived. However, potential effects can be more pronounced if dredging causes the disturbance of high levels of oxygen-depleting substances and nutrients present in some very fine-grained sediment deposits and where a great portion originate from waste water (Cefas, 2012).

4.8.6 Oxygen depletion in severe situations can lead to hypoxia with most research on the effects of reductions in dissolved oxygen on benthic fauna during hypoxic conditions. This occurs when oxygen is consumed (e.g., by decomposing organic matter, respiration and oxidation of reduced chemical species) faster than it is replenished (e.g., via air-water oxygen transfer, photosynthesis, and mixing) (Larsen *et al*., 2019). Coastal and estuarine waters can be particularly susceptible to low oxygen conditions as sediments are organic-rich and impose high sediment oxygen demands. Highly stratified estuaries, in which surface and bottom waters do not mix, are more prone to hypoxia (Larsen *et al*., 2019). Coastal areas are more likely to experience hypoxia during summer when high temperatures strengthen salinity stratification (Levin *et al*., 2009). Severe anoxic events can deplete the benthic invertebrate communities and cause a shift in community composition, through attrition of intolerant species and elevated dominance, as well as reductions in body size (Tweedley *et al*., 2015). In general, crustaceans and echinoderms are typically more sensitive to hypoxia, with lower oxygen thresholds, than annelids, molluscs and cnidarians (Levin *et al*., 2009).

Elevated SSC: implications for fish

4.8.7 Increased suspended sediments can lead to physiological effects in adult finfish resulting from the abrasion of sediment particles on gill tissues, causing reduced gill function and possible mortality (Wenger *et al*., 2017; Kjelland *et al*., 2015). Such effects on fish are considered to occur at suspended sediment levels of around 10,000 mg/l (Britwell, 2000). High SSC levels may impact spawning and nursery grounds through damage to eggs and planktonic larvae, as well as causing abrasion or clogging of the fragile gills of larval and juvenile fish, resulting in mortality or reduced growth rates.

4.8.8 Because turbidity often impairs visual acuity, activities and processes that require vision can be inhibited, leading to behavioural responses. For example, foraging in both planktivorous and piscivorous fish can be negatively affected by suspended sediments. Piscivores are especially sensitive to increasing turbidity because many are visual hunters that detect prey from a distance. An increase in suspended sediment reduces both light and contrast, decreasing encounter distances between predator and prey (Wenger *et al*., 2017).

4.8.9 Elevated suspended sediments can also influence the movements and migration of fish with some species have been observed actively avoiding moving through areas with suspended sediment plumes (Wenger *et al*., 2017; Kjelland *et al*., 2015). However, such responses can cease if fish become acclimatised. Fish in high latitude coastal areas typically have to contend with variable turbidity and often poor visual conditions, resulting from fluctuations in ambient light levels, suspended sediments and in the light transmission properties of the water. For example, concentrations as high as 9,000 mg/l have been recorded in the path of salmon runs in the Usk Estuary (Alabaster, 1993). Similarly, lamprey and shad species have been known to successfully pass through estuaries with extremely high suspended sediments and, therefore, can be considered tolerant of turbid conditions (Scottish Government, 2010). The mobile nature of fish species generally allows avoidance of areas of adverse conditions which are unlikely to significantly affect a population provided such conditions are temporary.

4.8.10 The resuspension of sediments containing organic material can cause oxygen depletion within the water column. The subsequent settling of this organic rich sediment can deplete the sediments of oxygen and affect benthic prey items used by fish (Paragraphs 4.8.5and 4.8.6). The response of fish to low concentrations of dissolved oxygen is determined by a range of factors, including the duration of exposure, water temperature and the presence of other pollutants (Wenger *et al*., 2017). The duration of any low dissolved oxygen event is a key factor in determining its effect. Most fish would survive an extremely low concentration of dissolved oxygen, such as 2 mg/l, for a few minutes, but a longer exposure would start to have sub-lethal and eventually lethal effects (ABP Research, 2000).

Summary of effects

Effects on benthic habitats and species

4.8.11 The changes in SSC that are predicted to occur as a result of the capital dredge are presented in detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). The modelling results show that the predicted increases in SSC due to the capital dredging will be localised and temporary.

4.8.12 Naturally very high SSC typically occur year-round in the Humber Estuary, particularly during the winter months when storm events disturb the seabed and on spring tides (Uncles *et al.,* 2006; Cefas, 2016). The estuarine benthic communities recorded on mudflats and the shallow mud occur commonly in this region and are considered tolerant to this highly turbid environment (De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). The predicted SSCs are within the range that can frequently occur naturally and also as a result of ongoing dredge and disposal activity (see Chapter 7 of the ES (Application Document Reference number 8.2.7)).

4.8.13 With respect to dissolved oxygen, increases in SSC will be brief and localised and there is not expected to be a significant reduction in dissolved oxygen nor therefore any implications for benthic species and habitats.

Effects on fish

4.8.14 As highlighted above, migratory fish including lamprey are known to migrate through estuaries with high SSC to get to spawning areas (including the Humber Estuary which is considered one of the estuaries in the UK with the highest levels of SSCs) (Scottish Government, 2010; Wenger *et al*., 2017; Kjelland *et al*., 2015; Uncles *et al.,* 2006; Cefas, 2016). Elevated SSCs due to dredging are considered to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal.

4.8.15 Sediment plumes resulting from dredging will be relatively localised (in the context of the entire width of the estuary). It is considered that they will dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time (less than a single tidal cycle) as described in more detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). It follows, therefore, that salmonids and other migratory fish will also be able to avoid the temporary sediment plumes. Based on these factors there is considered to be limited potential for migrating fish to be adversely affected by the predicted changes in SSC.

4.8.16 Given that elevated SSCs due to dredge are considered to be in the range of variability that can occur naturally in the Humber Estuary (which has very high SSCs year-round, particularly during the winter months) as well as due to ongoing maintenance dredging/disposal and that plumes will be temporary in nature, sensitive life stages of fish occurring in the region such as larvae and juvenile fish are considered unlikely to be adversely affected by the dredging.

4.8.17 With respect to dissolved oxygen, increases in SSC will be brief and localised and there is not expected to be a reduction in dissolved oxygen and therefore a response by fish is not anticipated.

Mitigation

4.8.18 Mitigation is not relevant to this impact pathway and is, therefore, not required.

Assessment of the potential for an AEOI

4.8.19 Based on the evidence provided above and the rationale provided in Table 22, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 22. The potential for an AEOI on qualifying habitats and species due to elevated SSC during capital dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Benthic habitats and species within the local area are considered to be well adapted to high suspended sediment conditions. Elevated SSCs due to dredging are predicted to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated SSCs of this magnitude will also, therefore, not cause any changes to the *'the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	H1140: Mudflats and sandflats not covered by seawater at low tide		
	S1095: Sea lamprey *Petromyzon marinus*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Lamprey regularly migrate through estuaries with very high SSC (including the Humber Estuary). In addition, the elevated SSCs due to dredging are predicted to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.
	S1099: River lamprey *Lampetra fluviatilis*		

Site	Features	Potential AEOI	Justification
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Benthic habitats and species within the local area are considered to be well adapted to high suspended sediment conditions. Elevated SSCs due to dredging are predicted to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated SSCs of this magnitude will also, therefore, not cause any changes to the *'the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Lamprey regularly migrate through estuaries with very high SSC (including the Humber Estuary). In addition, the elevated SSCs due to dredging are predicted to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.

The potential effects of elevated SSC during capital dredge disposal on qualifying habitats and species

General scientific context

4.8.20 Scientific evidence on this impact pathway is provided in Paragraphs 4.8.1 to 4.8.10.

Summary of effects

Effects on benthic habitats and species

4.8.21 The changes in SSC that are predicted to occur as a result of the capital dredge disposal are presented in detail in the Physical Processes assessment set out in Chapter 7 of the ES (Application Document Reference number 8.2.7). In summary, the dredge disposal is predicted to produce peak SSC of around 600 to 800 mg/l above background at the disposal site, reducing to typically 100 to 200 mg/l within a distance of around 7 km from the source. These peak increases are predicted to persist at any given location for a single modelled timestep (10 minutes) before the tidal forcing carries the plume further up or down estuary on the respective flood or ebb tide. SSCs of this magnitude are considered to regularly occur naturally or as a result of ongoing maintenance dredging/disposal. Upstream of Hull and downstream (within the outer estuary), maximum SSC levels are lower; generally, between 20 and 100 mg/l above background, as the tidal excursion from the disposal site limits the extent of the resultant plume. However, in reality due to the existing high SSC that typically occurs in the Humber Estuary, the predicted increase in concentrations resulting from the disposal is likely to become immeasurable (against background) within approximately 1 km of the disposal site. The measurable plume from each disposal operation is also only likely to persist for a single tidal cycle (less than 6 hours from disposal) as after this time the dispersion under the peak flood or ebb tidal flows means concentrations will have reverted to background levels.

4.8.22 Naturally very high SSCs typically occur year-round in the Humber Estuary, particularly during the winter months when storm events disturb the seabed and on spring tides. The estuarine benthic communities recorded within the disposal ground and surrounding area were found to be of low ecological value but are considered characteristic of the ‘Sandbanks which are slightly covered by sea water all the time’ feature. The benthic communities have low sensitivity to increases in suspended sediments and are considered tolerant to this highly turbid environment (De-Bastos and Hiscock, 2016; Tillin, 2016; Ashley, 2016). The predicted SSCs are within the range that can frequently occur naturally and also as a result of ongoing dredge and disposal activity (see Chapter 7 of the ES (Application Document Reference number 8.2.7)).

4.8.23 The disposal of sediment will temporarily increase SSC, however, due to the strong hydrodynamic conditions in the area, these temporary elevations in SSC are expected to dissipate rapidly to background concentrations. With respect to dissolved oxygen, increases in SSC will be brief and localised and there is not expected to be a significant reduction in dissolved oxygen nor therefore any implications for benthic species and habitats.

Effects on fish

4.8.24 The changes in SSC are described in 4.8.21. Migratory species including lamprey are known to migrate through estuaries with high SSC (including the Humber Estuary which is considered one of the estuaries in the UK with the highest levels of SSC) (Uncles *et al*., 2006) and the predicted SSC are within the range that can frequently occur naturally and also as a result of ongoing dredge and disposal activity. Sediment plumes resulting from disposal will also be relatively localised in the context of the entire width of the estuary. Therefore, salmonids and other migratory fish would also be able to avoid the temporary sediment plumes and sensitive life stages of fish occurring in the region such as larvae and juvenile fish are considered unlikely to be adversely affected by the dredging

Mitigation

4.8.25 Mitigation is not relevant to this impact pathway and is not, as a consequence, required.

Assessment of the potential for an AEOI

4.8.26 Based on the evidence provided above and the rationale provided in Table 23, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 23. The potential for an AEOI on qualifying habitats and species due to elevated SSC during capital dredge disposal

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Benthic habitats and species within the local area are considered well adapted to high suspended sediment conditions. Elevated SSCs due to dredging are predicted to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated SSCs of this magnitude will also, therefore, not cause any changes to the *'the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Lamprey regularly migrate through estuaries with high SSC (including the Humber Estuary). In addition, the elevated SSCs due to dredge disposal are considered to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.

Site	Features	Potential AEOI	Justification
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Benthic habitats and species within the local area are considered well adapted to high suspended sediment conditions. Elevated SSCs due to dredging are predicted to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated SSCs of this magnitude will also, therefore, not cause any changes to the *'the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Lamprey regularly migrate through estuaries with high SSC (including the Humber Estuary). In addition, the elevated SSCs due to dredge disposal are considered to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal. On this basis the localised and temporary effects are not considered to cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.

4.9 Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases

The potential effects of the release of contaminants during capital dredging on qualifying habitats and species

General scientific context

Release of contaminants: implications for benthic habitats and species

4.9.1 Benthic habitats and species are sensitive to toxic contamination (where concentrations of contaminants exceed sensitivity thresholds). Toxic contamination during construction can occur as a result of the release of synthetic contaminants such as fuels and oils or through the resuspension of sediment as a result of the disturbance of the seabed which can lead to the release and mobilisation of sediment-bound contaminants into the water column. These include both toxic contaminants, such as heavy metals, pesticides and hydrocarbons, and non-toxic contaminants, such as nutrients. In particular, there is a risk that any uncontrolled releases of materials or sediments into the water column could make contaminants temporarily available for uptake by marine organisms. Over the longer-term any such releases could also become stored in the surface sediments of benthic habitats for future benthic uptake.

4.9.2 Suspension-feeding organisms may be particularly vulnerable to pollutants in the water column due to their dependence on filtration (Tillin *et al*., 2019). High levels of chemical contaminants can potentially cause genetic, reproductive and morphological disorders in marine species. Contaminants may also have combined effects. Studies have suggested links between contamination with polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCBs), amines and metals and a range of disorders (MacDonald and Ingersoll, 2010). Increased incidence of tumours, neoplasia, deoxyribonucleic acid (DNA) damage, polyploidy, hypoploidy, hermaphroditism and reduced immune response have all been reported in marine invertebrates in areas of high levels of pollution (Hannam *et al.,* 2010; Catalano *et al.,* 2012; Hesselman *et al.,* 1988; Nacci and Jackim, 1989; Schaeffer, 1993; Barsiene, 1994). Another highly researched pollutant is Tributyltin (TBT), which has toxic effects in a wide variety of biota, whereas inorganic tin is less toxic. TBT effects include lethal toxicity and effects on growth, reproduction, physiology, and behaviour. Several of the negative effects are due to interferences with the endocrine function, as occurs in the phenomenon imposex. Imposex is the superimposition of male organs onto females of gastropods, which are normally a dioecious species (Borja *et al.,* 2012).

4.9.3 Sub-lethal effects of chemical contamination on marine invertebrates can reduce the fitness of individual species. Lethal effects may allow a shift in community composition to one dominated by pollution-tolerant species such as oligochaete worms (Elliott *et al.,* 1998). A reduction in community species richness is associated with elevated levels of pollutants. Contamination with PAHs, for example, leads to high levels of mortality in amphipod and shrimp species, and decreased benthic diversity (Long *et al.,* 1995). Similar reductions in diversity are linked with heavy metal contamination (Dauvin, 2008). Polychaete worms are thought to be quite tolerant of heavy metal contamination, whereas crustaceans and bivalves are considered to be intolerant (Rayment, 2002).

Release of contaminants: implications for fish

4.9.4 The potential release of contaminants during construction and dredging activities may result in those contaminants becoming available for uptake by any fish in the water column or on surface sediments. There is an indirect risk to some finfish species as sediment-bound contaminants may temporarily bioaccumulate in the tissues of certain fish prey, such as polychaete worms and marine bivalves, and made available for uptake by feeding fish.

4.9.5 The influence of contaminated sediments is considered to have a greater impact on fish than elevated SSC with a range of evidence suggesting that direct exposure to contaminants negatively effects fish (Wenger *et al*., 2017). Hydrophobic contaminants (such as legacy persistent organic pollutants including PCBs and organochlorine pesticides) as well as high-molecular weight polyaromatic and aliphatic hydrocarbons (such as PAHs), are closely associated with organic material in sediments. These contaminants have been linked to a range of potential reproductive impacts on adult fish (e.g., steroidogenesis, vitellogenesis, gamete production or spawning success) as well as lethal and non-lethal developmental (spinal and organ development, growth) impacts on embryos and larvae (Johnson *et al.,* 2014).

4.9.6 Demersal fish species, such as dab and flounder, which remain close to the seabed and feed mainly on benthic organisms, would experience a higher exposure to contaminated sediments than pelagic fish such as herring.

Summary of effects

Effects on benthic habitats and species

4.9.7 The potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere. However, it should be noted that the majority of material disturbed during capital dredging works will be lifted from the bed to the hopper/barge, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the draghead/bucket).

4.9.8 Sampling and subsequent chemical analysis has been undertaken in accordance with the agreed MMO sample plan. The results of this analysis are summarised in more detail in Chapter 8 of the ES (Application Document Reference number 8.2.8) and show the majority of contaminants in the sediments of the proposed dredge area are at relatively low concentrations, mostly below, or marginally exceeding, Cefas Action Level 1 (AL1). There were no exceedances of Action level 2 (AL2) in any sediment samples analysed.

4.9.9 Based on the chemical analysis, there are low levels of contamination in sediments in the proposed dredge area. Only a small proportion of disturbed material is expected to be raised into suspension and this material will be rapidly dispersed by strong tidal currents in the area. Significant elevations in the water column contamination are, therefore, not anticipated. Based on these factors, the benthic communities would have no or very limited exposure to contaminants and not at concentrations of contaminants that would constitute a lethal or sub-lethal effect. The effects on subtidal and intertidal benthic communities from the release of contaminants during capital dredging is considered inconsequential.

Effects on fish

4.9.10 As described in Paragraph 4.9.8 low levels of contamination were found in the sediment contamination samples. Significant elevations in the concentrations of contaminants within the water column are not anticipated. Based on these factors, it is unlikely that fish including lamprey species would be exposed to elevated levels of contaminants during capital dredging and therefore effects on fish species are unlikely.

Mitigation

4.9.11 Mitigation is not relevant to this impact pathway and is not, as a consequence, required.

Assessment of the potential for an AEOI

4.9.12 Based on the evidence provided above and the rationale provided in Table 24 the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 24. The potential for an AEOI on qualifying habitats and species the release of contaminants during capital dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on existing available information summarised above, the overall level of contamination in the proposed dredge area is considered to be low with only a small proportion of disturbed material expected to be raised into suspension. This material will be rapidly dispersed by strong tidal currents in the area. Significant elevations in the water column contamination are, therefore, not anticipated. Based on these factors, the magnitude of change to marine habitats and species is considered to be negligible. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated contamination levels of this magnitude will also not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on existing available information summarised above, the localised and temporary potential changes are considered to cause negligible effects in lamprey and will not cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives. This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.

Site	Features	Potential AEOI	Justification
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on existing available information summarised above, the overall level of contamination in the proposed dredge area is considered to be low with only a small proportion of disturbed material expected to be raised into suspension. This material will be rapidly dispersed by strong tidal currents in the area. Significant elevations in the water column contamination are, therefore, not anticipated. Based on these factors, the magnitude of change to marine habitats and species is considered to be negligible. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated contamination levels of this magnitude will also not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to '*the supporting processes on which qualifying natural habitats rely'* conservation objectives.
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on existing available information summarised above, the localised and temporary potential changes are considered to cause negligible effects in lamprey and will not cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives. This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.

The potential effects of the release of contaminants during capital dredge disposal on qualifying habitats and species

General scientific context

4.9.13 Scientific evidence on this impact pathway is provided in Paragraphs 4.9.1 to 4.9.6.

Summary of effects

Effects on benthic habitats and species

4.9.14 As described in Paragraph 4.9.8 low levels of contamination were found in the sediment contamination samples and there is no reason to believe the sediment will be unsuitable for disposal in the marine environment.

4.9.15 During disposal, sediment will be rapidly dispersed in the water column. Therefore, the already low levels of contaminants in the dredged sediments will be dispersed further. The probability of changes in water quality occurring at the disposal site is considered to be low. The material will be rapidly dispersed by strong tidal currents in the area. Significant elevations in the water column contamination are, therefore, not anticipated. Based on these factors, the benthic communities at the disposal site would have no or very limited exposure to contaminants and not at concentrations of contaminants that would constitute a lethal or sub-lethal effect. The effects on subtidal and intertidal benthic communities from the release of contaminants during capital dredge disposal is considered inconsequential.

Effects on fish

4.9.16 Significant elevations in the concentrations of contaminants within the water column are not anticipated (Paragraph 4.9.14). Based on these factors, it is unlikely that fish would be exposed to elevated levels of contaminants during capital dredge disposal and therefore effects on fish species are unlikely.

Mitigation

4.9.17 Mitigation is not relevant to this impact pathway and as a consequence, is not required .

Assessment of the potential for an AEOI

4.9.18 Based on the evidence provided above and the rationale provided in Table 25, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 25. The potential for an AEOI on qualifying habitats and species the release of contaminants during capital dredging disposal

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Given the low levels of contamination found in the samples and the high level of dispersal expected as the disposal sites, subtidal habitats and species found in the vicinity of the disposal sites are not expected to be vulnerable to the potential release of sediment bound contaminants which could occur as a result of the disposal of the capital dredged arisings. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated contamination levels of this magnitude will also not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to 'the supporting processes on which qualifying natural habitats rely' conservation objectives.
	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on existing available information summarised above, the localised and temporary potential changes are considered to cause negligible effects in lamprey and will not cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives. This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying*

Site	Features	Potential AEOI	Justification
			features' or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Given the low levels of contamination found in the samples and the high level of dispersal expected as the disposal sites, subtidal habitats and species found in the vicinity of the disposal sites are not expected to be vulnerable to the potential release of sediment bound contaminants which could occur as a result of the disposal of the capital dredged arisings. On this basis the localised and temporary effects are not considered to cause changes to '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species*' conservation objective. Elevated contamination levels of this magnitude will also not cause any changes to the '*the structure and function of qualifying natural habitats*' or cause modifications to 'the supporting processes on which qualifying natural habitats rely' conservation objectives.
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Based on existing available information summarised above, the localised and temporary potential changes are considered to cause negligible effects in lamprey and will not cause changes to '*the population of each of the qualifying features'* or the '*distribution of the qualifying features within the site'* conservation objectives. This pathway would also not cause any changes to '*the extent and distribution of the habitats of the qualifying features'* or the '*supporting processes on which the habitats of the qualifying features rely'* conservation objectives.

4.10 Airborne noise and visual disturbance

The potential effects of airborne noise and visual disturbance during construction on qualifying species

General scientific context

Introduction

4.10.1 Disturbance can cause birds to cease feeding, which can decrease the total amount of time available for feeding, as well as disrupting other behaviour such as breeding (Coleman *et al.*, 2003; Martín *et al.*, 2014). Where disturbance causes birds to take flight, it can increase energy demands and may increase food consumption by decreasing the available habitat area (Goss-Custard, 2020; Linssen *et al*., 2019; Stillman *et al.*, 2007). Repetitive disturbance events can result in possible long-term effects such as loss of weight, condition and a reduction in reproductive success, leading to population impacts (Durell *et al*., 2005; Goss-Custard *et al.*, 2006; Belanger and Bedard, 1990). Birds typically show a dispersive response to disturbance with prolonged disturbance causing displacement (Goss-Custard, 2020; Dwyer, 2010; Navedo and Herrera, 2012).

4.10.2 Disturbance often occurs through a combination of simultaneous visual and noise stimuli, although some occurrences may be through separate visual or noise stimuli (Wright *et al.*, 2013). Birds will also vary their response to human activities depending on the type of the activity, the noise produced, the speed and randomness of approach, the distance to which the disturbance factor approaches and the frequency of disturbance (Burton *et al*., 2002a., Rees *et al*., 2005; Liley *et al*., 2010; Coleman *et al.*, 2003; Ruddock and Whitfield, 2007; Stillman *et al.*, 2012).

Disturbance responses associated with construction activity

4.10.3 Construction activity in the coastal zone may lead to disturbance which has the potential to cause a reduction in foraging activity as well as temporary displacement from a localised area around the works (Burton *et al.*, 2002a).

4.10.4 Overall, responses to construction noise and activity appear to initiate similar or less disturbance than that of human presence on the foreshore (e.g., recreation) (ERM, 1996; ABPmer, 2013; IECS, 1997; IECS, 2013). For example, while some localised disturbance was caused as a result of piling activity as part of the construction work for ABB Power Generation Ltd (Pyewipe, Grimsby), this was not considered to have a major effect on surrounding bird populations and was found to be no greater than the effect arising from third party disturbance, including walkers and stopped cyclists, which were unrelated to the ABB works (ERM, 1996). The greater effect of human presence as opposed to general construction works and machinery is also supported by IECS (1997), in that a person approaching feeding birds on the mudflat caused birds to fly when the person was approximately 300 m from the birds, whereas machinery could approach birds up to 50 m before the birds moved away.

4.10.5 Lower levels of disturbance for construction activities compared with other nearby human activity was also observed during bird monitoring as part of the marine licensing consent for a quay wall construction development at the Port of Southampton. The study evaluated the disturbance effects of the extension work on waterbird species using the mudflat habitat on Bury Marsh opposite the Port of Southampton (approximately 100 to 200 m away) during the overwinter period. No bird disturbance behaviour (such as startling, rapid flight or abruptly stopping foraging) was observed during periods of percussive piling activity. However, disturbance to waterbirds was observed on several occasions due to vessels and kayaks within 50 m of Bury Marsh (ABPmer, 2013).

4.10.6 Studies into the distances from activities that evoke a disturbance response (or flight initiation distance (FID)) suggest that for most coastal works and other foreshore activity in areas where birds are likely to be habituated to some extent to disturbance due to existing anthropogenic activity, disturbance behaviour is not typically observed when activities occur more than some 200 m away from a source with the reactions of many species occurring between 20 and 100 m (ABPmer, 2002; Ruddock and Whitfield, 2007; IECS, 2009a; Wilson, 2009; IECS, 2009b; Dwyer, 2010; IECS, 2013; Ross and Liley, 2014; Collop *et al*., 2016; Goodship and Furness, 2019; Goodship and Furness, 2022; ABPmer, 2013). This is discussed in more detail in **Table 26**.

4.10.7 Construction techniques which are known to cause loud source noise levels (such as piling) have been the subject of a number of disturbance monitoring studies which have investigated the relationship between activity source levels and the disturbance responses elicited by birds (IECS, 2009a; Xodus, 2012; Wright *et al.*, 2013; ABPmer, 2002; IECS, 2013). Research suggests that irregular construction noise at levels typically above 70 dB can cause behavioural responses in some waterbird species with flight responses generally occurring above 80 dB (Table 26. However, responses of birds will be dependent on a range of site-specific factors including ambient (background) noise levels, time of year, levels of existing activity and the species assemblage. In addition, visual disturbance associated with construction activity will often create a disturbance effect before any associated noise starts to have an effect (IECS, 2013).

4.10.8 Birds generally appear to habituate to continuous noise as long as there is no large amplitude 'startling' component (Hockin *et al.*, 1992). With specific respect to piling, it has been concluded that although piling has the potential to create most noise during construction; it often consists of rhythmic "bangs", which birds might become accustomed to depending on the distance that birds are away from the piling (ABP Research, 2001). For example, observations as part of the construction work for ABB Power Generation Ltd (Pyewipe) suggested that it was the initial sudden bang during piling activities, which caused some localised disturbance, and that subsequent bangs typically resulted in reduced disturbance, demonstrating habituation (ERM, 1996).

Table 26. Summary of noise disturbance studies

Study	Summary
IECS, 2009a; IECS, 2009b	A study of coastal construction noise effects on the Humber Estuary was undertaken based around the measurement of noise levels while simultaneously monitoring the behavioural response by birds during flood defence works at Saltend. The defence works involved the use of a double hydraulic pile on site. The study noted a moderate to high behavioural response to irregular piling noise above 70 dB and a moderate response to regular piling noise below 70 dB. A flight response was noted to occur during works generating noise at between 80-85 dB. Behavioural responses, notably the down-shore movements of wildfowl were noted above 70 dB. Noise levels between 55 dB and 84 dB were generally accepted by birds. Other impacts associated with construction included a high response to personnel and plant equipment on the mudflat and a moderate to high response to personnel and plant equipment on the seaward toe and crest. Occasional movement of a crane jib and load resulted in a low to moderate response. Noises below 50 dB, long-term plant activities only on the crest and activity behind the flood bank elicited a low response.
Xodus, 2012	Monitoring of birds as part of the Grimsby River Terminal Project found that noise from construction (including piling) caused only 1 % of the disturbance events observed, with large disturbances mainly caused by the presence of raptors, aircraft and helicopters. The study concluded that percussive piling noise less than 66 dB LA_{max} F gave rise to no disturbance, whilst a mild behavioural response (such as heads up alert, short walk or swimming) was observed to occur in the range of 73 to 81 dB LA_{max} F. Percussive piling noise over 83 dB LA_{max} F was considered likely to evoke a flight response.
Wright *et al.*, 2013	The experimental study intentionally disturbed birds at a high tide roost site, on the south bank of the Humber estuary using an impulsive sound similar to that associated with noise from port and power generation construction such as percussive piling and recorded the behavioural responses. Lapwing appeared to be the species most sensitive to intentional disturbance, while Curlew was the most tolerant. The study recommended that impulsive noise limits should be restricted to < 69.9 dB at the site.
ABPmer, 2002	Disturbance monitoring of waterbirds in the vicinity of construction works (piling and dredging) at the ABP Teignmouth Quay Development concluded that sudden noise in the region of 80 dB appears to elicit a flight response in waders up to 250 m from the source, with levels of approximately 70 dB causing flight or anxiety behaviour in some species.

Species sensitivity and responses

4.10.9 The level of response to potential disturbance stimuli also varies considerably between species with some ducks (such as Shelduck) and larger waders such as Curlew and godwits generally showing stronger responses to disturbance stimuli than smaller waders (such as Turnstone and Dunlin) (Collop *et al*., 2016; Goodship and Furness, 2022; Calladine *et al*., 2006; IECS, 2013; Goodship and Furness, 2019; Davidson and Rothwell, (1993)). A detailed review of the responses and sensitivity of key waterbird species to noise and visual disturbance is presented in Table 27. This includes data on FID which is the distance at which a bird takes flight in response to a perceived danger and is used to help better understand the relative sensitivity of different species to disturbance.

4.10.10 The response to disturbance is also dependant on the previous experience of the birds to disturbance (i.e., level of habituation) as well as a range of other factors such as environmental conditions, their state at the time of the disturbance (e.g., hungry or satiated) and the quality of their alternative foraging sites (Gill *et al.*, 2001; Mullner *et al.*, 2004; IECS, 2009a; Collop *et al.* 2016).

4.10.11 It is also important to understand potential behavioural responses of disturbance in the context of energetic costs, mortality and population consequences as some disturbance has been shown to have limited adverse effects on waterbirds. For example, Goss-Custard *et al*. (2006) used an individual-based behavioural model to establish critical thresholds for the frequency with which wading birds can be disturbed before they die of starvation. The model was tested on oystercatchers in the Baie de Somme, France, where birds were put to flight by disturbance up to 1.73 times/daylight hour. The modelling results showed that the birds could be disturbed up to 1.0 to 1.5 times/h before their fitness was reduced in winters with good feeding conditions (abundant cockles and mild weather) but only up to 0.2 to 0.5 times/h when feeding conditions were poor (scarce cockles and severe winter weather).

4.10.12 Collop *et al.* (2016) looked into the likely consequences of different frequencies of disturbance on various wading birds, using their data on mean flight time and mean total time lost. The authors found that a 5 % reduction in birds' daily available feeding time would be expected to result from responding to between 38 and 162 separate disturbance events (depending on species and tidal stage). The mean cost per individual flight response represented less than a tenth of a per cent of each species' daily energy requirements. The study concluded that the energetic costs of individual disturbance events were low relative to daily requirements and unlikely to be frequent enough to seriously limit foraging time.

Table 27. Summary of evidence of the sensitivity for different key species to noise and visual disturbance stimuli

<table>
<tr><th rowspan="2">Species</th><th colspan="2">Sensitivity to noise and visual disturbance</th></tr>
<tr><th>Evidence on the sensitivity to disturbance stimuli</th><th>Sensitivity level[1]</th></tr>
<tr><td>Shelduck</td><td>Shelduck are generally a wary species and are considered particularly sensitive to visual disturbance. Typically, they approach construction works no closer than 300 m and can be affected by visual disturbance up to 500 m away from source (IECS, 2013).

Noise disturbance has been reported from 72 dB upwards for Shelduck. However, the species is subject to a high degree of habituation and further exposure to sounds of the same or greater level can lead to no response to stimuli. No response has been recorded for noise levels as high as 88 dB but this is likely to be an extreme 'no response' level and caution should be exercised at receptor levels over 70 dB. Observation of disturbance responses from flood protection works has suggested that Shelduck react to noise in approximately 30 % of exposure events to sudden noise above 60 dB or any noise above 70 dB (IECS, 2013).

Goodship and Furness (2022) assessed Shelduck as having a high sensitivity to human disturbance with the range in mean FID from the literature reviewed of 36 m to 250 m as a result of the presence of people on or near the foreshore although FIDs up to 700 m have been recorded.

Goodship and Furness (2019) undertook a disturbance literature review and assessed Shelduck as one of the species considered most sensitive to disturbance stimuli with the range in mean FID from the literature reviewed of 148 m to 250 m as a result of the presence of people on or near the foreshore.</td><td>Moderate to high</td></tr>
<tr><td>Curlew</td><td>Research evidence indicates that Curlew are a cautious species that does not habituate to works rapidly and are also particularly intolerant of people, allowing approach to a range of typically 120-300 m before flushing (IECS, 2013; Lausen et al.,2005).

Goodship and Furness (2022) assessed Curlew as having a high sensitivity to human disturbance with the with the range in mean FID from the literature reviewed of 38 m to</td><td>Moderate to high</td></tr>
</table>

Species	Sensitivity to noise and visual disturbance	
	Evidence on the sensitivity to disturbance stimuli	**Sensitivity level[1]**
	340 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 140 m and motorised vehicles 188 m. Collop *et al., (*2016) recorded a minimum FID of 88 m and a maximum FID of 570 m (with a mean of 340 m) for this species through experimentally disturbing foraging birds (approaching a total of 39 times) as part of a research study. Goodship and Furness (2019) undertook a disturbance literature review and assessed Curlew as one of the species considered most sensitive to disturbance stimuli with the range in mean FID from the literature reviewed of 38 m to 340 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 140 m.	
Black-tailed Godwit	Data on the responses of Black-tailed Godwit to disturbance in the UK is limited although disturbance responses have been recorded within 100-250 m of construction activity (IECS, 2013). Goodship and Furness (2022) found evidence of FIDs between 20 and 150 m as a result of presence of people on or near the foreshore from the literature reviewed in the study.	Moderate to high
Bar-tailed Godwit	Bar-tailed Godwit can be a relatively disturbance tolerant species that habituates to works rapidly (allowing an approach range of as close as 40-100 m before flushing). However, despite this tolerance, Bar-tailed Godwits can abandon highly disturbed areas in favour of quieter areas to forage and roost. For example, direct observation of disturbance responses by the species to flood defence works found the species did not forage within 200 m of the activity, despite foraging being actively pursued beyond this range, suggesting that they had actively vacated the area close to the works. This is consistent with previous research findings (IECS. 2013). Collop *et al., (*2016) recorded a minimum FID of 32 m and a maximum FID of 225 m (with a mean of 84 m) for this species through experimentally disturbing foraging birds (approaching a total of 92 times) as part of a research study.	Moderate

Species	Sensitivity to noise and visual disturbance	
	Evidence on the sensitivity to disturbance stimuli	Sensitivity level[1]
	Goodship and Furness (2019) and Goodship and Furness (2022) undertook disturbance literature reviews and assessed Bar-tailed Godwit as being of moderate sensitivity to disturbance stimuli with the range in mean FID from the literature reviewed of 22 m to 219 m as a result of the presence of people on or near the foreshore.	
Oystercatcher	Oystercatchers are relatively tolerant of disturbance stimuli and will habituate rapidly to ongoing activity. In undisturbed areas they will often flush at great ranges but in more disturbed locations such as a typical estuary, this figure reduces to typically between approximately 25-200 m dependent upon the stimuli (with people causing the most extreme reaction) (IECS, 2013). Collop *et al., (*2016) recorded a minimum FID of 30 m and a maximum FID of 228 m (with a mean of 97 m) for this species through experimentally disturbing foraging birds (approaching a total of 147 times) as part of a research study. Goodship and Furness (2019) and Goodship and Furness (2022) undertook disturbance literature reviews and assessed Oystercatcher as being of moderate sensitivity to disturbance stimuli with the range in mean FID from the literature reviewed of 26 m to 136 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 74 m and motorised vehicles a mean FID of 106 m.	Moderate
Redshank	Redshank are considered a relatively tolerant species to visual stimuli (and will often approach much closer than 100 m before flushing (sometimes as close as 30-50 m)) but can be sensitive to noise stimuli, They are also considered to habituate to works rapidly (IECS, 2013). Collop *et al., (*2016) recorded a minimum FID of 28 m and a maximum FID of 187 m (with a mean of 80 m) for this species through experimentally disturbing foraging birds (approaching a total of 53 times) as part of a research study.	Low to moderate

Species	Sensitivity to noise and visual disturbance	
	Evidence on the sensitivity to disturbance stimuli	Sensitivity level[1]
	Goodship and Furness (2022) assessed Redshank as having a moderate sensitivity to human disturbance with the range in mean FID from the literature reviewed of 4 to 150 m as a result of the presence of people on or near the foreshore. Goodship and Furness (2019) undertook a disturbance literature review and assessed Redshank as being relatively sensitive to disturbance stimuli with the range in mean FID from the literature reviewed of 24 m to 137 m as a result of the presence of people on or near the foreshore.	
Knot	Knot appear to be a species relatively tolerant to visual stimuli and are considered to habituate relatively rapidly to people although disturbance responses have been recorded within <75-100 m of visual stimuli. However, Knot are considered quite sensitive to noise stimuli, especially in conjunction with visual stimuli. Knot have been recorded foraging close to plant (<50 m) and to workers (>75 m), (IECS, 2013). Collop *et al., (*2016) recorded a minimum FID of 20 m and a maximum FID of 240 m (with a mean of 72 m) for this species through experimentally disturbing foraging birds (approaching a total of 78 times) as part of a research study. Goodship and Furness (2022) assessed Knot as having a moderate sensitivity to human disturbance with the range in mean FID from the literature reviewed of 21 to 74 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 200 m.	Low to moderate
Mallard	Mallard are considered a relatively tolerant species and will habituate rapidly to activity with most responses considered to occur within 200 m or less. There is very little information on the effects of noise disturbance on Mallard but direct disturbance observation of piling recorded two incidents of Mallards reacting to noise (heads-up response) at levels of 69dB and 71dB although higher noise generation instances c.	Low to moderate

Species	Sensitivity to noise and visual disturbance	
	Evidence on the sensitivity to disturbance stimuli	Sensitivity level[1]
	80dB had no observed response to loafing and foraging birds in a moderately 'noisy' tidal freshwater site on a busy navigation (IECS, 2013). Goodship and Furness (2019) and Goodship and Furness (2022) undertook disturbance literature reviews and assessed Mallard as being of moderate sensitivity to disturbance stimuli with the range in mean FID from the literature reviewed of 13 m to 236 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 110 m.	
Dunlin	Dunlin appear to be a species relatively tolerant to visual stimuli and are considered to habituate to people with most responses occurring in <75-100 m of visual stimuli. Dunlin have been recorded foraging extremely closely to plant (<50 m) and >75 m from worker. When foraging, they can be initially disturbed by activity start-up, with a flight response, but will then forage back towards construction works, approaching to within 25 m on occasion, before sometimes flushing and moving away again, to repeat the process (IECS, 2013). Collop *et al., (*2016) recorded a minimum FID of 9 m and a maximum FID of 194 m (with a mean of 44 m) for this species through experimentally disturbing foraging birds (approaching a total of 117 times) as part of a research study (IECS, 2013). Goodship and Furness (2019) and Goodship and Furness (2022) undertook disturbance literature reviews with the evidence reviewed suggesting that Dunlin is less sensitive to disturbance than many other waders with the range in mean FID from the literature reviewed of 39 m to 163 m as a result of the presence of people on or near the foreshore.	Low
Turnstone	Turnstone are considered not very sensitive to noise stimuli and habituate rapidly, especially in conjunction with visual stimuli. They are tolerant of people/workers and plant, allowing approach as close as 30-50 m before flushing. Direct observation of disturbance effects from works found Turnstone responses to be consistent with the expected high tolerance, with birds allowing approach to works to within 10 m before	Low

<table>
<tr><th rowspan="2">Species</th><th colspan="2">Sensitivity to noise and visual disturbance</th></tr>
<tr><th>Evidence on the sensitivity to disturbance stimuli</th><th>Sensitivity level[1]</th></tr>
<tr><td></td><td>reacting. This was in a highly disturbed area with much public use of the foreshore and of 127 potential disturbance events observed, only 19 caused reaction of which only 3 were caused by the works with trucks flushing Turnstones at between 15-100m. Walkers (and dog walkers in particular) caused the greatest reactions. There was no evidence of reactions to noise, which reached levels above 90 dB due to piling (IECS, 2013).

Collop et al., (2016) recorded a minimum FID of 5 m and a maximum FID of 75 m (with a mean of 32 m) for this species through experimentally disturbing foraging birds (approaching a total of 40 times) as part of a research study.

Goodship and Furness (2019) undertook a disturbance literature review with the evidence suggesting that Turnstone is less sensitive to disturbance than many other waders with the range in mean FID from the literature reviewed of 12.5 m to 39 m as a result of the presence of people on or near the foreshore.</td><td></td></tr>
<tr><td>Ringed Plover</td><td>Ringed Plover are considered to be tolerant species to disturbance that habituates to anthropogenic activities rapidly and appear not to be very sensitive to noise or visual stimuli (often allowing approach as close as 30-50 m to workers/people or plant before flushing) (Lausen et al.,2005; IECS, 2013). Research has found that at distances of over 100 m from activity, birds rarely showed any sign of disturbance and appeared often unperturbed when other species in their vicinity were reacting (IECS, 2013).

Collop et al., (2016) recorded a minimum FID of 29 m and a maximum FID of 74 m (with a mean of 41 m) for this species through experimentally disturbing foraging birds (approaching a total of 30 times) as part of a research study.</td><td>Low</td></tr>
<tr><td colspan="3">1. The assigned sensitivity levels have been based on available evidence with respect to responses to disturbance stimuli. For some species a range in sensitivity has been presented where evidence suggests large variations in intraspecific responses due to various factors which could influence sensitivity (such as the type of activity, site specific factors such as habituation, environmental conditions and site fidelity etc). Where information is limited a precautionary sensitivity level has been assigned.</td></tr>
</table>

Review summary

4.10.13 Within the construction site, the level of disturbance stimuli is dependent on the type of activity being undertaken. In general, human presence on or near the foreshore (e.g., walking) is considered to cause greater disturbance than vehicles or watercraft and waterbirds are more easily disturbed by irregular movements than the regular and defined presence of machinery, vessels and other vehicles (IECS, 1997; ABPmer, 2013; McLeod, *et al.* 2013; Guay *et al.* 2014; Glover *et al.* 2015). High level responses to noise (such as dispersal away from marine works) are typically associated with sudden or irregular noise over 70-80 dB (at the receiver (i.e., bird) location not the noise source) (IECS, 2009a; Xodus, 2012; Wright *et al*., 2013; ABPmer, 2002; IECS, 2013).

4.10.14 The specific responses that waterbirds will have to disturbance varies between species as well as between birds of the same species due to a range of factors including the level of habituation and environmental conditions (Gill *et al.,* 2001; Mullner *et al.,* 2004; IECS, 2009a; Collop *et al.* 2016).

4.10.15 Distances over 300 m have been recorded more occasionally for some sensitive species such as Curlew or Shelduck (IECS, 2013; Collop *et al*. 2016; Goodship and Furness, 2019; Goodship and Furness, 2022). However, evidence from the detailed review above suggests that waterbirds generally show a flight response to anthropogenic activities such as construction and a presence of people (such as workers) on or near the foreshore at distances of typically less than 200 m (and more typically between 20 m and 100 m for certain species such as Turnstone or Dunlin) in areas where birds are likely to be habituated to some extent to disturbance due to existing human activity (ABPmer, 2002; Ruddock and Whitfield, 2007; IECS, 2009a; Wilson, 2009; IECS, 2009b; Dwyer, 2010; IECS, 2013; Ross and Liley, 2014; Goodship and Furness, 2022; Collop *et al*., 2016; Goodship and Furness, 2019; ABPmer, 2013).

Summary of effects (without mitigation)

4.10.16 The bird data suggest that the foreshore immediately fronting the proposed development (i.e. the section of Sector B effectively representing that part of the port's frontage between the Inner Dock entrance and IOT Jetty) is regularly used by 500 to 800 birds for feeding during the winter months (October to March) (see Table 9.19 and Figure 9.10 in Chapter 9 of the ES (Application Document Reference number 8.2.9) with the species recorded in the largest numbers including Black-tailed Godwit, Dunlin, Redshank, Shelduck, Turnstone and Curlew (see Table 28). Other species recorded include Bar-tailed Godwit, Knot, Oystercatcher, Ringed Plover, Teal and Mallard (see Figure 9.10 to the ES (Application Document Reference number 8.3.9 (j)) and Table 9.19 and Table 9.24 of Chapter 9 of the ES

(Application Document Reference number 8.2.9))[21]. It should be noted that data collected in passage months recorded broadly similar peak counts of Black-tailed Godwit, Redshank, Curlew, Oystercatcher and Turnstone and generally lower numbers of other species such as Dunlin and Shelduck (see Table 9.20 of Chapter 9 of the ES).

Table 28. The 5-year mean peak (2017/18 to 2021/22) for key species of birds in Sector B and % of the mean peak as a proportion of the current estuary-wide WeBS 5-year mean peak.

Species	Mean Peak	Mean peak as a % of the current estuary-wide WeBS 5-year mean peak [1]
Bar-tailed Godwit	15	< 1 %
Black-tailed Godwit	574	13 %
Curlew†	12	< 1 %
Dunlin	387	2%
Knot	8	< 1 %
Mallard†	5	< 1 %
Oystercatcher†	9	< 1 %
Redshank	171	6 %
Ringed Plover†	5	< 1 %
Shelduck	76	2 %
Teal†	14	< 1 %
Turnstone†	29	12 %

SPA qualifying species highlighted in **bold.** † Species with this symbol are included within the SPA waterfowl assemblage.

1. The latest Humber Estuary WeBS Core Counts 5-year average from 2015/16 to 2019/20 (Frost *et al*., 2021) has been used in this assessment. It should be noted that as a result of COVID-19 lockdowns, the BTO were unable to undertake comprehensive counts and therefore produce robust data for 2020/21 at an estuary-wide scale and therefore the period 2015/16 to 2019/20 is the most recent 5 years of data available from the BTO.

4.10.17 The evidence reviewed above suggests that the response of waterbirds to disturbance stimuli is relatively limited at distances over 200 m (see Paragraphs 4.10.3 to 4.10.16), particularly in areas subject to already high levels of existing anthropogenic activity (as found in the Port of Immingham area).

21 The highest densities of feeding and roosting birds in Sector B typically occur on the intertidal mudflats in the eastern section of the foreshore fronting Immingham Docks (from the lock gate towards the IOT Jetty). Very low numbers of waterbirds have been recorded west of the lock gate with flocks of Turnstone (which often show a preference for the sea defence/mud interface in this area) and occasional individuals of Dunlin, Curlew and Redshank recorded. It should also be noted that the foreshore to the east of the IOT jetty within approximately 300 m of the proposed development is used by very low numbers of birds based on data collected as part of the IOH ornithological monitoring of Sector C (which overlaps with this area). Observations from these surveys has recorded typically less than a total of 10 birds with individuals or small flocks of mainly Redshank, Curlew and Oystercatcher occurring.

4.10.18 With specific respect to noise stimuli, Natural England provided advice as part of the consultation for the IERRT project which stated that '*peak levels below 55 dBA can be regarded as not significant, while peak noise levels approaching 70dBA and greater are most likely to cause an adverse effect.' Therefore, levels over 65.5 dBA may cause disturbance to SPA birds. Birds may habituate to regular noise below 70 dBA, but irregular above 50 dBA should be avoided*'. It is also worth noting that visual disturbance associated with anthropogenic activity will in some situations create a disturbance effect before any associated noise starts to have an effect particularly in those species sensitive to visual stimuli (McLeod *et al.,* 2013; Smit and Visser, 1993; IECS, 2013).

4.10.19 Ambient noise levels on the foreshore around the Port of Immingham are shown in Table 14.20 in the Airborne Noise and Vibration assessment set out in Chapter 14 of the ES (Application Document Reference number 8.2.14). Unattended noise measurements over five days in July 2022 suggest a range of 42 to 58 dB *L*Aeq,1hr and the existing range of *L*max noise levels is 48 to 84 dB *L*max. During percussive piling associated with the proposed development, noise levels above 70 dB *L*max are predicted within approximately 1.8 km of the piling rigs and over 80 dB *L*max within approximately 600 m in the absence of noise reducing controls.

4.10.20 The assessment has been based on consideration of a 200 m potential disturbance zone and noise levels provided by Natural England described above.

4.10.21 During construction, disturbance could potentially occur as a result of the following activities:

- Capital dredging:
- Construction of the outer finger pier; and
- Construction of the approach jetty and inner finger pier.

4.10.22 Each one of these activities is described in more detail below. In order to better understand potential zones of disturbance, Figures 9.11, 9.12 and 9.13 to the ES (Application Document Reference numbers 8.3.9 (k), 8.3.9 (l) and 8.3.9 (m)) present a 200 m buffer zone which is considered relatively precautionary in terms of zones of potential effects . The figures also shows MLWS and MLWN so that the extent of foreshore within and outside of these buffers under different tidal states can be better understood.

Capital dredging

4.10.23 Evidence suggests most disturbance events from powered vessels have been recorded within 100 m of the receptor with vessels approaching at faster speeds eliciting higher disturbance (Rodgers and Schwikert, 2002; Burger and Gochfield, 1998; Schwemmer *et al*., 2011; Glover *et al*., 2015). The dredging vessel will be operating at slow speeds when undertaking the capital dredging. Most capital dredging will be undertaken in the vicinity of the outer berths (approximately 100 to 300 m from the lower shore during low water periods). The near shore environment in the Port of Immingham area is already subject to large numbers of vessel movements including maintenance dredging. Given the distance between the intertidal and the main dredge area and expected existing habituation to vessels operating at this distance from the foreshore, disturbance responses by birds are considered likely to be limited by dredging in this area.

4.10.24 Some capital dredging is also required nearer the intertidal (within approximately 50-100 m). At these distances it is possible that visual and noise stimuli from the dredger (noise levels between 62 and 71 dB *LA*eq are predicted) could potentially cause disturbance responses. However, this will only be for a short duration of time (<one week) although some localised and intermittent disturbance responses (such as avoidance walking and short flights with birds rapidly resettling and resuming feeding near their original location) is possible. It should be noted that dredging activity is common in this area and to a large extent, the birds will already have become habituated to marine activities. It should also be noted that the existing slope in this area is similar in gradient to the 1 in 4 dredge slope that is proposed for the IERRT project (see Chapter 2 and Chapter 3 of the ES (Application Document Reference numbers 8.2.2 and 8.2.3 respectively)). Furthermore, the amount of material that needs to be dredged within the berth pocket in this location is limited. It is therefore likely that the existing slope will remain stable and will not require further dredging; it is included in the assessment as a worst case.

Construction of the outer finger pier (including connecting pontoon infrastructure)

4.10.25 Noise stimuli caused by the vibro and percussive piling activity and the presence of jack-up or crane barges (causing both potential noise and visual disturbance stimuli) as well as other construction machinery, construction workers and plant activity are all potential sources of disturbance associated with construction of the outer pier.

4.10.26 The construction zone for the outer finger pier including connecting pontoon infrastructure (i.e., outer pontoon and pontoon restraints) will be located approximately 200 m from the lowest part of the foreshore during low water periods (as shown in Figure 9.12 to the ES (Application Document Reference number 8.3.9 (l))). As a consequence, there will at all times be a substantial body of water separating the foreshore from construction activity. This will reduce the perceived threat of disturbance that the birds may have to construction activities. It follows, therefore, that while some disturbance of more sensitive species could occur on the lower shore (when exposed) during this element of the construction, the greater part of the foreshore fronting the Port of Immingham will be at distances of more than 200 m. At this distance, the potential for disturbance responses in even sensitive species will be limited with a large amount of the foreshore still available for feeding at locations and at distances in which responses are unlikely to occur. For example, approximately 92 % of the foreshore at low water between the Inner Dock entrance and the IOT (which is the mudflat habitat fronting the Port of Immingham supporting the highest numbers of birds as shown in Figure 9.10 to the ES (Application Document Reference number

8.3.9 (j))) will be at distances of more than 200 m from the construction zone.

Construction of the approach jetty and inner pier

4.10.27 The approach jetty construction works will overlap directly with a part of the foreshore located close to the IOT jetty. In addition, the inner finger pier (and associated infrastructure such as the bankseat, linkspan and the inner pontoon) are located within approximately 50 to 200 m of the foreshore (Figure 9.13 to the ES (Application Document Reference number 8.3.9 (m)). Noise stimuli caused by the vibro and percussive piling activity and the presence of jack-up or crane barges (causing both potential noise and visual disturbance stimuli) as well as other construction machinery, construction workers and plant activity are all potential sources of disturbance associated with construction of the approach jetty and inner pier.

4.10.28 Waterbirds present in the area will be habituated to some extent to anthropogenic activities (due to existing port operations) near the foreshore such as vessel and vehicle movements, port related noise and human activity. Nevertheless, construction of the approach jetty and inner pier overlaps with some areas of highest bird use on the foreshore within Sector B, within which the proposed development is located (see Figures 9.9, 9.10, 9.11, 9.12 and 9.13 to the ES (Application Document Reference numbers 8.3.9 (i), 8.3.9 (j), 8.3.9 (k), 8.3.9 (l) and 8.3.9 (m))). Avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas may occur relatively frequently for the duration of the construction of these specific elements. On this basis, for species considered more sensitive to bird disturbance such as godwits, Redshank, Curlew and Shelduck (see Table 27)), this could mean that as a worst case a relatively large proportion of the local populations occurring within this area (i.e. recorded in Count Sector B) (as shown in Tables 9.19 and 9.24 of Chapter 9 of the ES (Application Document Reference number 8.2.9)) could be potentially regularly disturbed or displaced as a result of construction activity associated with the approach jetty and inner finger pier. Less sensitive species such as Dunlin, Turnstone and gulls would be expected to be disturbed to a lesser degree and feed closer to construction activity.

4.10.29 It is not anticipated, however, that birds will be displaced from the local area completely, in that the birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. In this respect, approximately 59 % of the foreshore at low water between the Inner Dock entrance and the IOT (which is the mudflat habitat fronting the Port of Immingham supporting the highest numbers of birds as shown in Figure 9.10 to the ES (Application Document Reference number 8.3.9 (j)) will be available at distances of more than 200 m away. In addition, while energetic costs might be increased slightly due to disturbance, the research reviewed above suggests that the energetic costs of individual disturbance events is expected to be relatively low and even relatively frequent disturbance could potentially only cause a small reduction in the time available in a day for feeding. In addition, birds are known to forage nocturnally and might potentially change foraging patterns to utilise the area during nocturnal periods when limited construction activity is occurring.

4.10.30 It should also be noted that this zone of potential disturbance is also very small in the context of the Humber Estuary SPA/Ramsar. The 200 m buffer, for example only represents 0.023 % of the SPA/Ramsar and 0.10% of intertidal foreshore habitats and specifically 0.14 % of mudflat within the SPA. Furthermore, most species occur in numbers that represent only a very small proportion of the estuary-wide populations that typically occur. However, it is acknowledged that a greater proportion of the Humber Estuary population of Black-tailed Godwit, Redshank and Turnstone occur in this area on the foreshore and could be disturbed or temporarily displaced (see Table 9.24 of Chapter 9 of the ES (Application Document Reference number 8.2.9)).

4.10.31 It is acknowledged, however, that wintering waterbirds can show a high level of site fidelity and utilise small home ranges (Mander *et al*., 2022). Site faithful waterbirds can sometimes either show reluctance to move to alternative sites or choose the nearest alternative site, despite potentially being of lower quality habitat (e.g., reduced prey resources and also subject to disturbance pressure) when compared to more optimal habitats further away) (Woodward *et al*. 2014; Wright *et al*., 2014; Méndez *et al*, 2018; Burton, 2000). The carrying capacity of adjacent areas of foreshore is inherently difficult to characterise due to the high degree of natural variability (in both prey availability and bird usage) and as such it is recognised that there is a degree of uncertainty as to whether such areas could accommodate displaced birds if this were to occur.

4.10.32 For all the construction activities, it is also recognised that during cold periods, coastal waterbirds are more susceptible to disturbance due to higher energetic costs and greater feeding requirements for thermoregulation. Furthermore, very cold winter weather can cause mudflats and adjacent functionally linked terrestrial habitats used for feeding (such as agricultural land and wet grassland) to freeze. In addition, cold conditions can cause an influx of waterbirds from continental Europe which have flown to Britain to escape from even colder conditions. This can further increase competition for feeding resources in an area. The increased difficulty obtaining enough food and greater energy required for thermoregulation can in some situations cause reduced survival rates and appear to make birds seem more tolerant to disturbance as birds avoid using excess energy reserves (Goss-Custard, *et al*., 2006; JNCC, 2021, RSPB, 2010; Collop *et al*., 2016; Davidson and Rothwell, 1993).

4.10.33 In summary, there is clearly a probability of noise and visual disturbance stimuli occurring during construction. As described above, frequent disturbance at a level which could cause dispersive responses and relatively localised displacement of coastal waterbirds is likely with respect to construction activity associated with the inner finger pier and approach jetty. Only temporary and very localised responses, however, are anticipated during the construction of the outer finger pier. Limited responses are anticipated with regard to the capital dredging.

4.10.34 The extent of the effect varies with location and depends on the species present and their sensitivity to noise and visual disturbance stimuli. It is considered that the capital dredge works are unlikely to result in an AEOI. As regards the works on the outer finger pier (including the connecting pontoon infrastructure), inner finger pier and approach jetty the potential for an AEOI cannot be ruled out, particularly for higher sensitivity species (see Table 27). On this basis mitigation has been included.

Mitigation

4.10.35 In order to reduce the level of impact associated with noise and visual disturbance during construction a number of mitigation measures will be implemented. These measures, which have been discussed with Natural England, will be secured through the DCO approval process and have been included in the CEMP (Application Document Reference number 9.2) and include the following:

- **Winter marine construction restriction from 1 October to 31 March** (**approach jetty and the inner finger pier):** In order to minimise potential disturbance effects on wintering populations of coastal waterbirds on the foreshore it is proposed that marine construction activity associated with the approach jetty, linkspan, innermost pontoon and the inner finger pier which are all located on or close (within approximately 200 m) to the intertidal mudflat is prohibited during the winter months of October to March (Figure 1.2 of the ES (Application Document Reference number 8.3.1 (b))). This restriction applies until an acoustic barrier/visual screen has been installed on both sides of the semi-completed structure. Construction activity will then be undertaken on the approach jetty itself, behind the screens, with no use of large heavy plant. With the addition of acoustic barriers, noise levels on the intertidal mudflat will be less than 65 dB(A). Construction activity associated with the seaward section of the approach jetty, linkspan, innermost pontoon and inner finger pier can also take place two hours before and two hours after high water, when works are approximately 200 m from the exposed mudflat. A noise suppression system will also be used for piling. The noise suppression system is predicted to reduce noise levels to <70 dB Lmax at distances greater than approximately 200 m from the piling;

- **Noise suppression system for piling on the outer finger pier:** It is proposed that a noise suppression system (consisting of a piling sleeve with noise insulating properties) is used during all percussive piling activities for the outer finger pier to reduce noise levels on nearby foreshore areas;

- **Acoustic barrier/screening on marine construction barges**: To limit disturbance during construction, it is proposed that an acoustic barrier/screening is placed on the side of the floating barges closest to the foreshore and construction activity should only be undertaken from the side of the barge facing away from the foreshore. This will be applied to floating barges used for all construction works including the outer finger pier during the over wintering period;

- **Soft starts:** Using soft starts (as outlined in the marine mammal and fish section above) will allow birds to become more tolerant to piling noise by allowing a more gradual increase in noise levels which will reduce the potential for birds to become startled. This will be applied to all piling activity including the outer finger pier; and

- **Cold weather construction restriction**: Coastal waterbirds are considered particularly vulnerable to bird disturbance during periods of extreme winter weather[22]. On this basis, it is proposed that a temporary cessation of all construction activity is implemented following seven consecutive days of freezing (zero or sub-zero temperature) weather conditions. The restriction should not be lifted until after 24 hours of above freezing temperatures and also that Metrological Office weather forecasts indicate that freezing conditions will not return for the next five days. Similar measures have been implemented for other nearby developments and also as part of the JNCC scheme to reduce disturbance to waterfowl due to shooting activity during severe winter weather.

Assessment of the potential for an AEOI

4.10.36 Based on the evidence provided above with reference to the mitigation measures detailed and the rationale provided in Table 29, the predicted effects are not considered to compromise any of the conservation objectives, and as a consequence, this pathway will not create AEOI on the qualifying interest features.

22 It is recognised that during cold periods, coastal waterbirds are more susceptible to disturbance due to higher energetic costs and greater feeding requirements for thermoregulation. Furthermore, very cold winter weather can cause mudflats and adjacent functionally linked terrestrial habitats used for feeding (such as agricultural land and wet grassland) to freeze. In addition, cold conditions can also cause an influx of waterbirds from continental Europe which have flown to Britain to escape from even colder conditions in these areas. This can further increase competition for feeding resources in an area. The increased difficulty obtaining enough food and greater energy required for thermoregulation can in some situations cause reduced survival rates and appear to make birds seem more tolerant to disturbance as birds avoid using excess energy reserves (Goss-Custard, *et al*., 2006; JNCC, 2021, RSPB, 2010; Collop *et al*., 2016; Davidson and Rothwell,1993).

Table 29. The Potential for an AEOI on qualifying species due to potential airborne noise and visual disturbance during construction

Site	Features	Potential AEOI	Justification
Humber Estuary SPA	A048; Common Shelduck (Non-breeding) *Tadorna tadorna*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information provided above, Shelduck typically occur in relatively large numbers on the foreshore in the local area and are also known to be sensitive to anthropogenic disturbance. Without mitigation, evidence suggests that regular disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200 m around construction activities is considered possible. Any responses at greater distances would be expected to only occur infrequently. However, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised. The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region.

Site	Features	Potential AEOI	Justification
			Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
	A143: Red Knot (Non-breeding) *Calidris canutus*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information provided above, Knot typically occur in relatively low numbers on the foreshore in the local area and are also known to be relatively tolerant to anthropogenic disturbance. Evidence suggests this species has been observed in relatively close proximity to potential disturbance stimuli before responses are recorded (often within 50-100 m or less of a disturbance sources). Nevertheless, any birds present could be susceptible to potential disturbance and displacement at these distances without mitigation. However, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised.

Site	Features	Potential AEOI	Justification
			The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
	A149: Dunlin *Calidris alpina alpina* (Non-breeding)	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information provided above, Dunlin frequently occur in relatively large numbers on the foreshore in the local area and are known to be relatively tolerant to anthropogenic disturbance. Evidence suggests this species has been observed in relatively close proximity to potential disturbance stimuli before responses are recorded (often within 50-100 m or less of a disturbance sources). Nevertheless, any birds present could be susceptible to potential distance and displacement at these distances without mitigation. However, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as

Site	Features	Potential AEOI	Justification
			used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised. The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
	A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information provided above, Black-tailed Godwit typically occur in relatively large numbers on the foreshore in the local area and also have the potential to be sensitive to anthropogenic disturbance. Without mitigation, evidence suggests that regular disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200 m around construction activities is considered possible. Any responses at greater distances would be expected to only occur infrequently. However, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby

Site	Features	Potential AEOI	Justification
			foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised. The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
	A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information provided above, Bar-tailed Godwit typically occur in relatively low numbers on the foreshore in the local area and also have the potential to be sensitive to anthropogenic disturbance. Without mitigation, evidence suggests that regular disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200 m around construction activities is considered possible. Any responses at greater distances would be expected to only occur infrequently. However, with the application of the proposed mitigation measures,

Site	Features	Potential AEOI	Justification
			disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised. The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
	A162: Common Redshank *Tringa totanus* (Non-breeding)	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the	Based on the information provided above, Redshank typically occur in relatively large numbers on the foreshore in the local area. Without mitigation, evidence suggests that regular disturbance and avoidance responses (i.e., temporary displacement) within a zone of approximately 200 m around construction activities is considered possible. However, with the application of the proposed mitigation

Site	Features	Potential AEOI	Justification
		qualifying interest feature.	measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised. The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
	Waterbird assemblage	In the context of the site's conservation objectives, there is considered to be no potential	Based on the information provided above, assemblage species such as Curlew, Oystercatcher and Turnstone are frequently recorded in the local area. Oystercatcher and Curlew typically occur in low numbers. Without mitigation, evidence suggests that regular disturbance and avoidance responses (i.e., temporary displacement) within a zone of

Site	Features	Potential AEOI	Justification
		AEOI on the qualifying interest feature.	approximately 200 m around construction activities is considered possible. Any responses at greater distances would be expected to only occur infrequently. Turnstone are typically recorded in relatively large numbers (as a proportion of SPA numbers) but are considered relatively tolerant with evidence suggesting this species has been observed in close proximity to potential disturbance stimuli before responses are recorded (often within 50-100 m or less of a disturbance sources). However, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbed birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Furthermore, following completion of the construction phase, birds would be expected to return to broadly use the same areas as used prior to construction with any effects considered temporary. On this basis, the '*distribution of the qualifying features within the site'* conservation objective is not considered to be compromised. The predicted disturbance responses are not expected to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any displaced waterbirds would be expected to redistribute locally to nearby habitat within the Humber Estuary rather than dispersing out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation

Site	Features	Potential AEOI	Justification
			measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected.
Humber Estuary Ramsar site	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Summary information with respect to assemblage and individual qualifying species has been provided above in the table.
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		

The potential effects of airborne noise and visual disturbance during operation on qualifying species

General scientific context

4.10.37 Operational ports, wherever located, inevitably present as a potential source of disturbance in the coastal environment. Waterbird monitoring work in the vicinity of port locations (such as the Port of Southampton, Port of Mostyn and Port of Immingham) has generally recorded limited evidence of birds on nearby intertidal habitat being disturbed through regular land side port operations with birds often becoming habituated (such as the movement of vehicles, cranes and cargo containers) (ABPmer, 2013; ABPmer, 2015). For example, Cutts (2021) reported that most species of waterbird assemblages utilising estuarine habitats adjacent to major infrastructure (such as power stations, jetties, bridges, port facilities etc) appear to be tolerant and will both roost and forage within less than 50 m of the working infrastructure. Waterbirds have also been recorded regularly feeding under large industrial jetties as well as roosting on jetties and harbour walls.

4.10.38 Disturbance events have also been recorded as part of the ongoing IOH monitoring in the Port of Immingham area since winter 2005/06[23]. This includes any potential disturbance due to operational activities on various jetties (such as the Immingham Oil Terminal (which includes vehicle activity), Western Jetty, Eastern Jetty and Immingham Bulk Terminal). During the surveys the vast majority of the disturbance observed was caused due to either raptors (such as peregrine and sparrowhawk), recreational activities (angling or dog walking) or maintenance work on the seawall. Disturbance was also recorded on several occasions as a result of construction or maintenance work on several of the jetties. No disturbance, however, was recorded as a result of vessel movements or operational activity at or near the berths or jetties.

4.10.39 In general, human presence on the foreshore (e.g., walking) is considered to cause greater disturbance than vehicles (McLeod *et al.,* 2013; Guay *et al.,* 2014; IECS, 2009a). With specific respect to activity associated with commercial operations and works, observations from monitoring and other studies (including specifically on the Humber Estuary), suggests that disturbance responses are typically greater for personnel in the open, compared to when enclosed within a vehicle at the same distances (Cutts, 2021). Waterbirds are also considered more likely to habituate to vehicle movements which occur in a more predictable manner and in a spatially limited area compared to more erratic activity (such as quad bikes on the foreshore) (Burton *et al*., 2002b; Natural England, 2017; Cutts *et al.,* 2021).

4.10.40 Disturbance events from powered vessels have been recorded within 100 m of the receptor with vessels approaching at faster speeds eliciting higher disturbance. Predictability and randomness are factors of vessel traffic which can cause variation in waterbird response. Literature suggests that

[23] These surveys have been undertaken twice a month from October to March (see Section 9.3 for further information on these surveys).

large commercial vessels consistently using defined routes (such as ferries or cargo ships) elicit less of a disturbance response than recreational craft which are more unpredictable in terms of speed and course and thus their disturbance potential for birds may be enhanced (Rodgers and Schwikert, 2002; Burger and Gochfield, 1998; Schwemmer *et al*., 2011; Glover *et al*., 2015).Monitoring of potential disturbance due to the movements of vessels berthing at pontoons associated with offshore windfarm Operation and Maintenance (O&M) facilities in several port locations near to mudflats used by waterbirds recorded evidence of some mild and localised disturbance and avoidance although events were generally infrequent with larger disturbance events (causing bird to fly out of the area) only occurring more rarely. Consistent evidence of changes (reductions) in waterbird abundance in the local area which could be linked to the operational activities was not recorded (ABPmer, 2015; ABPmer, 2021).

Summary of effects

4.10.41 Operational disturbance stimuli could occur as a result of Ro-Ro vessel movements. The nearest berth during spring tide periods following completion of the capital dredge will be located approximately 40 to 150 m from intertidal mudflat used by coastal waterbirds.

4.10.42 Hundreds of commercial vessel movements take place each year close to the location of the proposed new berths. Commercial vessel activity is, therefore, a relatively constant feature along the Immingham port frontage close to the foreshore – this is particularly the case in relation to vessels using the Eastern Jetty berth which is very close (low tens of metres) to lower shore mudflats. These mudflats are used extensively by feeding waterbirds around the tideline. The Eastern Jetty is a busy liquid bulks berth which regularly receives large vessels. At its eastern termination a floating pontoon also provides berthing for some of the port's tugs. However, as described above in the scientific context section, no disturbance events linked to vessel movements either at the Eastern Jetty or any other berthing facility in the Port of Immingham area has been recorded during the IOH bird surveys.

4.10.43 Disturbance could also occur as a result of people (such as workers) or vehicles on berthing infrastructure (floating pontoons, finger piers, approach jetty, linkspan) near the intertidal. The proposed development will see some activity of workers/personnel on the finger piers during vessel mooring and disembarkation. Outside these periods, movements of pedestrians will be minimal with almost all access to the vessels using motorised vehicles (HGVs and Ro-Ro tractors/trailers).

4.10.44 On a daily basis there will typically be a steady flow of vehicle movements coming and going from the Ro-Ro vessels throughout the day. The vehicle movements will, however, be undertaken at slow speeds (typically <12 miles per hour) and also in a predictable and consistent manner (i.e., producing the same type of visual/noise stimuli each time). Based on the evidence reviewed above, these are all attributes which support habituation and therefore are likely to limit disturbance responses. It should also be noted that many of the existing approach jetties in the Port of Immingham have some vehicular access. The IOT approach jetty in particular has regular vehicle movements with no disturbance associated with this activity recorded during the IOH bird surveys (as described in the general scientific context above).

4.10.45 Regarding engineering and maintenance works, this activity is expected to be limited and only required occasionally.

4.10.46 The level of response that waterbirds will have to the three new berths when operational will be dependent to some extent on the sensitivity they have to anthropogenic disturbance stimuli. For example, species such as Turnstone and Dunlin are typically more tolerant than Shelduck, Curlew and godwits as summarised in Table 9.23 of Chapter 9 of the ES (Application Document Reference number 8.2.9). The evidence presented above, however, suggests that birds are typically less affected by defined regular movements of people or vehicles near the shoreline (as occurs in port environments) than by random movements of people on the foreshore. Birds are regularly recorded feeding nearby or below port structures such as jetties or pontoons and appear to be relatively tolerant to normal day-to-day port operational activities.

4.10.47 It is acknowledged, however, that disturbance can occur as result of any human activity irrespective of habituation, if the activity occurs in sufficiently close proximity to a species so as to trigger a responsive reaction. Given that Ro-Ro vessels and human activity associated with operations will be occurring close to the foreshore (such as on the approach jetty), intermittent disturbance responses are, therefore, still possible. This may particularly be the case at first when birds are likely to be less habituated to the new activity or as a response to a more infrequent sporadic type of activity on a structure with which birds are less familiar (such as maintenance works which are likely to be highly infrequent). Responses for most species are expected typically to involve infrequent, mild behavioural responses in a localised area in the vicinity of the pontoon or approach jetty. The responses observed in birds are likely to range from increased vigilance to short flights with birds rapidly resettling and resuming feeding near their original location. More sensitive species could show localised avoidance and larger disturbance events (causing birds to flush and temporarily disperse from the vicinity of the proposed development). That said, rather than dispersing from the area completely, however, it is anticipated that the birds will temporarily redistribute within the local area to feed.

4.10.48 Based on the above, the probability of some disturbance occurring is considered to be high with some disturbance at a level which could cause dispersive responses and potentially short-term and localised displacement of coastal waterbirds. It is expected, however, that birds will become habituated relatively quickly which will limit any longer-term disturbance responses to a relatively localised area around berthing infrastructure. The sensitivity of coastal waterbirds in the area is considered to range from low to moderate depending on the species. This is because even species considered relatively sensitive to disturbance appear to show relatively limited responses to operational stimuli. It is acknowledged, however, that there is some uncertainty with respect to the extent and rate of habituation given the overlap of the berthing infrastructure with the foreshore. Therefore, taking a precautionary approach the potential for an AEOI cannot be ruled out and on this basis mitigation in the form of screening is proposed.

Mitigation

4.10.49 On a precautionary basis, in order to reduce potential visual disturbance stimuli to waterbirds on the foreshore, screening (see Paragraph 4.10.50) will be installed so that movements of workers or vehicles will not be as visible from the foreshore. This measure has been discussed with Natural England and will be secured through the DCO consent. The use of screens is considered likely to be most effective initially during operation when birds are less likely to be as habituated to the new sources of noise and visual disturbance stimuli. Over time as the birds would be expected to become habituated to such disturbance events and as such a phased removal of the screens is proposed after 2 years.

4.10.50 Screens (such as fences and other barriers) are a widely used measure to help reduce potential disturbance to coastal waterbirds (Ikuta and Blumstein, 2003; Liley and Tyldesley, 2013; Hockin *et al*., 1992) and has been successfully applied as mitigation to reduce disturbance at a number of operational berthing facilities in port locations located near intertidal waterbird populations (GoBe Consultants Ltd, 2011, ABPmer, 2014; MMO, 2018).

4.10.51 Screening will be installed either side of the linkspan and approach jetty. These screens should be opaque or made out of material that distorts outlines of anthropogenic activity on the infrastructure. It is noted that some gaps might be required in the screens for engineering reasons and to allow for emergency sight lines and access.

4.10.52 Coastal waterbird monitoring will also be undertaken based on the same sectors and approach as the current IOH surveys for the first two years of operation (see Chapter 9 of the ES (Application Document Reference number 8.2.9)). This will include recording any bird disturbance observed during the surveys. The results of these surveys will be summarised as part of an annual report. .

Assessment of the potential for an AEOI

4.10.53 Based on the evidence provided above with reference to the mitigation measures detailed and the rationale provided in Table 30, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 30. The Potential for an AEOI on qualifying species due to potential airborne noise and visual disturbance during operation

Site	Features	Potential AEOI	Justification
Humber Estuary SPA	A048; Common Shelduck (Non-breeding) *Tadorna tadorna*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Disturbance responses during operation are generally expected to be localised given the tolerance that coastal waterbirds typically show to existing port operations, the expected habituation to disturbance stimuli resulting directly from the proposed development that will occur and also considering the screening that will be installed. As a consequence, any change to '*the distribution of the qualifying features within the site'* conservation objective is expected to be negligible. The predicted disturbance responses of waterbirds are considered unlikely to cause any changes to '*the population of each of the qualifying features'* conservation objective. This is because any responses are considered to be relatively limited and will not cause birds to disperse out of the Humber Estuary to another region. Furthermore, based on the magnitude of disturbance effects and also taking into account the proposed mitigation measures, population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success is considered highly unlikely.
	A143: Red Knot (Non-breeding) *Calidris canutus*		
	A149: Dunlin *Calidris alpina alpina* (Non-breeding)		
	A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)		
	A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica*		
	A162: Common Redshank *Tringa totanus* (Non-breeding)		
	Waterbird assemblage		
Humber Estuary Ramsar site	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)		
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		

4.11 Disturbance through underwater noise and vibration

The potential effects of underwater noise and vibration during piling on qualifying species

General scientific context

Underwater noise and vibration: implications for fish

4.11.1 Elevated underwater noise and vibration levels during construction activities can potentially disturb fish by causing physiological damage and/or inducing adverse behavioural reactions. A detailed underwater noise assessment has been undertaken for the proposed development (Appendix 9.2 of the ES (Application Document Reference number 8.4.9 (b))).

4.11.2 For most piling activities, the main source of noise and vibration relates to where piles are hammered or vibrated into the ground. Percussive piling involves hammering the pile into the seabed resulting in an impact blow and high levels of noise. Vibro-piling produces lower levels of noise as piles are vibrated into the seabed.

4.11.3 There is a wide diversity in hearing structures in fish which leads to different auditory capabilities across species (Webb *et al*., 2008). All fish can sense the particle motion[24] component of an acoustic field via the inner ear as a result of whole-body accelerations (Radford *et al*., 2012), and noise detection ('hearing') becomes more specialised with the addition of further hearing structures. Particle motion is especially important for locating sound sources through directional hearing (Popper *et al*., 2014; Hawkins *et al*., 2015; Nedelec *et al*., 2016). Although many fish are also likely to detect sound pressure[25], particle motion is considered equally or potentially more important (Hawkins and Popper, 2017).

4.11.4 From the few studies of hearing capabilities in fish that have been conducted, it is evident that there are potentially substantial differences in auditory capabilities from one fish species to another (Hawkins and Popper, 2017). Popper *et al.* (2014) proposed the following three categories of fish which are described below:

- Fish with a swim bladder or air cavities that aid hearing;
- Fish with a swim bladder that does not aid hearing; and
- Fish with no swim bladder.

4.11.5 Sea lamprey *Petromyzon marinus* and River lamprey *Lampetra fluviatilis* fall into the third category as they lack swim bladders and that are sensitive only

24 Particle motion is a back and forth motion of the medium in a particular direction; it is a vector quantity that can only be fully described by specifying both the magnitude and direction of the motion, as well as its magnitude, temporal, and frequency characteristics.

25 Pressure fluctuations in the medium above and below the local hydrostatic pressure; it acts in all directions and is a scalar quantity that can be described in terms of its magnitude and its temporal and frequency characteristics.

to sound particle motion and show sensitivity to only a narrow band of frequencies.

Underwater noise and vibration: implications for grey seal

4.11.6 Marine mammals are particularly sensitive to underwater noise at higher frequencies and generally have a wider range of hearing than other marine fauna, namely fish (i.e., their hearing ability spans a larger range of frequencies). The hearing sensitivity and frequency range of marine mammals varies between different species and is dependent on their physiology.

4.11.7 The National Oceanic and Atmospheric Administration (NOAA) (2018) provides technical guidance for assessing the effects of underwater anthropogenic (human-made) sound on the hearing of marine mammal species. Specifically, the received levels, or acoustic thresholds, at which individual marine mammals are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for acute, incidental exposure to impulsive and non-impulsive underwater anthropogenic sound sources are provided. These thresholds update and replace the previously proposed criteria in Southall *et al.* (2007) for preventing auditory/physiological injuries in marine mammals. Further recommendations have recently been published regarding marine mammal noise exposure by Southall *et al.* (2019) which complement the NOAA (2018) thresholds and also look at a wider range of marine mammal species.

4.11.8 The NOAA (2018) and Southall *et al.* (2019) thresholds are categorised according to marine mammal hearing groups. According to NOAA (2018) grey seals are categorised as phocid pinniped (PW) (earless seals or "true seals").

4.11.9 There are no equivalent Sound Pressure Level (SPL) behavioural response criteria that would represent the sources of underwater noise associated with the proposed development. Behavioural reactions to acoustic exposure are less predictable and difficult to quantify than effects of noise exposure on hearing or physiology as reactions are highly variable and context specific (Southall *et al*., 2007).

4.11.10 Few studies have documented responses of seals to underwater noise in the field (Cefas, 2020). Tracking studies found reactions of the grey seals to pile driving during the construction of windfarms were diverse (Aarts *et al*., 2017). These included altered surfacing or diving behaviour, and changes in swim direction including swimming away from the source, heading into shore or travelling perpendicular to the incoming sound, or coming to a halt. Also, in some cases no apparent changes in their diving behaviour or movement were observed. Of the different behavioural changes observed a decline in descent speed occurred most frequently, which suggests a transition from foraging (diving to the bottom), to more horizontal movement. These changes in behaviour were on average larger, and occurred more frequently, at smaller distances from the pile driving events, and such changes were statistically significantly different at least up to 36 km from the piling. In addition to changes in dive behaviour, also changes in movement were recorded. There was evidence that on average grey seals within 33 km were more likely to swim away from the pile driving. In some cases, seals exposed to pile-driving at close range, returned to the same area on subsequent trips. This suggests that some seals had an incentive to go to these areas, which was stronger than the deterring effect of the pile-driving.

4.11.11 A telemetry study found no overall significant displacement of common seal (also a phocid or true seal like grey seals) during construction of a wind farm in The Wash, south-east England (Russell, 2016). However, during piling, seal usage (abundance) was significantly reduced up to 25 km from the piling activity; within 25 km of the centre of the wind farm, there was a 19 to 83 % (95 % confidence intervals) decrease in usage compared to during breaks in piling, equating to a mean estimated displacement of 440 individuals. This amounts to significant displacement starting from predicted received levels of between 166 and 178 dB re 1 μPa (peak-peak). Displacement was limited to piling activity; within 2 hours of cessation of pile driving, seals were distributed as per the non-piling scenario.

4.11.12 Koschinski *et al.* (2003) conducted a playback experiment on harbour seals in which the recorded sound of an operational wind turbine was projected via a loudspeaker, resulting in modest displacement of seals from the source (median distance was 284 vs 239 m during control trials). Two further studies of ringed seals (*Phoca hispida*), which are closely related to both harbour and grey seals, have observed behaviour in response to anthropogenic noise: Harris *et al*., (2001) reported animals swimming away and avoidance within ~150 m of a seismic survey, while Moulton *et al*., (2003) found no discernible difference in seal densities in response to construction and drilling for an oil pipeline.

4.11.13 Another way to evaluate the responses of marine mammals and the likelihood of behavioural responses is by comparing the received sound level against species specific hearing threshold levels. Further information on the dB_{ht} metric and its limitations is provided in Section 7.3 of Appendix 9.2 of the ES (Application Document Reference number 8.4.9 (b)).

Summary of effects

Effects on fish

4.11.14 The distances at which potential mortality/injury and behavioural effects in fish are predicted to occur as a result of the percussive piling and vibro-piling associated with the development are included in Appendix 9.2 to the ES (Application Document Reference number 8.4.9 (b)).

4.11.15 The predicted range (R) at which the Popper *et al.* (2014) quantitative instantaneous peak SPL thresholds for pile driving are reached indicates that there is a risk of mortality, potential mortal injury or recoverable injury within 10 m in fish with no swim bladder (lamprey). For vibro-piling, there is a risk of mortality, potential mortal injury or recoverable injury within 1 m in fish with no swim bladder.

4.11.16 The calculator developed by the United States National Marine Fisheries Service (NMFS) (NMFS, 2021) as a tool for assessing the potential effects to fish exposed to elevated levels of underwater sound produced during pile driving was used to calculate the range at which the cumulative SEL thresholds for pile driving (Popper *et al*., 2014) are reached. Based on the assumptions highlighted in Appendix 9.2 to the ES (Application Document Reference number 8.4.9 (b)), there is predicted to be a risk of mortality and potential mortal injury within 15 m in fish with no swim bladder (lamprey). The distance at which the received level of noise is within the limits of the recoverable injury threshold is within 23 m in fish without a swim bladder. For vibro-piling, there is predicted to be a risk of mortality and potential mortal injury within 8 m in fish with no swim bladder. The distance at which the received level of noise is within the limits of the recoverable injury threshold is within 12 m in fish without a swim bladder.

4.11.17 Given the mobility of fish, any individuals that might be present within the localised areas associated with potential mortality/injury during pile driving activities would be expected to easily move away and avoid harm. Furthermore, the area local to the proposed development is not considered a key foraging, spawning or nursery habitat for sea lamprey or river lamprey and, therefore, this localised zone of injury is unlikely to result in effects.

4.11.18 The range at which the Hawkins *et al*. (2014) quantitative instantaneous peak SPL behaviour thresholds for percussive pile driving are reached indicates that there is a risk of a behavioural response in fish within around 1.6 km from the impact piling. Behavioural reactions during impact piling are, therefore, anticipated to occur across 67 % width of the Humber Estuary at low water and 46 % of the estuary width at high water, potentially creating a partial temporary barrier to fish movements. For vibro-piling, there is a risk of a behavioural response in fish within around 1.1 km from the source which equates to 48 % of the width of the Humber Estuary at low water and 33 % of the estuary width at high water.

4.11.19 However, the scale of the behavioural response is partly dependent on the hearing sensitivity of the species. Fish without a swim bladder (e.g., river lamprey) are likely to show only very subtle changes in behaviour in this zone.

4.11.20 The scale of the behavioural effect is also dependent on the size of fish (which affects maximum swimming speed). Smaller fish, juveniles and fish larvae swim at slower speeds and are likely to move passively with the prevailing current. Larger fish are more likely to actively swim and, therefore, may be able to move out of the behavioural effects zone in less time, although it is recognised that the movement of fish is very complex and not possible to define with a high degree of certainty.

4.11.21 The effects of piling noise on fish also need to be considered in terms of the duration of exposure. It is anticipated that piling noise will take place over a period of approximately 24 or 37 weeks (depending on whether a sequenced construction is employed). However, piling will not take place continuously over that period as there will be periods of downtime, pile positioning and set up.

4.11.22 The piling works will be undertaken Monday to Sunday). The maximum impact piling scenario is for 4 tubular piles to be installed each day from either front (i.e., the land and water), involving approximately 180 minutes of impact piling per day and 20 minutes of vibro piling per day. It should be noted, however, that in terms of potential disturbance, four piles a day is very much a worst case scenario. Either way, there will clearly be significant periods over a 24-hour period when fish will not be disturbed by any piling noise. The actual proportion of piling is estimated to be at worst around 14 % (based on 180 minutes of impact piling and 20 minutes of vibro piling each working day) over any given construction week. In other words, any fish that remain within the predicted behavioural effects zone at the time of piling will be exposed a maximum of up to 14 % of the time on the assumption that four piles are driven in a given day – which is considered to be unlikely.

4.11.23 It is also important to consider the noise from piling against existing background or ambient noise conditions. The wider local area in which the construction will take place already experiences regular vessel operations and ongoing maintenance dredging, and, therefore, fish are likely to be habituated to a certain level of anthropogenic background noise.

4.11.24 Applying the standard impact assessment criteria, the probability of occurrence of underwater noise disturbance during piling is high. Given the uncertainty regarding the actual timing and programme for the piling, this assessment has been undertaken on the basis that the works could take place at any time of year as a worst case. There is the potential for piling to occur during the sensitive migratory periods of lamprey in the Humber Estuary. Both river and sea lamprey moving between the Humber Estuary and the sea could potentially pass near to the proposed marine works (with a risk of injury potentially occurring in very close proximity to the piling activity). In addition, behavioural response (e.g., displacement) or acoustic barrier could occur over the entire width of the Humber Estuary at low water and the majority of the estuary width at high water.

4.11.25 Although the effect of underwater noise and vibration from piling works is temporary and of short duration, there is uncertainty with respect to the timing of the works which could in the worst case scenario coincide with the migration periods of river and sea lamprey. The potential for an AEOI cannot, therefore, be ruled out and on this basis mitigation has been proposed.

Effects on grey seal

4.11.26 The distances at which permanent threshold shifts (PTS), TTS and behavioural effects in grey seals that are predicted to occur during impact piling and vibro-piling for the proposed development are included in Appendix 9.2 to the ES (Application Document Reference number 8.4.9 (b)).

4.11.27 There is predicted to be a risk of instantaneous PTS and TTS in seals within 5 m and 12 m respectively from the source of the percussive piling noise.

4.11.28 If the propagation of underwater noise from impact piling were unconstrained by any boundaries, the maximum theoretical distance at which the predicted cumulative SEL weighted levels of underwater noise during impact piling is within the limits of PTS and TTS in seals of 0.9 km and 6.5 km respectively. The maximum theoretical distance at which the predicted cumulative SEL weighted levels of underwater noise during vibro piling is within the limits of PTS and TTS in seals of 44 m and 581 m respectively.

4.11.29 Assuming a worst case of a lower swimming speed of 1.5 m/s for all marine mammal species (including both adults and juveniles), the maximum time that would take a grey seal to leave the centre of the cumulative SEL weighted PTS and TTS injury zones during impact piling is estimated to be 10 minutes and 1.2 hours respectively. This is less than 5 % of the time that would be required for an injury to occur and, therefore, assuming seals avoid the injury effects zone, they are not considered to be at risk of any permanent or temporary injury during impact piling.

4.11.30 Assuming a worst case of a lower swimming speed of 1.5 m/s for all marine mammal species (including both adults and juveniles), the maximum time that would take a grey seal to leave the centre of the cumulative SEL weighted PTS and TTS injury zones during vibro piling is estimated to be 29 seconds and 6 minutes respectively. This is less than 0.4 % of the time that would be required for an injury to occur and, therefore, assuming seals evade the injury effects zone, they are not considered to be at risk of any permanent or temporary injury during vibro piling.

4.11.31 Impact piling is predicted to have the potential to cause instantaneous injury effects within close proximity to the activity and strong behavioural responses over a wider area although this will be constrained to within the outer section of the Humber Estuary between Hull and Cleethorpes.

4.11.32 The results indicate that if grey seals present in the Humber Estuary were to remain stationary within the cumulative SEL distances from the source of piling over a 24 hour period, it could result in temporary and/or permanent hearing injury. However, it is considered highly unlikely that any individual seal will in fact stay within this “injury zone” during the piling operations.

4.11.33 Any grey seal present are likely to avoid the area. Behavioural responses could include movement away from a sound source, aggressive behaviour related to noise exposure (e.g., flipper slapping, abrupt directed movement), visible startle response and brief cessation of reproductive behaviour (Southall *et al*., 2007). Mild to moderate behavioural responses of any individuals within these zones could include movement away from a sound source and/or visible startle response (Southall *et al*., 2007).

4.11.34 Any evasive response could also lead to the potential temporary avoidance of the outer section of the Humber Estuary between Hull and Cleethorpes. There is therefore potential for the restriction of the movements of grey seal upstream and downstream (i.e., a barrier to movements). The Humber Estuary upstream of the proposed development is not known to be used as a breeding site for seals (with the nearest known breeding colony located over 25 km away at Donna Nook at the mouth of the estuary). However, seals are frequently recorded foraging in the Humber Estuary. Any barrier to movements causing by the noise during piling, however, would be temporary with significant periods during a 24-hour period when no piling will be undertaken (see below). This of itself will allow the unconstrained movements of seals through the Humber Estuary. Seals are also highly mobile and wide ranging and therefore are likely to be able to exploit other areas for foraging during any piling.

4.11.35 The effects of piling noise on grey seal also need to be considered in terms of the duration of exposure. Piling noise will take place for a very small amount of time each day over a period of approximately 24 or 37 weeks (depending on whether a sequenced construction is employed). Piling will not take place continuously over that period as there will be periods of downtime, pile positioning and set up.

4.11.36 The piling works will be undertaken Monday to Sunday. At present, the maximum impact piling scenario is for 4 tubular piles to be installed each day from either front (i.e., the land and water), involving approximately 180 minutes of impact piling per day and 20 minutes of vibro piling per day. It should be noted, however, that in terms of potential disturbance, four piles a day is very much a worst case scenario. Either way, there will clearly be significant periods over a 24-hour period when seals will not be disturbed by any piling noise. The actual proportion of impact piling is estimated to be at worst around 14 % (based on 180 minutes of impact piling and 20 minutes of vibro piling each working day) over any given construction week. In other words, any seals that remain within the predicted behavioural effects zone at the time of percussive piling will be exposed a maximum of up to 14 % of the time on the assumption that four piles are driven in a given day – which is considered to be unlikely.

4.11.37 It is also important to consider the noise from piling against existing background or ambient noise conditions. The area in which the construction will take place already experiences constant vessel operations and ongoing maintenance dredging, and, therefore, marine mammals are likely to be habituated to a certain level of anthropogenic background noise.

4.11.38 Although the effect of underwater noise and vibration from piling works is temporary and of short duration, there is uncertainty with respect to the timing of the works which could in the worst case scenario result in a restriction of the movements of grey seal upstream and downstream (i.e., a barrier to movements). Whilst this effect would be temporary and short in duration, the potential for an AEOI cannot therefore be ruled out and on this basis mitigation has been proposed.

Mitigation

4.11.39 In order to reduce the level of impact associated with underwater noise and vibration on fish and grey seal during construction, the following mitigation measures will be implemented during piling (see the CEMP (Application Document reference number 9.2)). These measures, which have been discussed with Natural England, will be secured through the DCO consent and include the following:

- **Soft start:** The gradual increase of piling power, incrementally, until full operational power is achieved will be used as part of the piling methodology. This will give fish and marine mammals the opportunity to move away from the area before the onset of full impact strikes. The duration of the soft start is proposed to be 20 minutes in line with the JNCC piling protocol [26];

- **Vibro piling**: Vibro piling is proposed to be used where possible (which produces lower peak source noise levels than percussive piling);

- **Seasonal piling restrictions:** During percussive piling the following further restrictions are proposed:
    - No percussive piling is to take place within the waterbody between 1 April and 31 May inclusive in any calendar year. This will minimise the potential impact on the greatest number of different migratory fish in the Humber Estuary, including lamprey, in accordance with the periods identified in Table 9.16 in Chapter 9 (Application Document Reference number 8.2.9), and also the more vulnerable earlier life stages of a number of migratory fish species[27]. This restriction does not apply to percussive piling that can be undertaken outside the waterbody at periods of low water[28].
    - The duration of percussive piling is to be restricted within the waterbody from 1 June to 30 June and 1 August to 31 October

26 JNCC (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise.

27 Spring is the peak period when Atlantic salmon and sea trout smolts migrate downstream to the sea and it is also the peak migration period for European eel elvers moving into the estuary. In addition, it is the period when allis shad move into estuaries and when sea lamprey and twaite shad gather in estuaries and move up to spawn. It is also the period when the highest densities of smelt are present in the Humber Estuary.

28 The force generated by piling outside the waterbody will be exerted on the ground at that location. The sound waves can travel outwards through the seabed or be reflected from deeper sediments. As these waves propagate, sound will also “leak” upwards contributing to the airborne sound wave. The underwater noise from piling outside the waterbody will, therefore, be considerably reduced (and negligible in scale) as a result of absorption of the sound by the ground and air, the interaction with the ground surface (reflection and scattering), and the interaction with and transmission through the ground.

inclusive in any year to minimise the impacts on fish migrating through Humber Estuary during this period such as silver eels, river lamprey and returning adult Atlantic salmon. The maximum amount of percussive piling permitted within any 4-week period must not exceed 140 hours where a single piling rig is in operation or a total of 196 hours where two or more rigs are in operation. The measurement of time during each work-block described above must begin at the start of each timeframe, roll throughout it, then cease at the end, where measurement will begin again at the start of the next timeframe, such process to be repeated until the end of piling works. This restriction does not apply to percussive piling that can be undertaken outside the waterbody at periods of low water. This approach has been developed in consultation with the MMO and Cefas.

- **Night time piling restriction:** The upstream migration of river lamprey takes place almost exclusively at night (Environment Agency, 2013). No percussive piling is to take place within the waterbody between 1 March to 31 March, 1 June to 30 June and 1 August to 31 October inclusive after sunset and before sunrise on any day. Percussive piling operations that have already been initiated will, however, be completed where an immediate cessation of the activity would form an unsafe working practice. This restriction does not apply to percussive piling that can be undertaken outside the waterbody at periods of low water which will limit the potential effects of underwater piling noise on the nocturnal movements of river lamprey.

- **Marine Mammal Observer**: In addition, in order to further reduce the significance of the impact to marine mammals the JNCC "Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals during piling" (JNCC, 2010) will be followed during percussive piling. The key procedures highlighted in this document include the following:
  - Establishment of a 'mitigation zone' of 500 m from the piling locations, prior to any percussive piling. Within this mitigation zone, observations of marine mammals will be undertaken by a trained member of the construction team using marine mammal identification resources;
  - 30 minutes prior to the commencement of percussive piling, a search should be undertaken by the Marine Mammal Observer to determine that no marine mammals are within the mitigation zone. Percussive piling activity should not be commenced if marine mammals are detected within the mitigation zone or until 20 minutes after the last visual detection;
  - During percussive piling, the Marine Mammal Observer should observe the mitigation zone to determine that no marine mammals are within this area. Construction workers will be alerted if marine mammals are identified, and piling will cease whilst any marine mammals are within the mitigation zone. Piling can recommence when the marine mammal exits the mitigation zone and there is no further detection after 20 minutes; and

- If there is a pause in percussive piling operations for any reason over an agreed period of time, then another search (and soft-start procedures for piling) should be repeated before activity recommences. If, however, the mitigation zone has been observed while piling has ceased and no marine mammals have entered the zone, piling activity can recommence immediately.

Assessment of the potential for an AEOI

4.11.40 Based on the evidence provided above with reference to the mitigation measures detailed and the rationale provided in Table 31, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 31. The Potential for an AEOI on qualifying species due to potential underwater noise and vibration during piling

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	S1095: Sea lamprey *Petromyzon marinus*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information highlighted above, underwater noise levels during piling have the potential to result in potential injury/mortality in lamprey species within a relatively localised area around the piling activity and behavioural reactions over a larger area. However, piling in the most sensitive period for migrating sea lamprey will be avoided as a result of the proposed piling restriction mitigation with the potential for injury effects on sea lamprey, therefore, considered to be limited. On this basis, underwater noise effects on sea lamprey during piling is considered unlikely to causes changes to *'The populations of qualifying species'* conservation objective. With the proposed mitigation measures in place, changes to the '*distribution of qualifying species within the site'* conservation objective is also considered unlikely as sea lamprey would be expected to continue to migrate through the estuary.
	S1099: River lamprey *Lampetra fluviatilis*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information highlighted above, underwater noise levels during piling have the potential to result in potential injury/mortality in lamprey species within a relatively localised area around the piling activity and behavioural reactions over a larger area. However, a seasonal restriction on piling at night will help minimise the potential for injury effects to river lamprey. On this basis, underwater noise effects on river lamprey during piling is considered unlikely to causes changes to

Site	Features	Potential AEOI	Justification
			'The populations of qualifying species' conservation objective. With the proposed mitigation measures in place, changes to the '*distribution of qualifying species within the site'* conservation objective is also considered unlikely as river lamprey would be expected to continue to migrate through the estuary.
	S1364: Grey seal *Halichoerus grypus*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Based on the information highlighted above, underwater noise might cause some temporary changes to the movement patterns of foraging grey seals with piling causing avoidance responses and intermittent barrier effects during piling operations. Therefore, short term changes in the local distribution of grey seals could occur but no permanent changes in the overall distribution of grey seals in the region will occur. On this basis, the *'distribution of qualifying species within the site'* conservation objective will therefore not be compromised. Potential injury or lethal effects to seals would be expected to be restricted to a very localised area in the direct vicinity of piling operations. However, with the proposed mitigation in place, the potential for injury effects on seals is considered to be limited. On this basis, underwater noise effects on grey seals during piling is considered unlikely to causes changes to '*The populations of qualifying species'* conservation objective.

Site	Features	Potential AEOI	Justification
Humber Estuary Ramsar site	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Summary information with respect to the grey seal feature has been provided above in the table.
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	Summary information with respect to lamprey features has been provided above in the table.

The potential effects of underwater noise and vibration during capital dredge and dredge disposal on qualifying species

General scientific context

4.11.41 As described in Paragraph 4.11.1, elevated underwater noise and vibration levels during construction activities can potentially disturb fish and marine mammals by causing physiological damage and/or inducing adverse behavioural reactions. A detailed underwater noise assessment has been undertaken for the proposed development (Appendix 9.2 of the ES (Application Document Reference number 8.4.9 (b))).

4.11.42 Scientific evidence on this impact pathway is provided in Paragraphs 4.11.3 to 4.11.5 in relation to lamprey and in Paragraphs 4.11.6 to 4.11.13 in relation to marine mammals (grey seal).

4.11.43 The dredging process involves a variety of sound generating activities which can be broadly divided into sediment excavation, transport and placement of the dredged material at the disposal site (CEDA, 2011; WODA, 2013; Jones and Marten, 2016). For most dredging activities, the main source of sound relates to the vessel engine noise.

Summary of effects

Effects on fish

4.11.44 The worst case source level (SL) generated by dredging and vessels is below the Popper *et al*. (2014) quantitative instantaneous peak SPL and cumulative SEL thresholds for pile driving, which indicates that there is no risk of mortality, potential mortal injury or recoverable injury in all categories of fish even at the very source of the dredger or vessel noise. This appears to correlate with the Popper *et al*. (2014) recommended qualitative guidelines for continuous noise sources which consider that the risk of mortality and potential mortal injury in all fish is low in the near, intermediate and far-field.

4.11.45 According to Popper *et al.* (2014), the risk of recoverable injury is considered lower for fish with no swim bladder (lamprey) compared to fish where the swim bladder is involved in hearing (e.g., herring). For the latter group whereby a cumulative noise exposure threshold is recommended (170 dB rms for 48 h), the distance at which recoverable injury is predicted as a result of the dredging and vessel movements is 10 m, and therefore the distance to recoverable injury in lamprey is less than 10 m.

4.11.46 Popper *et al*. (2014) advise that there is a moderate risk of temporary threshold shifts (TTS) occurring in the nearfield (i.e., tens of metres from the source) in fish with no swim bladder (lamprey) and a low risk in the intermediate and far-field. There is a greater risk of TTS in fish where the swim bladder is involved in hearing (e.g., herring) when a cumulative noise exposure threshold is recommended (158 dB rms for 12 h). The distance at which TTS is predicted in these fish as a result of the dredging and vessel movements is 46 m and therefore the distance to TTS in lamprey is less than 46 m.

4.11.47 Popper *et al.* (2014) guidelines suggest that there is considered to be a moderate risk of potential behavioural responses occurring in the nearfield (i.e., tens of metres from the source) for fish species with no swim bladder (lamprey). At intermediate distances (i.e., hundreds of metres from the source), there is considered to be a moderate risk of potential behavioural responses in all fish and in the farfield (i.e., thousands of metres from the source) there is considered to be a low risk of a response in all fish.

4.11.48 Overall, there is considered to be a low risk of any injury in lamprey as a result of the underwater noise generated by dredging and vessel movements. The level of exposure will depend on the position of the fish with respect to the source, the propagation conditions, and the individual's behaviour over time. However, it is unlikely that a fish would remain in the vicinity of a dredger for extended periods given the distances at which recoverable injury or TTS are predicted in lamprey as a result of the dredging and vessel movements, as explained in Paragraph 4.11.46. Behavioural responses are anticipated to be spatially negligible in scale and lamprey will be able to move away and avoid the source of the noise as required. Furthermore, the period of dredging will be short term (approximately 80 days (11 weeks) in total). Based on the above considerations, the effect of underwater noise on river and sea lamprey due to dredging and disposal activities is considered to be negligible.

Effects on grey seal

4.11.49 The distances at which PTS, TTS and behavioural effects in marine mammals that occur in the study area are predicted to occur as a result of the dredging and vessel movements to and from the disposal sites associated with the proposed development are included in Appendix 9.2 to the ES (Application Document Reference number 8.4.9 (b)).

4.11.50 NOAA's user spreadsheet tool (NOAA, 2021) has been used to predict the range at which the weighted cumulative SEL acoustic thresholds (NOAA, 2018) for PTS and TTS are reached during the proposed dredging and disposal activity based on the assumptions highlighted in Appendix 9.2 to the ES (Application Document Reference number 8.4.9 (b)).

4.11.51 There is predicted to be no risk of PTS in seals and the risk of TTS is limited to within 12 m from the dredging or vessel activity.

4.11.52 Overall, there is not considered to be any risk of injury or significant disturbance to grey seal from the dredging and vessel activities that are proposed at the Port of Immingham even if the dredging and vessel movements were to take place continuously 24/7.

4.11.53 Hearing damage is unlikely to occur and the main effect that could be expected in the vicinity of the dredge vessels would be short-term mild behavioural avoidance. Based on these factors, the effect of underwater noise on grey seal due to dredging and disposal activities is considered to be negligible.

Mitigation

4.11.54 Mitigation is not relevant to this impact pathway and is not required.

Assessment of the potential for an AEOI

4.11.55 Based on the evidence provided above and the rationale provided in Table 32, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 32. The potential for an AEOI on qualifying species due to potential underwater noise and vibration during dredging

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	The risk of injury to fish as result of dredging noise is considered to be very low. Behavioural responses are only predicted in a highly localised area near to the dredging vessel with lamprey able to easily move away and avoid the source of noise. The capital dredging noise will therefore not affect the migratory movements of lamprey or causes changes to '*The populations of qualifying species'* or the '*distribution of qualifying species within the site'* conservation objectives.
	S1364: Grey seal *Halichoerus grypus*	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest feature.	The risk of injury to grey seal as a result of dredging noise is considered very low. Behavioural responses are only predicted in a highly localised area near to the dredging vessel with grey seals able to easily move away and avoid the source of noise. The capital dredging noise will, therefore, not causes changes to 'The populations of qualifying species' or the 'distribution of qualifying species within the site' conservation objectives.

Site	Features	Potential AEOI	Justification
Humber Estuary Ramsar site	Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Summary information with respect to the grey seal feature has been provided above in the table.
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	Summary information with respect to lamprey features has been provided above in the table.

4.12 Biological disturbance due to potential introduction and spread of non-native species

The potential effects of the introduction and spread of non-native species during construction on qualifying habitats

General scientific context

4.12.1 Non-native, or invasive, species are described as ‘organisms introduced into places outside of their natural range of distribution, where they become established and disperse, generating a negative impact on the local ecosystem and species’ (International Union for Conservation of Nature (IUCN, 2011). The ecological impacts of such ‘biological invasions’ are considered to be the second largest threat to biodiversity worldwide, after habitat loss and destruction. In the last few decades marine and freshwater systems have been impacted by invasive species, largely as a result of increased global shipping (Carlton and Geller, 1993).

4.12.2 The introduction and spread of non-native species can occur either accidentally or by intentional movement of species as a consequence of human activity (Ruiz and Carlton, 2003 cited in Pearce *et al.,* 2012). The main pathway for the potential introduction of non-native species is via fouling of vessels’ hulls, transport of species in ballast or bilge water and the accidental imports from materials brought into the system during development activities. Pathways involving vessel movements (fouling of hulls and ballast water) have been identified as the highest potential risk routes for the introduction of non-native species (Carlton, 1992; Pearce *et al.,* 2012), particularly from different biogeographical regions, which agrees with the fact that areas with a high volume of shipping traffic are hotspots for non-native species in British waters (Pearce *et al.,* 2012).

4.12.3 The fouling of a vessel hull and other below-water surfaces can be reduced through the use of protective coatings. These coatings usually contain a toxic chemical (such as copper) or an irritant (such as pepper) that discourages organisms from attaching. Other coatings, such as those that are silicone-based, provide a surface that is more difficult to adhere to firmly, making cleaning of the hull less laborious. The type and concentration of coatings that can be applied to a boat hull is regulated and can vary between countries. Maintenance of hulls through regular cleaning will minimise the number of fouling organisms present. Hull cleaning can take place on land or in-water. In both cases, care needs to be taken to prevent the organisms and coating particles from being released into the water. By following best management practices, the impact of the cleaning procedure on the environment can be minimised.

4.12.4 Non-native invasive species also have the potential to be transported via ship ballast water. Seawater may be drawn into tanks when the ship is not carrying cargo, for stability, and expelled when it is no longer required. This provides a vector whereby organisms may be transported long distances. In 2004, the International Maritime Organisation (IMO) adopted the

'International Convention for the Control and Management of Ships' Ballast Water and Sediments', which introduced two performance standards seeking to limit the risk of non-native invasive species being imported (including distances for ballast water exchange and standards for ballast water treatment). The Convention came into force internationally in September 2017.

4.12.5 The UK is bound by international agreements such as the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979), the Convention on the Conservation of European Wildlife and Natural Habitat (Berne Convention, 1979) and the Habitats and Birds Directives. All of these include provisions requiring measures to prevent the introduction of, or control of, non-native species, especially those that threaten native or protected species (JNCC, 2004). Additionally, Section 14(1) of the Wildlife and Countryside Act (WCA) makes it illegal to release, or allow to escape into the wild, any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state or is listed in Schedule 9 to the WCA.

Summary of effects

4.12.6 As discussed above, non-native species have the potential to be transported into the study area on ships' hulls during capital dredging and construction activity (such as crane barges used in piling). Non-native invasive species also have the potential to be transported via ship ballast water. Seawater may be drawn into the dredger tanks or hopper when the ship is not carrying cargo, for stability, and expelled when it is no longer required. This provides a vector whereby organisms may be transported long distances.

4.12.7 Within England and Wales, best practice guidance has been developed on how to manage marine biosecurity risks at sites and when undertaking activities through the preparation and implementation of biosecurity plans (Cook *et al.,* 2014). This guidance will be followed when developing biosecurity control measures to minimise the risk of the introduction and spread of non-native species during construction of the scheme. These measures will be included within the CEMP (Application Document reference number 9.2). On this basis, the probability of the introduction and spread of non-native species from the construction phase is considered to be low.

Mitigation

4.12.8 No additional mitigation has been identified in relation to this pathway, however the assessment is based on the application of standard best practice measures in the form of robust biosecurity management procedures.

4.12.9 Biosecurity control measures during construction will be included within the CEMP (Application Document reference number 9.2).

Assessment of the potential for an AEOI

4.12.10 Based on the evidence provided above and the rationale provided in Table 33, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 33. The potential for an AEOI on qualifying habitats due to the potential introduction and spread of non-native species during construction

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1110: Sandbanks which are slightly covered by sea water all the time	In the context of the site's conservation objectives, there is no potential AEOI on qualifying interest features.	Taking into account the considerations highlighted above and the proposed biosecurity measures, the probability of the introduction and spread of non-native species from the construction phase is considered to be low. On this basis, this pathway is not expected to cause a change to the '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. This pathway will also not cause any changes to the '*the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely*' conservation objectives.
	H1130: Estuaries		
	H1140: Mudflats and sandflats not covered by seawater at low tide		
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.		

The potential effects of the introduction and spread of non-native species during operation on qualifying habitats

General scientific context

4.12.11 Scientific evidence on this impact pathway is provided in Paragraphs 4.12.1 to 4.12.5.

Summary of effects

4.12.12 Non-native species have the potential to be transported into the study area on ships' hulls during maintenance dredging and through operational vessels. Non-native invasive species also have the potential to be transported via ship ballast water. Seawater may be drawn into tanks when the ship is not carrying cargo, for stability, and expelled when it is no longer required. This provides a vector whereby organisms may be transported long distances.

4.12.13 In view of current legislation (described in Paragraph 4.12.7) and the fact that potential biosecurity risks are managed through ABP's existing biosecurity management procedures, the probability of the introduction and spread of non-native species from operational phase is considered to be low.

Mitigation

4.12.14 No additional mitigation has been identified in relation to this pathway, however there is a requirement to ensure the application of standard best practice measures in the form of robust biosecurity management procedures.

4.12.15 ABP’s existing biosecurity management procedures will be followed during operation.

Assessment of the potential for an AEOI

4.12.16 Based on the evidence provided above and the rationale provided in **Table** 34, the predicted effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features as a result of this pathway.

Table 34. The potential for an AEOI on qualifying habitats due to the potential introduction and spread of non-native species during operation

Site	Features	Potential AEOI	Justification
Humber Estuary SAC	H1110: Sandbanks which are slightly covered by sea water all the time	In the context of the site's conservation objectives, there is no potential AEOI on qualifying interest features.	Taking into account the considerations highlighted above and the proposed biosecurity measures, the probability of the introduction and spread of non-native species from the operational phase is considered to be low. On this basis, this pathway is not expected to cause a change to the '*the extent and distribution of qualifying natural habitats and habitats of the qualifying species'* conservation objective. This pathway will also not cause any changes to the '*the structure and function of qualifying natural habitats'* or cause modifications to '*the supporting processes on which qualifying natural habitats rely*' conservation objectives.
	H1130: Estuaries		
	H1140: Mudflats and sandflats not covered by seawater at low tide		
Humber Estuary Ramsar site	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	In the context of the site's conservation objectives, there is considered to be no potential AEOI on the qualifying interest features.	

4.13 Consideration of combined effects

4.13.1 The potential impact pathways have also been considered collectively. The assessment of intra-project effects involves the consideration of where two or more different types of effect arising from the IERRT project could interact or combine to influence the same qualifying interest feature and whether this combined effect could potentially undermine the conservation objectives of the European Site.

4.13.2 Potential intra-project effects were identified for the features of the Humber Estuary SAC, SPA and Ramsar considering all impact pathways screened into the assessment (see Section 4.2). The following potential effects which could interact or combine were identified:

- During construction there are potential combined effects on Humber Estuary SAC habitats (sandbanks which are slightly covered by sea water all the time; estuaries; and mudflats and sandflats not covered by seawater at low tide) from habitat loss. damage, contamination and biological disturbance;
- During operation there are potential combined effects on Humber Estuary SAC habitats from habitat loss/damage and biological disturbance;
- During construction there are potential combined effects on Humber Estuary SAC species sea lamprey and river lamprey from contamination and disturbance through underwater noise and vibration; and
- During construction there are potential combined effects on features of the Humber Estuary SPA (Common Shelduck, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Common Redshank and the waterbird assemblage) from habitat loss/damage and airborne noise and visual disturbance.

4.13.3 Multiple impact pathways were similarly identified for the Humber Estuary Ramsar with potential effects relating to the following:

- Criterion 1: Habitat loss/damage, contamination and disturbance during construction and habitat loss/damage and disturbance during operation 1;
- Criterion 5 and Criterion 6: Habitat loss/damage and disturbance in both construction and operation; and
- Criterion 8: Contamination and disturbance during construction[29].

4.13.4 The combined intra-project effects of all impact pathways have been considered in relation to each feature and in the context of the sites' conservation objectives. The majority of effects are small scale and are assessed as negligible/*de minimis* magnitude and it is concluded that there are no intra-project effects that would result in an AEOI of the Humber SAC, SPA or Ramsar.

29 JNCC (2007). Information Sheet on Ramsar Wetlands - Humber Estuary. Available at: https://jncc.gov.uk/jncc-assets/RIS/UK11031.pdf (accessed 2 January 2023).

4.13.5 It is noted that for two instances there is a reliance on mitigation measures to enable a conclusion of no AEOI to be reached. This relates to mitigation measures that are required during construction to minimise the effects due to airborne noise and visual disturbance and from underwater noise and vibration which are discussed in more detail below.

4.13.6 During construction coastal waterbirds which are features of the Humber Estuary SPA (Common Shelduck, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Common Redshank and the waterbird assemblage) will be subject to effects from airborne noise and visual disturbance as well as loss of intertidal mudflat which is a feeding resource. In theory these effects could combine to result in a synergistic effect if birds which are displaced as a result of noise are also limited by the availability of food resource. However, in reality the direct loss of a very small area of lower shore intertidal mudflat (0.003 ha) and the indirect loss from alterations to physical processes (0.01ha) are within the scale of natural variability and is expected to be immeasurable in real terms when taking account of the variation in water levels, wave climate and accuracy of the modelled bathymetry. The combined loss of intertidal mudflat is considered inconsequential to these mobile coastal waterbird species even at a local scale (see Section 4.3). Based on the evidence provided in Section 4.9 in relation to airborne noise and visual disturbance during construction and with reference to the mitigation measures, the predicted combined effects are not considered to compromise any of the conservation objectives, and it concluded that there is no potential for AEOI on qualifying interest features of the Humber Estuary SPA.

4.13.7 During construction there are potential combined effects on Humber Estuary SAC species sea lamprey and river lamprey from contamination and disturbance through underwater noise and vibration. There are no anticipated effects on fish from toxic and non-toxic contamination pathways. Based on modelling the sediment plumes resulting from dredging will be relatively localised and will dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time (less than a single tidal cycle. There are generally low levels of contamination in the sediment contamination samples and elevations in the concentrations of contaminants within the water column are not anticipated. Based on the evidence provided in Section 4.10 in relation to disturbance from underwater noise and vibration during construction and with reference to the mitigation measures, the predicted combined effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features of the Humber Estuary SAC.

4.14 In-combination assessment

4.14.1 The Habitats Regulations require an assessment of the potential in-combination effects of the proposed works on European/Ramsar sites with other plans and projects. These refer to effects, which may or may not interact with each other, but which could affect the same interest feature.

4.14.2 Potential in-combination effects on interest features of European/Ramsar sites that have been screened into the AA (see Section 3) have been considered in this section.

4.14.3 Proposed plans or projects in the Humber Estuary which have the potential to cause potential cumulative/in-combination effects with marine ecology features are discussed in more detail in the cumulative and in-combination effects assessment (Chapter 20 of the ES (Application Document Reference number 8.2.20)). Those plans or projects which overlap with the zone of influence of potential effects on marine ecology receptors as a result of the IERRT project and are assessed in Chapter 20 have been taken forward for this HRA in-combination assessment. The details of each short-listed application including a description of the project, the application and approval status and project timescales are provided in Table 20.5 in Chapter 20 of the ES. The projects and pathways relevant to the HRA in-combination assessment are detailed in Table 35. Potential in-combination effects are then considered in detail in Table 36 (Humber Estuary SAC), Table 37 (Humber Estuary SPA) and Table 38 (Humber Estuary Ramsar) in the context of the sites' conservation objectives.

4.14.4 In summary, none of the ongoing activities, plans and projects are anticipated to result in in-combination effects of a scale that would change the existing condition status of the interest features recognised within the European/Ramsar sites screened into the AA. On this basis, the proposed development is considered to result in no potential for an AEOI on any interest features of European/Ramsar sites in-combination with other plans, projects and activities.

Table 35. Identification of projects and impact pathways relevant to the in-combination assessment.

ID	Project	Distance From IERRT Project	Impact Pathways Relevant to the HRA In-combination Assessment
1.	Maintenance dredge disposal at Grimsby, Immingham and Sunk Dredged Channel	Approx. 0.1 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance
2.	Humber International Terminal (HIT) berth 2: adaptation for car carriers	Approx. 2.5 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases

ID	Project	Distance From IERRT Project	Impact Pathways Relevant to the HRA In-combination Assessment
			Disturbance • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance
3.	Outstrays to Skeffling Managed Realignment Scheme (OtSMRS)	Approx.10 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Airborne noise and visual disturbance
21.	Development of a sustainable transport fuels facility Two discharge of conditions applications in 2022. Land at Hobson Way, Stallingborough (DM/0664/19/FUL)	Approx. 2.2 km	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants

ID	Project	Distance From IERRT Project	Impact Pathways Relevant to the HRA In-combination Assessment
35.	Construction of an Energy Recovery Facility with an electricity export capacity of up to 49.5MW and associated infrastructure including a stack to 90m high (DM/0026/18/FUL)	Approx. 177 m	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants **Disturbance** • Airborne noise and visual disturbance
44.	New access road from existing public highway on Queens Road, Immingham (DM/0294/21/FUL)	Approx. 0.25 km	**Disturbance** • Airborne noise and visual disturbance
51.	Erection of 2x 24m Biomass Flues. Netherlands Way, Stallingborough	Approx. 840 m	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants
53.	Able Marine Energy Park (AMEP) DCO as consented and Material Change 1 and 2	Approx. 2.8 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC

ID	Project	Distance From IERRT Project	Impact Pathways Relevant to the HRA In-combination Assessment
			• Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance
54.	Able Marine Energy Park (AMEP) Regulated Tidal Exchange & Managed Realignment scheme at Cherry Cobb Sands	Approx. 3.5 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss or damage of habitat through alterations in physical processes **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Airborne noise and visual disturbance
55.	Humber Low Carbon Pipelines	Current proposal within 10 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases

ID	Project	Distance From IERRT Project	Impact Pathways Relevant to the HRA In-combination Assessment
			Disturbance • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance
56.	Viking CCS Pipeline	Current proposal within 4 km	**Disturbance** • Airborne noise and visual disturbance
57.	Immingham Green Energy Terminal	Approx. 0.1 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance
58.	South Humber Bank Energy Centre	Approx. 3.8 km	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants **Disturbance** • Airborne noise and visual disturbance
59.	VPI Immingham B OCGT	Approx. 5 km	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants

ID	Project	Distance From IERRT Project	Impact Pathways Relevant to the HRA In-combination Assessment
60.	North Killingholme Power Project	Approx. 8 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance
61.	Humber Stallingborough Phase 3 Project	Approx. 2 km	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases **Disturbance** • Disturbance through underwater noise and vibration • Airborne noise and visual disturbance

Table 36. The potential for an AEOI on qualifying habitats and species of the Humber Estuary SAC due to in-combination effects.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
1.	Maintenance dredge disposal at Grimsby, Immingham and Sunk Dredged Channel (MLA/2014/00431)	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The habitats in the area are already subject to considerable seabed disturbance as a result of the existing maintenance dredging regime. The variations proposed to this existing maintenance dredge licence will not change the volumes of material to be dredged from the Port of Immingham area. The marine habitats and species occurring in the area are also considered to be commonly occurring and of low conservation value. Changes during dredging as a result of the IERRT project are considered to be localised and low magnitude and in-combination with this maintenance dredging project will result in only a small increase in the potential maintenance dredge commitment for the Immingham area and disposal site. **Contamination** There is the potential for cumulative effects with respect to increased SSC as a result of maintenance dredging and disposal of material from Grimsby, Immingham, and Sunk Dredged Channel. The assessment of the potential future maintenance dredging requirements for the IERRT indicates an increase of 3-6% on the existing average annual maintenance dredge (between 2004 and 2020) rate across the existing Immingham berths (or a 2-4% increase on the average annual disposal volume at the HU060 site since 2004). In-combination effects from dredge or disposal plumes from adjacent sites will only exist for a short period of time (a matter of hours) when activities are taking place concurrently. Once the next peak tide (ebb or flood) has dispersed the plume across the wider study area, the increased SSC values are unlikely to be distinguishable from the existing background concentrations. It is also considered likely that the availability of dredging plant (servicing the ports and approaches across the wider Humber, including Goole, Hull and Grimsby) will mean the potential for dredging to be taking place at adjacent locations and at the same time is limited. In relation to the release of sediment -bound contaminants, the Marine Licence requires sediment samples to be tested in line with OSPAR requirements prior to disposal which minimises the potential for mobilisation of contaminants. In addition, this project is concerned with the disposal of recently accreted sediment which is less likely to comprise a source of historic contamination and therefore this is unlikely to result in a cumulative effect. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	There is the potential for cumulative effects on local air quality. Activities associated with MLA/2014/00431 may have emissions to air that could coincide with proposed IERRT emissions and effect shared receptors. Due to the location of MLA/2014/00431 emission sources, shared receptors are limited to air quality sensitive habitats within the Humber Estuary SAC, namely the closet areas of saltmarsh. The proposed IERRT project does not impact on the nearest saltmarsh habitats to the extent that the effect is significant. Any emissions associated with MLA/2014/00431 will be limited due to the number of emission sources and intermittent operation of those sources over the course of a year. The predicted in-combination effects are not considered to compromise any of the conservation objectives, and it concluded that there is no potential for AEOI on qualifying interest features.
		S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis*	**Disturbance** • Disturbance through underwater noise and vibration	There is the potential for cumulative effects on lamprey and grey seal features if the dredging activities associated with MLA/2014/00431 occur at the same time as construction and maintenance dredging as part of IERRT. The noise associated with MLA/2014/00431 is likely to be similar to the dredging operations for IERRT and will be limited due the intermittent operation over the course of a year. It is also considered likely that the availability of dredging plant (servicing the ports and approaches across

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		S1364: Grey seal *Halichoerus grypus*		the wider Humber, including Goole, Hull and Grimsby) will mean the potential for dredging to be taking place at adjacent locations and at the same time is limited. However, dredging for both projects is only expected to cause behavioural reactions (at most) in a relatively localised area in the vicinity of the dredger. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
2.	Humber International Terminal (HIT) berth 2: adaptation for car carriers	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The piles required for the HIT berth 2 works will result in a *de minimis* loss of subtidal habitat. In addition, sedimentation due to the localised resuspension of sediment as a result of seabed disturbance during piling and changes to hydrodynamic and sedimentary processes due to the presence of the piles including potential scouring directly around piles effects are anticipated to be negligible and highly localised. Furthermore, the benthic community is expected to recover relatively rapidly from any localised physical disturbance with subtidal species known to occur in the area typically considered fast growing and/or have rapid reproductive rates. The cumulative effects of physical loss of habitat are considered negligible. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects with respect to increased SSC and changes to dissolved oxygen and chemical water quality as a result of seabed disturbance during piling. Any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis* S1364: Grey seal *Halichoerus grypus*	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with HIT berth 2 works have the potential to result in cumulative effects on lamprey and grey seal features of the Humber Estuary SAC. Piling noise has the potential to cause injury effects in fish and marine mammals within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Both projects will require similar mitigation to help minimise potential adverse effects (such as soft start procedures, timing restrictions to avoid sensitive periods for migratory fish and the use of marine mammal observers). It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is therefore concluded that there is no potential for AEOI on qualifying interest features.
3.	Outstrays to Skeffling Managed Realignment Scheme (OtSMRS)	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	The proposed OtSMRS is located approximately 10 km from the IERRT project. The managed realignment site works has the potential to result in highly localised effects on physical processes elements (such as local flows and elevated suspended sediment levels and sediment deposition) as a result of the breaching. The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the hydrodynamic or sedimentary effects as a result of the IERRT project. Effects on water quality are also predicted to be highly localised quality (such as due to elevated suspended sediment levels and changes to dissolved oxygen and chemical water quality). The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the water quality effects as a result of the IERRT project. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
22.	New access road from existing public highway on Queens	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	The potential impacts on air quality relate to construction dust and it is reasonable to assume that the planning application process has identified a proportionate level of mitigation relating to this effect. There are no predicted impacts in relation to nitrogen deposition and therefore no in-combination effects and no potential for AEOI.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
	Road, Immingham (DM/0294/21/FUL)			
24.	Able Marine Energy Park (AMEP) DCO as consented and Material Change 1 and 2	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** Both the AMEP and IERRT project have the potential to result in changes to marine habitats as a result of capital dredging due to physical disturbance during sediment removal, sediment deposition and indirectly as a result of changes to hydrodynamic and sedimentary processes. These potential effects were assessed as not significant both projects. The subtidal habitats around the Port of Immingham are typically impoverished and of low ecological value reflecting the existing high levels of physical disturbance in the area due to strong near bed tidal currents and sediment transport. Deposition of sediment as a result of dredging for both projects were predicted to be localised and similar to background variability away from the dredge pockets with species occurring in the local area considered tolerant to some sediment deposition. The cumulative effects of change on marine habitats and species from the highly localised and small scale predicted effects due to hydrodynamic and sedimentary processes are considered negligible for both projects. The AMEP project will result in a direct loss of intertidal habitat (mudflat and saltmarsh) as a result of the reclamation of the proposed quay (33 ha). Compensation for this loss will be provided at the Cherry Cobb Sands compensation site. Direct loss of intertidal as a result of the proposed IERRT development will be de minimis and therefore, with the provision of the compensatory habitat required for AMEP project, there is no additional cumulative effect from the IERRT project that could compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects with respect to increased SSC and changes to dissolved oxygen and chemical water quality as a result of seabed disturbance. Any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. In relation to the release of sediment -bound contaminants, the level of contamination in the proposed dredge areas for both projects was considered to be low with material expected be rapidly dispersed by strong tidal currents in the area. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	The traffic data used to inform the air quality assessment for the proposed IERRT project is inherently cumulative with regards to the Consent Order for the AMEP. There are no predicted in-combination effects and it is concluded that there is no potential for AEOI on qualifying interest features.
		S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis* S1364: Grey seal *Halichoerus grypus*	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with the AMEP works have the potential to result in cumulative effects on lamprey and grey seal features of the Humber Estuary SAC. Dredging for both projects is only expected to cause behavioural reactions in a relatively localised area in the vicinity of the dredger for both fish and marine mammals. Piling noise has the potential to cause injury effects in fish and marine mammals within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Both projects will require similar mitigation to help minimise potential adverse effects (such as soft start procedures, timing restrictions to avoid sensitive periods for migratory fish and the use of marine mammal observers). It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
21.	Development of a sustainable transport fuels facility Two	H1330. Atlantic salt meadows (*Glauco-*	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Potential for cumulative effects in relation to operational effects from emissions.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
	discharge of conditions applications in 2022. Land at Hobson Way, Stallingborough (DM/0664/19/FUL)	*Puccinellietalia maritimae*)		In terms of impacts from DM/0664/19/FUL on the Humber Estuary, with respect to annual mean NOx, annual mean ammonia and annual mean sulphur dioxide; total concentrations will be below the relevant critical levels. With respect to 24-hour mean NOx, nutrient nitrogen deposition and acid deposition, baseline concentrations currently exceed the critical level or load and as the predicted process contributions exceed 1%/10% of the relevant critical levels and critical loads, significant impacts cannot be discounted The proposed DM/0664/19/FUL development will operate in accordance with Best Available Techniques (BAT) and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for DM/0664/19/FUL. The predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
35.	Construction of an Energy Recovery Facility with an electricity export capacity of up to 49.5MW and associated infrastructure including a stack to 90m high (DM/0026/18/FUL)	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Potential for cumulative effects in relation to operational effects from emissions. In terms of impacts from DM/0026/18/FUL on the Humber Estuary, with respect to annual mean NOx, annual mean ammonia and annual mean sulphur dioxide total concentrations will be below the relevant critical levels. There is a small magnitude increase in oxides of nitrogen levels and nitrogen deposition on saltmarsh habitats and this is assessed as not significant. The proposed DM/0026/18/FUL development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. The predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
44.	New access road from existing public highway on Queens Road, Immingham (DM/0294/21/FUL)	No effects on SAC features.	N/A	N/A
51.	Erection of 2x 24m Biomass Flues. Netherlands Way, Stallingborough (DM/1056/20/FUL)	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Potential for cumulative effects from emissions. The air quality assessment for DM/1056/20/FUL concluded that the effects were insignificant at all receptors and given the scale of the project there are no anticipated cumulative effects and it is concluded that there is no potential for AEOI on qualifying interest features.
53.&54.	Able Marine Energy Park (AMEP) Regulated Tidal Exchange & Managed Realignment scheme at Cherry Cobb Sands	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	The proposed Managed Realignment Scheme is located on the opposite bank of the Humber Estuary. The managed realignment site works has the potential to result in highly localised effects on physical processes elements (such as local flows and elevated suspended sediment levels and sediment deposition) as a result of the breaching. The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the hydrodynamic or sedimentary effects as a result of the IERRT project. Effects on water quality are also predicted to be highly localised quality (such as due to elevated suspended sediment levels and changes to dissolved oxygen and chemical water quality). The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the water quality effects as a result of the IERRT project. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
55.	Humber Low Carbon Pipelines	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** Based on information provided in the EIA scoping report for the Humber Low Carbon Project, trenchless methods (e.g., bored tunnel) could be used to minimise potential effects on SAC habitats where the pipelines cross the Humber Estuary. However, construction method has not been confirmed at the landfall (trenchless, e.g., Horizontal Directional Drilling (HDD), or via cofferdam) and, therefore, features of the SAC could not be scoped out. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects with respect to increased SSC and changes to dissolved oxygen and chemical water quality as a result of seabed

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
				disturbance. Any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. In relation to the release of sediment -bound contaminants, it is assumed that the Humber Low Carbon Project projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects. If trenchless methods are not feasible and excavation (dredging) of the seabed is required then the project would require sediment samples to be tested in line with OSPAR requirements which minimises the potential for mobilisation of contaminants. Given the current uncertainties with respect to the construction methods and programme for the Humber Low Carbon Pipeline, a detailed assessment of effects on SAC features is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on SAC features. Therefore, assuming appropriate mitigation measures are followed for the IERRT project in-combination effects are not considered to compromise any of the conservation objectives, and a conclusion of no AEOI can be reached, subject to further information becoming available.
		S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis* S1364: Grey seal *Halichoerus grypus*	**Disturbance** • Disturbance through underwater noise and vibration	Given the current uncertainties with respect to the construction methods and programme for the Humber Low Carbon Pipeline, a detailed assessment of underwater noise and vibration effects on SAC features is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on SAC features. Therefore, assuming appropriate mitigation measures are followed for the IERRT project in-combination effects are not considered to compromise any of the conservation objectives, and a conclusion of no AEOI can be reached, subject to further information becoming available.
56.	Viking CCS Pipeline	No effects on SAC features	N/A	N/A
57.	Immingham Green Energy Terminal	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The piles required for the jetty of the Immingham Green Energy Terminal project are likely to result in a small loss of subtidal habitat and a *de minimis* loss in the intertidal. In addition, sedimentation due to the localised resuspension of sediment as a result of seabed disturbance during piling and the small capital dredge as well as changes to hydrodynamic and sedimentary processes due to the presence of the piles/dredging are anticipated to be negligible and highly localised. Furthermore, the benthic community is expected to recover relatively rapidly from any localised physical disturbance with subtidal species known to occur in the area typically considered fast growing and/or have rapid reproductive rates. The cumulative effects of change on marine habitats and species are considered negligible for both projects. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects from the resuspension of sediment as a result of seabed disturbance during piling and the small capital dredge will cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	There are potential for cumulative effects on local air quality, due to the proximity of the Consent Order application site from the proposed IERRT project, shared receptors and pollutants. There is no AEOI of the proposed IERRT project alone, although the effect of the Consent Order application cannot be confirmed until further information on that application is published.
		S1095: Sea lamprey *Petromyzon marinus*	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with the Immingham Green Energy Terminal works have the potential to result in cumulative effects on lamprey and grey seal features of the Humber Estuary SAC. Dredging for both projects is only expected to cause behavioural reactions in a relatively localised area in the vicinity of the dredger for both fish and marine mammals. Piling noise has the potential to cause injury effects in fish and

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		S1099: River lamprey *Lampetra fluviatilis* S1364: Grey seal *Halichoerus grypus*		marine mammals within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Given the current uncertainties with respect to the construction methods and programme and operational noise impacts for the Immingham Green Energy Terminal, a detailed assessment is not considered possible. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
58.	South Humber Bank Energy Centre	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Some potential for significant cumulative effects on local air quality during operation, due to the proximity of the South Humber Bank Energy Centre application site from the proposed IERRT project, shared receptors and pollutants. The cumulative effects on air quality during construction from the IERRT or the South Humber Bank Energy Centre are considered negligible. Predicted concentrations of air pollutants at ground level due to emissions from the stacks during operation of the Humber Bank Energy Centre have been calculated and used to determine the appropriate height of stacks. The proposed South Humber Bank Energy Centre development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for Humber Bank Energy Centre. The predicted in-combination effects are therefore not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
59.	VPI Immingham B OCGT	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Some potential for cumulative effects on local air quality during operation, due to the proximity of the VPI Immingham B OCGT development application site from the proposed IERRT project, shared receptors and pollutants. The cumulative adverse effects on air quality during construction from the IERRT or the VPI Immingham B OCGT development are considered negligible. Predicted concentrations of air pollutants at ground level due to emissions from the stacks during operation of the VPI Immingham B OCGT development have been calculated and used to determine the appropriate height of stacks. The proposed VPI Immingham B OCGT development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for VPI Immingham B OCGT development. The predicted in-combination effects are therefore not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
60.	North Killingholme Power Project	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The marine elements of the proposed North Killingholme Power Project are located approximately 8 km up-estuary of the IERRT location. In between the two schemes is the infrastructure associated with the Immingham Eastern and Western jetties, the Immingham Outer Harbour and the Humber international Terminal. The assessment for IERRT indicates that the extent of change to hydrodynamics and waves does not extend up-estuary to the North Killingholme Power Project location. There are no anticipated cumulative effects. The North Killingholme Power Project involves the construction of an intake and piling within the existing footprint of the Killingholme Ports jetty. The DCO requires the scheme to be approved by the MMO prior to construction. Given that consent has been granted it is considered that impacts from the North Killingholme Power Project have been adequately mitigated. On this basis cumulative effects are anticipated to be negligible In relation to water and sediment quality, the potential impacts resulting from the North Killingholme Power Project (such as increased suspended sediment levels) will be highly localised, temporary and are considered negligible.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
				Contamination Given the extent of seabed disturbance which involves construction of an intake and piling any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen). There are no anticipated cumulative effects. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	The assessment for the North Killingholme Power Project found no risk of exceedances for the majority of pollutants but considered the potential for an increase in nitrogen deposition which show a maximum impact around 1 km north-east of the stack. The model showed maximum impacts on NOx are >1% of the critical level in all scenarios, and the total concentration exceeds critical level, however project-specific monitoring has shown that the Defra and APIS datasets overestimated NOx in the vicinity of the facility and that total concentrations are therefore likely to be below the critical level. The proposed North Killingholme Power Project will operate in accordance with BAT and will be regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for North Killingholme Power Project. The predicted in-combination effects are therefore not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis* S1364: Grey seal *Halichoerus grypus*	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with construction of the intake and piling for the North Killingholme Power Project have the potential to result in cumulative effects sea and river lamprey and grey seal features in the Humber Estuary. Piling noise has the potential to cause injury if these features are within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Both projects will require similar mitigation to help minimise potential adverse effects (such as soft start procedures, timing restrictions to avoid sensitive periods for migratory fish and the use of marine mammal observers). Assuming appropriate mitigation measures are followed during construction the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
61.	Humber Stallingborough Phase 3 Project	H1110: Sandbanks which are slightly covered by sea water all the time H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The revetment works will be restricted to the upper foreshore with the effects of the marine works for the IERRT project largely restricted to subtidal habitats. Any indirect effects resulting from the IERRT project on intertidal habitats in the vicinity of Humber Stallingborough Phase 3 Project (located approximately 2 km away) will be negligible. In relation to water and sediment quality, the potential impacts resulting from the Humber Stallingborough Phase 3 Project (such as increased suspended sediment levels) will be highly localised, temporary and are considered negligible. **Contamination** In relation to the release of sediment -bound contaminants, prior to excavation of the toe of the revetment sediment samples will be tested in line with OSPAR requirements to minimise the potential for mobilisation of contaminants. In addition, excavation is restricted to within a few metres of the revetment and therefore this is unlikely to result in a cumulative effect. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	There are potential for cumulative effects on local air quality, due to the proximity of the Humber Stallingborough Phase 3 Project from the proposed IERRT project, shared receptors and pollutants. There is no AEOI of the proposed IERRT project alone, and whilst the effects of the Humber Stallingborough Phase 3 Project cannot be confirmed until further information on that application is published, given the scale of the works it is very unlikely that any in-combination effects will be generated.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		S1095: Sea lamprey *Petromyzon marinus* S1099: River lamprey *Lampetra fluviatilis* S1364: Grey seal *Halichoerus grypus*	**Disturbance** • Disturbance through underwater noise and vibration	The works for the Humber Stallingborough Phase 3 Project will be carried out from land and in the dry as far as possible. Sources of underwater noise and vibration would be limited to excavation at the toe of the revetment. Given the extent and nature of the impacts there are no predicted cumulative effects and it is concluded that there is no potential for AEOI on qualifying interest features, subject to further information becoming available.

Table 37. The potential for an AEOI on qualifying species of the Humber Estuary SPA due to in-combination effects.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
1.	Maintenance dredge disposal at Grimsby, Immingham and Sunk Dredged Channel (MLA/2014/00431)	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for cumulative effects on birds features if the dredging activities associated with MLA/2014/00431 occur at the same time as construction and maintenance dredging as part of IERRT. The noise and visual stimuli associated with MLA/2014/00431 is likely to be similar to the dredging operations for IERRT and will be limited due the periodic frequency over the course of a year. Any disturbance responses would be expected to be infrequent, short duration and localised. It is also considered likely that the availability of dredging plant (servicing the ports and approaches across the wider Humber, including Goole, Hull and Grimsby) will mean the potential for dredging to be taking place at adjacent locations and at the same time is limited. Assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
2.	Humber International Terminal (HIT) berth 2: adaptation for car carriers	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with HIT berth 2 works to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore during construction. Data presented as part of the marine licence application for the HIT berth 2 works suggest that waterbirds such as Shelduck, Dunlin, Curlew, Redshank and Black-tailed Godwit are only recorded in very low numbers (typically <10-20 individuals). Piling for the HIT berth 2 works will be short term (2 weeks) with only intermittent piling activity undertaken each day (several hours per day) during this period. Mild disturbance responses and short-term and localised displacement of the very low numbers of this species present in the vicinity of the proposed development during the works is possible. However, rather than being displaced from the local area completely, birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Following completion of the construction phase, birds would be expected to return to use the same areas as used prior to construction with any effects considered temporary. In order to reduce potential waterbird disturbance effects associated with the IERRT project a range of mitigation measures are proposed. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for any adverse cumulative effects on features of designated sites. Assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
3.	Outstrays to Skeffling Managed Realignment Scheme (OtSMRS)	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. There are no cumulative effects anticipated as the OtSMRS ZoI falls outside of the IERRT ZoI for noise and visual disturbance. The distance between each of the projects means that different local populations will be potentially affected. Birds which are part of different local populations may form part of the same feature, however given the scale of the potential disturbance and assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
21.	Development of a sustainable transport fuels facility Two discharge of conditions applications in 2022. Land at Hobson Way, Stallingborough (DM/0664/19/FUL)	No effects on SPA features.	N/A	N/A
35.	Construction of an Energy Recovery Facility with an electricity export	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus*	**Disturbance** • Airborne noise and visual disturbance	There is the potential for some cumulative noise effects if there are simultaneous construction works. However, given the generally localised nature of noise effects associated with the construction of each scheme, and provided IERRT and DM/0026/18/FUL complies with any assigned noise and vibration limits and follows the

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
	capacity of up to 49.5MW and associated infrastructure including a stack to 90m high (DM/0026/18/FUL)	A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage		general guidance contained within BS 5228-1 with respect to noise mitigation, there are no anticipated in-combination effects, and it is concluded that there is no potential for AEOI on qualifying interest features. There also potential for cumulative operational noise effects, however provided each scheme complies with any operational noise limits or planning conditions/requirements there are no anticipated in-combination effects, and it is concluded that there is no potential for AEOI on qualifying interest features. Cumulative operational road traffic noise effects have already been included in the road traffic noise assessment reported in Chapter 14 Airborne Noise and Vibration (Application Document Reference number 8.2.14). The traffic data used to inform the noise assessment for the proposed IERRT project is inherently cumulative with regards to DM/0026/18/FUL.
44.	New access road from existing public highway on Queens Road, Immingham (DM/0294/21/FUL)	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for some cumulative noise effects if there are simultaneous construction works. However, given the generally localised nature of noise effects associated with the construction of each scheme, and provided IERRT and DM/0294/21/FUL complies with any assigned noise and vibration limits and follows the general guidance contained within BS 5228-1 with respect to noise mitigation, then the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
51.	Erection of 2x 24m Biomass Flues. Netherlands Way, Stallingborough	No effects on SPA features.	N/A	N/A
53.	Able Marine Energy Park (AMEP) DCO as consented and Material Change 1 and 2	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Habitat loss/damage** • Physical loss of (or change to) habitat and associated species **Disturbance** • Airborne noise and visual disturbance	**Habitat loss/damage** The AMEP project will result in a direct loss of intertidal habitat (mudflat and saltmarsh) as a result of the reclamation of the proposed quay (33 ha). Compensation for this loss will be provided at the Cherry Cobb Sands compensation site. Direct loss of intertidal as a result of the proposed IERRT development will be *de minimis* in extent with birds expected to feed below or very close to the approach jetty and other infrastructure on the foreshore. Any avoidance of marine infrastructure is expected to be limited (and highly localised) and is unlikely to change the overall distribution of waterbird assemblages more widely on the foreshore in the local area. Therefore, with the provision of the compensatory habitat required for AMEP project, there is no additional cumulative effect from the IERRT project that could compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features. **Disturbance** There is the potential for the AMEP project along with the IERRT project to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore during construction and operation. Mitigation measures for AMEP include a cold weather construction restriction. In addition, indirect functional loss of intertidal habitat (mudflat and saltmarsh) through disturbance will also be provided at the Cherry Cobb Sands compensation site. Assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects relating to disturbance are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
54.	Able Marine Energy Park (AMEP) Regulated Tidal Exchange & Managed Realignment scheme at Cherry Cobb Sands	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding)	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. There are no cumulative effects anticipated as the Cherry Cobb Sands compensation site ZoI falls outside of the IERRT ZoI for noise and visual disturbance. The distance between each of the projects means that different local populations will be potentially affected. Birds which are part of different local populations may form part of the same feature, however given the scale of the potential disturbance and assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage		
55.	Humber Low Carbon Pipelines	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. Coastal waterbirds using functionally linked land within the footprint of the pipeline corridor could be potentially impacted due to disturbance during construction which could lead to cumulative effects with the IERRT project. The distance between each of the projects means that different local populations will be potentially affected. However, birds which are part of different local populations may form part of the same feature. Given the current uncertainties with respect to the construction methods and programme for the Humber Low Carbon Pipeline, a detailed assessment of effects on birds which are features of the SPA is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on marine habitats and species. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
56.	Viking CCS Pipeline	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. Coastal waterbirds using functionally linked land within the footprint of the pipeline corridor could be potentially impacted due to disturbance during construction which could lead to cumulative effects with the IERRT project. The distance between each of the projects means that different local populations may be potentially affected. However, birds which are part of different local populations may form part of the same feature. Given the current uncertainties with respect to the construction methods and programme for the V Net Zero Pipeline, a detailed assessment of effects on birds which are features of the SPA is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on marine habitats and species. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
57.	Immingham Green Energy Terminal	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with the Immingham Green Energy Terminal to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore if disturbing activities associated with each of the construction programmes are being undertaken concurrently. Given the current uncertainties with respect to the construction methods and programme and operational noise impacts for the Immingham Green Energy Terminal, a detailed assessment is not considered possible. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
58.	South Humber Bank Energy Centre	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with the South Humber Bank Energy Centre to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds which are present on the field to the south of the site, but this will be mitigated for by changing the type of piling technique or applying seasonal timing restrictions to drop hammer piling. On this basis, given the proposed mitigation for both projects, it is concluded that the potential for any adverse cumulative effects on coastal waterbirds would be avoided. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
59.	VPI Immingham B OCGT	No effects on SPA features.	N/A	N/A
60.	North Killingholme Power Project	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with North Killingholme Power Project to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds. However, given the mitigation proposed for both projects which includes soft start procedures and timing restrictions to avoid sensitive periods, it is considered that the impacts are likely to result in mild disturbance responses and short term displacement. The works are located 8 km from IERRT and therefore would affect different local populations. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for any adverse cumulative effects on marine ecology receptors. Therefore, assuming appropriate mitigation measures are followed during construction of the IERRT project, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
61.	Humber Stallingborough Phase 3 Project	A048; Common Shelduck (Non-breeding) *Tadorna tadorna* A143: Red Knot (Non-breeding) *Calidris canutus* A149: Dunlin *Calidris alpina alpina* (Non-breeding) A156: Black-tailed Godwit *Limosa limosa islandica* (Non-breeding) A157: Bar-tailed Godwit (Non-breeding) *Limosa lapponica* A162: Common Redshank *Tringa totanus* (Non-breeding) Waterbird assemblage	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with the Stallingborough Phase 3 Project to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore if disturbing activities associated with each of the construction programmes are being undertaken concurrently. This could reduce the amount of foreshore available with limited disturbance stimuli in the local area. However, the Stallingborough Phase 3 Project will not be undertaken during the winter period (between October and March) which will help minimise potential disturbance effects associated with this project. In order to reduce potential waterbird disturbance effects associated with the IERRT project a range of mitigation measures are proposed. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

Table 38. The potential for an AEOI on qualifying habitats and species of the Humber Ramsar due to in-combination effects.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
1.	Maintenance dredge disposal at Grimsby, Immingham and Sunk Dredged Channel (MLA/2014/00431)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical loss or damage of habitat through alterations in physical processes • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The habitats in the area are already subject to considerable seabed disturbance as a result of the existing maintenance dredging regime. The variations proposed to this existing maintenance dredge licence will not change the volumes of material to be dredged from the Port of Immingham area. The marine habitats and species occurring in the area are also considered to be commonly occurring and of low conservation value. Changes during dredging as a result of the IERRT project are considered to be localised and low magnitude and in-combination with this maintenance dredging project will result in only a small increase in the potential maintenance dredge commitment for the Immingham area and disposal site. There is the potential for cumulative effects on local air quality. Activities associated with MLA/2014/00431 may have emissions to air that could coincide with proposed IERRT emissions and effect shared receptors. Due to the location of MLA/2014/00431 emission sources, shared receptors are limited to air quality sensitive habitats within the Humber Estuary Ramsar, namely the closet areas of saltmarsh. The proposed IERRT project does not impact on the nearest saltmarsh habitats to the extent that the effect is significant. Any emissions associated with MLA/2014/00431 will be limited due to the number of emission sources and intermittent operation of those sources over the course of a year. **Contamination** In relation to the release of sediment -bound contaminants, the Marine Licence requires sediment samples to be tested in line with OSPAR requirements prior to disposal which minimises the potential for mobilisation of contaminants. In addition, this project is concerned with the disposal of recently accreted sediment which is less likely to comprise a source of historic contamination and therefore this is unlikely to result in a cumulative effect. The predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for cumulative effects on birds features if the dredging activities associated with MLA/2014/00431 occur at the same time as construction and maintenance dredging as part of IERRT. The noise and visual stimuli associated with MLA/2014/00431 is likely to be similar to the dredging operations for IERRT and will be limited due the periodic frequency over the course of a year. Any disturbance responses would be expected to be infrequent, short duration and localised. It is also considered likely that the availability of dredging plant (servicing the ports and approaches across the wider Humber, including Goole, Hull and Grimsby) will mean the potential for dredging to be taking place at adjacent locations and at the same time is limited. Assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both	**Disturbance** • Disturbance through underwater noise and vibration	There is the potential for cumulative effects on lamprey and grey seal features if the dredging activities associated with MLA/2014/00431 occur at the same time as construction and maintenance dredging as part of IERRT. The noise associated with MLA/2014/00431 is likely to be similar to the dredging operations for IERRT and will be limited due the intermittent operation over the course of a year. It is also considered likely that the availability of dredging plant (servicing the ports and approaches across the wider Humber, including Goole, Hull and Grimsby) will mean the potential for dredging to be taking place at adjacent locations and at the same time is limited. However, dredging for both projects is only expected to cause behavioural reactions (at most) in a relatively localised area in the vicinity of the dredger. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		
2.	Humber International Terminal (HIT) berth 2: adaptation for car carriers	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The piles required for the HIT berth 2 works will result in a *de minimis* loss of subtidal habitat. In addition, sedimentation due to the localised resuspension of sediment as a result of seabed disturbance during piling and changes to hydrodynamic and sedimentary processes due to the presence of the piles including potential scouring directly around piles effects are anticipated to be negligible and highly localised. Furthermore, the benthic community is expected to recover relatively rapidly from any localised physical disturbance with subtidal species known to occur in the area typically considered fast growing and/or have rapid reproductive rates. The cumulative effects of physical loss of habitat are considered negligible. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects with respect to increased SSC and changes to dissolved oxygen and chemical water quality as a result of seabed disturbance during piling. Any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with HIT berth 2 works to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore during construction. Data presented as part of the marine licence application for the HIT berth 2 works suggest that waterbirds such as Shelduck, Dunlin, Curlew, Redshank and Black-tailed Godwit are only recorded in very low numbers (typically <10-20 individuals). Piling for the HIT berth 2 works will be short term (2 weeks) with only intermittent piling activity undertaken each day (several hours per day) during this period. Mild disturbance responses and short-term and localised displacement of the very low numbers of this species present in the vicinity of the proposed development during the works is possible. However, rather than being displaced from the local area completely, birds would be expected to redistribute to nearby foreshore in the Immingham area and continue to feed and roost in these alternative locations following dispersal. Following completion of the construction phase, birds would be expected to return to use the same areas as used prior to construction with any effects considered temporary. In order to reduce potential waterbird disturbance effects associated with the IERRT project a range of mitigation measures are proposed. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for any adverse cumulative effects on features of designated sites. Assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis*	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with HIT berth 2 works have the potential to result in cumulative effects on lamprey and grey seal features of the Humber Estuary Ramsar. Piling noise has the potential to cause injury effects in fish and marine mammals within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Both projects will require similar mitigation to help minimise potential adverse effects (such as soft start procedures, timing restrictions to avoid sensitive periods for migratory fish and the use of marine mammal observers). It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		
3.	Outstrays to Skeffling Managed Realignment Scheme (OtSMRS)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The proposed OtSMRS is located approximately 10 km from the IERRT project. The managed realignment site works has the potential to result in highly localised effects on physical processes elements (such as local flows and elevated suspended sediment levels and sediment deposition) as a result of the breaching. The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the hydrodynamic or sedimentary effects as a result of the IERRT project. **Contamination** Effects on water quality are also predicted to be highly localised quality (such as due to elevated suspended sediment levels and changes to dissolved oxygen and chemical water quality). The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the water quality effects as a result of the IERRT project. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. There are no cumulative effects anticipated as the OtSMRS ZoI falls outside of the IERRT ZoI for noise and visual disturbance. The distance between each of the projects means that different local populations will be potentially affected. Birds which are part of different local populations may form part of the same feature, however given the scale of the potential disturbance and assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
21.	Development of a sustainable transport fuels facility Two discharge of conditions applications in 2022. Land at Hobson Way, Stallingborough (DM/0664/19/FUL)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Potential for cumulative effects in relation to operational effects from emissions. In terms of impacts from DM/0664/19/FUL on the Humber Estuary, with respect to annual mean NOx, annual mean ammonia and annual mean sulphur dioxide; total concentrations will be below the relevant critical levels. With respect to 24-hour mean NOx, nutrient nitrogen deposition and acid deposition, baseline concentrations currently exceed the critical level or load and as the predicted process contributions exceed 1%/10% of the relevant critical levels and critical loads, significant impacts cannot be discounted The proposed DM/0664/19/FUL development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for DM/0664/19/FUL. The predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
35.	Construction of an Energy Recovery Facility with an electricity export capacity of up to 49.5MW and associated infrastructure including a stack to 90m high (DM/0026/18/FUL)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Potential for cumulative effects in relation to operational effects from emissions. In terms of impacts from DM/0026/18/FUL on the Humber Estuary, with respect to annual mean NOx, annual mean ammonia and annual mean sulphur dioxide total concentrations will be below the relevant critical levels. There is a small magnitude increase in oxides of nitrogen levels and nitrogen deposition on saltmarsh habitats and this is assessed as not significant. The proposed DM/0026/18/FUL development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. The predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for some cumulative noise effects if there are simultaneous construction works. However, given the generally localised nature of noise effects associated with the construction of each scheme, and provided IERRT and DM/0026/18/FUL complies with any assigned noise and vibration limits and follows the general guidance contained within BS 5228-1 with respect to noise mitigation, there are no anticipated in-combination effects, and it is concluded that there is no potential for AEOI on qualifying interest features. There also potential for cumulative operational noise effects, however provided each scheme complies with any operational noise limits or planning conditions/requirements there are no anticipated in-combination effects, and it is concluded that there is no potential for AEOI on qualifying interest features. Cumulative operational road traffic noise effects have already been included in the road traffic noise assessment reported in Chapter 14 Airborne Noise and Vibration (Application Document Reference number 8.2.14). The traffic data used to inform the noise assessment for the proposed IERRT project is inherently cumulative with regards to DM/0026/18/FUL.
		Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		
44.	New access road from existing public highway on Queens Road, Immingham (DM/0294/21/FUL)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	The potential impacts on air quality relate to construction dust and it is reasonable to assume that the planning application process has identified a proportionate level of mitigation relating to this effect. There are no predicted impacts in relation to nitrogen deposition and therefore no in-combination effects and no AEOI.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for some cumulative noise effects if there are simultaneous construction works. However, given the generally localised nature of noise effects associated with the construction of each scheme, and provided IERRT and DM/0294/21/FUL complies with any assigned noise and vibration limits and follows the general guidance contained within BS 5228-1 with respect to noise mitigation, then the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		
51.	Erection of 2x 24m Biomass Flues. Netherlands Way, Stallingborough (DM/1056/20/FUL)	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Potential for cumulative effects from emissions. The air quality assessment for DM/1056/20/FUL concluded that the effects were insignificant at all receptors and given the scale of the project there are no anticipated cumulative effects and it is concluded that there is no potential for AEOI on qualifying interest features.
53.	Able Marine Energy Park (AMEP) DCO as consented and Material Change 1 and 2	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters,	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat	**Habitat loss/damage** Both the AMEP and IERRT project have the potential to result in changes to marine habitats as a result of capital dredging due to physical disturbance during sediment removal, sediment deposition and indirectly as a result of changes to hydrodynamic and sedimentary processes. These potential effects were assessed as not significant both projects. The subtidal habitats around the Port of Immingham are typically impoverished and of low ecological value reflecting the existing high levels of physical disturbance in the area due to strong near bed tidal currents and sediment transport. Deposition of sediment as a result of dredging for both projects were predicted to be localised and similar to background variability away from the dredge pockets

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	• Physical loss of (or change to) habitat and associated species • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	with species occurring in the local area considered tolerant to some sediment deposition. The cumulative effects of change on marine habitats and species from the highly localised and small scale predicted effects due to hydrodynamic and sedimentary processes are considered negligible for both projects. The AMEP project will result in a direct loss of intertidal habitat (mudflat and saltmarsh) as a result of the reclamation of the proposed quay (33 ha). Compensation for this loss will be provided at the Cherry Cobb Sands compensation site. Direct loss of intertidal as a result of the proposed IERRT development will be de minimis and therefore, with the provision of the compensatory habitat required for AMEP project, there is no additional cumulative effect from the IERRT project that could compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features. With respect to airborne pollutants, the traffic data used to inform the air quality assessment for the proposed IERRT project is inherently cumulative with regards to the Consent Order for the AMEP. There are no predicted in-combination effects and it is concluded that there is no potential for AEOI on qualifying interest features. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects with respect to increased SSC and changes to dissolved oxygen and chemical water quality as a result of seabed disturbance. Any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. In relation to the release of sediment -bound contaminants, the level of contamination in the proposed dredge areas for both projects was considered to be low with material expected be rapidly dispersed by strong tidal currents in the area. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Habitat loss/damage** • Physical loss of (or change to) habitat and associated species **Disturbance** • Airborne noise and visual disturbance	**Habitat loss/damage** The AMEP project will result in a direct loss of intertidal habitat (mudflat and saltmarsh) as a result of the reclamation of the proposed quay (33 ha). Compensation for this loss will be provided at the Cherry Cobb Sands compensation site. Direct loss of intertidal as a result of the proposed IERRT development will be *de minimis* in extent with birds expected to feed below or very close to the approach jetty and other infrastructure on the foreshore. Any avoidance of marine infrastructure is expected to be limited (and highly localised) and is unlikely to change the overall distribution of waterbird assemblages more widely on the foreshore in the local area. Therefore, with the provision of the compensatory habitat required for AMEP project, there is no additional cumulative effect from the IERRT project that could compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features. **Disturbance** There is the potential for the AMEP project along with the IERRT project to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore during construction and operation. Mitigation measures for AMEP include a cold weather construction restriction. In addition, indirect functional loss of intertidal habitat (mudflat and saltmarsh) through disturbance will also be provided at the Cherry Cobb Sands compensation site. Assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects relating to disturbance are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with the AMEP works have the potential to result in cumulative effects on lamprey and grey seal features of the Humber Estuary Ramsar. Dredging for both projects is only expected to cause behavioural reactions in a relatively localised area in the vicinity of the dredger for both fish and marine mammals. Piling noise has the potential to cause injury effects in fish and marine mammals within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Both projects will require similar mitigation to help minimise potential adverse effects (such as soft start procedures, timing restrictions to avoid sensitive periods for migratory fish and the use of marine mammal observers).

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
		regular breeding site on the east coast.		It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		
54.	Able Marine Energy Park (AMEP) Regulated Tidal Exchange & Managed Realignment scheme at Cherry Cobb Sands	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The proposed Managed Realignment Scheme is located on the opposite bank of the Humber Estuary. The managed realignment site works has the potential to result in highly localised effects on physical processes elements (such as local flows and elevated suspended sediment levels and sediment deposition) as a result of the breaching. The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the hydrodynamic or sedimentary effects as a result of the IERRT project. **Contamination** Effects on water quality are also predicted to be highly localised quality (such as due to elevated suspended sediment levels and changes to dissolved oxygen and chemical water quality). The highly localised and (likely) small extent of effects will not significantly overlap with the ZoI of the water quality effects as a result of the IERRT project. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. There are no cumulative effects anticipated as the Cherry Cobb Sands compensation site ZoI falls outside of the IERRT ZoI for noise and vibration. The distance between each of the projects means that different local populations will be potentially affected. Birds which are part of different local populations may form part of the same feature, however given the scale of the potential disturbance and assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		
55.	Humber Low Carbon Pipelines	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and	**Habitat loss/damage** Based on information provided in the EIA scoping report for the Humber Low Carbon Project, trenchless methods (e.g., bored tunnel) could be used to minimise potential effects on Ramsar habitats where the pipelines cross the Humber Estuary. However, construction method has not been confirmed at the landfall (trenchless, e.g., Horizontal Directional Drilling (HDD), or via cofferdam) and, therefore, features of the Ramsar could not be scoped out. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects with respect to increased SSC and changes to dissolved oxygen and chemical water quality as a result of seabed disturbance. Any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. In relation to the release of sediment -bound contaminants, it is assumed that the Humber Low Carbon Project projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects. If trenchless methods are not feasible and excavation (dredging) of the seabed is required

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
			accidental oil, fuel or chemical releases	then the project would require sediment samples to be tested in line with OSPAR requirements which minimises the potential for mobilisation of contaminants. Given the current uncertainties with respect to the construction methods and programme for the Humber Low Carbon Pipeline, a detailed assessment of effects on Ramsar features is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on Ramsar features. Therefore, assuming appropriate mitigation measures are followed for the IERRT project in-combination effects are not considered to compromise any of the conservation objectives, and a conclusion of no AEOI can be reached, subject to further information becoming available.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. Coastal waterbirds using functionally linked land within the footprint of the pipeline corridor could be potentially impacted due to disturbance during construction which could lead to cumulative effects with the IERRT project. The distance between each of the projects means that different local populations will be potentially affected. Given the current uncertainties with respect to the construction methods and programme for the Humber Low Carbon Pipeline, a detailed assessment of effects on birds which are features of the SPA is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on marine habitats and species. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.	**Disturbance** • Disturbance through underwater noise and vibration	Given the current uncertainties with respect to the construction methods and programme for the Humber Low Carbon Pipeline, a detailed assessment of underwater noise and vibration effects on Ramsar features is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on Ramsar features. Therefore, assuming appropriate mitigation measures are followed for the IERRT project in-combination effects are not considered to compromise any of the conservation objectives, and a conclusion of no AEOI can be reached, subject to further information becoming available.
56.	Viking CCS Pipeline	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds. Coastal waterbirds using functionally linked land within the footprint of the pipeline corridor could be potentially impacted due to disturbance during construction which could lead to cumulative effects with the IERRT project. The distance between each of the projects means that different local populations may be potentially affected. However, birds which are part of different local populations may form part of the same feature. Given the current uncertainties with respect to the construction methods and programme for the V Net Zero Pipeline, a detailed assessment of effects on birds which are features of the Ramsar is not considered possible. However, it is assumed that both projects will be subject to controls by statutory bodies to avoid the potential for any adverse cumulative effects on marine habitats and species. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
57.	Immingham Green Energy Terminal	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The piles required for the jetty of the Immingham Green Energy Terminal project are likely to result in a small loss of subtidal habitat and a *de minimis* loss in the intertidal. In addition, sedimentation due to the localised resuspension of sediment as a result of seabed disturbance during piling and the small capital dredge as well as changes to hydrodynamic and sedimentary processes due to the presence of the piles/dredging are anticipated to be negligible and highly localised. Furthermore, the benthic community is expected to recover relatively rapidly from any localised physical disturbance with subtidal species known to occur in the area typically considered fast growing and/or have rapid reproductive rates. The cumulative effects of change on marine habitats and species are considered low magnitude and *de minimis* in scale for both projects. **Contamination** In relation to water and sediment quality, there is the potential for cumulative effects from the resuspension of sediment as a result of seabed disturbance during piling and the small capital dredge will cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) and the effects are considered negligible. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features. There are potential for cumulative effects on local air quality, due to the proximity of the Consent Order application site from the proposed IERRT project, shared receptors and pollutants. There is no AEOI of the proposed IERRT project alone, although the effect of the Consent Order application cannot be confirmed until further information on that application is published.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	**Disturbance** • Airborne noise and visual disturbance	Both projects have the potential to cause potential disturbance to waterbirds if there are simultaneous construction works due to the proximity of the IERRT project and the Immingham Green Energy Terminal. Given the current uncertainties with respect to the construction methods and programme and operational noise impacts for the Immingham Green Energy Terminal, a detailed assessment is not considered possible. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with the Immingham Green Energy Terminal works have the potential to result in cumulative effects on lamprey and grey seal features of the Humber Estuary Ramsar. Dredging for both projects is only expected to cause behavioural reactions in a relatively localised area in the vicinity of the dredger for both fish and marine mammals. Piling noise has the potential to cause injury effects in fish and marine mammals within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Given the current uncertainties with respect to the construction methods and programme and operational noise impacts for the Immingham Green Energy Terminal, a detailed assessment is not considered possible. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
58.	South Humber Bank Energy Centre	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Some potential for significant cumulative effects on local air quality during operation, due to the proximity of the South Humber Bank Energy Centre application site from the proposed IERRT project, shared receptors and pollutants. There are no significant cumulative adverse effects on air quality during construction from the IERRT or the South Humber Bank Energy Centre. Predicted concentrations of air pollutants at ground level due to emissions from the stacks during operation of the Humber Bank Energy Centre have been calculated and used to determine the appropriate height of stacks. The proposed South Humber Bank Energy Centre development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for Humber Bank Energy Centre. The predicted in-combination effects are therefore not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3) Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with the South Humber Bank Energy Centre to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds which are present on the field to the south of the site, but this will be mitigated for by changing the type of piling technique or applying seasonal timing restrictions to drop hammer piling. On this basis, given the proposed mitigation for both projects, it is concluded that the potential for any adverse cumulative effects on coastal waterbirds would be avoided. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
59.	VPI Immingham B OCGT	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical change to habitats resulting from the deposition of airborne pollutants	Some potential for significant cumulative effects on local air quality during operation, due to the proximity of the VPI Immingham B OCGT development application site from the proposed IERRT project, shared receptors and pollutants. There are no significant cumulative adverse effects on air quality during construction from the IERRT or the VPI Immingham B OCGT development. Predicted concentrations of air pollutants at ground level due to emissions from the stacks during operation of the VPI Immingham B OCGT development have been calculated and used to determine the appropriate height of stacks. The proposed VPI Immingham B OCGT development will operate in accordance with BAT and regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for VPI Immingham B OCGT development. The predicted in-combination effects are therefore not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
60.	North Killingholme Power Project	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and	**Habitat loss/damage** The marine elements of the proposed North Killingholme Power Project are located approximately 8 km up-estuary of the IERRT location. In between the two schemes is the infrastructure associated with the Immingham Eastern and Western jetties, the Immingham Outer Harbour and the Humber international Terminal. The assessment for IERRT indicates that the extent of change to hydrodynamics and waves does not extend up-estuary to the North Killingholme Power Project location. There are no anticipated cumulative effects. The North Killingholme Power Project involves the construction of an intake and piling within the existing footprint of the Killingholme Ports jetty. The DCO requires the scheme to be approved by the MMO prior to construction. Given that consent has been granted it is considered that impacts from the North Killingholme Power Project have been adequately mitigated. On this basis cumulative effects are anticipated to be negligible In relation to water and sediment quality, the potential impacts resulting from the North Killingholme Power Project (such as increased suspended sediment levels) will be highly localised, temporary and are considered negligible.

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
			accidental oil, fuel or chemical releases	**Contamination** Given the extent of seabed disturbance which involves construction of an intake and piling any changes would cause highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen). There are no anticipated cumulative effects. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features. **Changes in marine habitats (air quality)** The assessment for the North Killingholme Power Project found no risk of exceedances for the majority of pollutants but considered the potential for an increase in nitrogen deposition which show a maximum impact around 1 km north-east of the stack. The model showed maximum impacts on NOx are >1% of the critical level in all scenarios, and the total concentration exceeds critical level, however project-specific monitoring has shown that the Defra and APIS datasets overestimated NOx in the vicinity of the facility and that total concentrations are therefore likely to be below the critical level. The proposed North Killingholme Power Project will operate in accordance with BAT and will be regulated by the Environment Agency which will include measures to minimise the impacts of emissions. It is reasonable to assume that the planning application process has identified a proportionate level of mitigation to do likewise for North Killingholme Power Project. The predicted in-combination effects are therefore not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with North Killingholme Power Project to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds. However, given the mitigation proposed for both projects which includes soft start procedures and timing restrictions to avoid sensitive periods, it is considered that the impacts are likely to result in mild disturbance responses and short term displacement. The works are located 8 km from IERRT and therefore would affect different local populations. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for any adverse cumulative effects on marine ecology receptors. Therefore, assuming appropriate mitigation measures are followed during construction of the IERRT project, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	**Disturbance** • Disturbance through underwater noise and vibration	Underwater noise generated during piling required as part of the IERRT project along with construction of the intake and piling for the North Killingholme Power Project have the potential to result in cumulative effects sea and river lamprey and grey seal features in the Humber Estuary. Piling noise has the potential to cause injury if these features are within close proximity to the piling activity and strong behavioural responses over a wider area of the Humber estuary for both projects. Both projects will require similar mitigation to help minimise potential adverse effects (such as soft start procedures, timing restrictions to avoid sensitive periods for migratory fish and the use of marine mammal observers). Assuming appropriate mitigation measures are followed during construction the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		

ID	Plan/Project	Features	Summary of potential effects	Potential for AEOI
61.	Humber Stallingborough Phase 3 Project	Criterion 1 – natural wetland habitats that are of international importance: The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	**Habitat loss/damage** • Physical loss or damage of habitat through alterations in physical processes • Physical damage through disturbance and/or smothering of habitat • Physical loss of (or change to) habitat and associated species • Physical change to habitats resulting from the deposition of airborne pollutants **Contamination** • Non-toxic contamination through elevated SSC • Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases	**Habitat loss/damage** The revetments works will be restricted to the upper foreshore with the effects of the marine works for the IERRT project largely restricted to subtidal habitats. Any indirect effects resulting from the IERRT project on intertidal habitats in the vicinity of Humber Stallingborough Phase 3 Project (located approximately 2 km away) will be negligible. **Contamination** Any potential impacts on water quality resulting from the Humber Stallingborough Phase 3 Project (such as increased suspended sediment levels) will be highly localised, temporary and of a magnitude not expected to cause any adverse reactions in marine species. Potential water quality impacts of the IERRT project were assessed as insignificant. Considering all pathways, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl - 153,934 waterfowl (5-year peak mean 1998/99-2002/3)	**Disturbance** • Airborne noise and visual disturbance	There is the potential for the IERRT project along with the Stallingborough Phase 3 Project to cause cumulative effects in term of visual and noise disturbance to coastal waterbirds along the foreshore if disturbing activities associated with each of the construction programmes are being undertaken concurrently. This could reduce the amount of foreshore available with limited disturbance stimuli in the local area. However, the Stallingborough Phase 3 Project will not be undertaken during the winter period (between October and March) which will help minimise potential disturbance effects associated with this project. In order to reduce potential waterbird disturbance effects associated with the IERRT project a range of mitigation measures are proposed. It is assumed that both projects will be subject to controls by the statutory bodies to avoid the potential for cumulative and in-combination effects on features of designated sites. Therefore, assuming the proposed mitigation measures for the IERRT project are implemented, the predicted in-combination effects are not considered to compromise any of the conservation objectives, and it is concluded that there is no potential for AEOI on qualifying interest features.
		Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering)		
		Criterion 3 – supports populations of plants and/or animal species of international importance: The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.	**Disturbance** • Disturbance through underwater noise and vibration	The works for the Humber Stallingborough Phase 3 Project will be carried out from land and in the dry as far as possible. Sources of underwater noise and vibration would be limited to excavation at the toe of the revetment. Given the extent and nature of the impacts there are no predicted cumulative effects and it is concluded that there is no potential for AEOI on qualifying interest features, subject to further information becoming available.
		Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.		

5 Conclusions

5.1.1 This report provides information for the Secretary of State, as the relevant Competent Authority, to undertake the first two stages of a Habitats Regulations Assessment as required under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended).

5.1.2 The Stage one (Screening) assessment has considered how the proposed construction of a new Ro-Ro facility within the Port of Immingham might affect four European sites in the vicinity of the project. This screening stage concluded that Likely Significant Effects could not be discounted with respect to three European sites, all with coincident boundaries:

- Humber Estuary SAC;
- Humber Estuary SPA; and
- Humber Estuary Ramsar site.

5.1.3 The impact pathways screened into stage 2 (AA) covered the following pathways:

- Physical loss of habitat and associated species;
- Physical damage through disturbance and/or smothering of habitat;
- Physical loss or damage of habitat through alterations in physical processes;
- Direct changes to qualifying habitats beneath marine infrastructure due to shading;
- Physical change to habitats resulting from the deposition of airborne pollutants;
- Non-toxic contamination through elevated SSC;
- Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases;
- Airborne noise and visual disturbance;
- Disturbance through underwater noise and vibration; and
- Biological disturbance due to potential introduction and spread of non-native species.

5.1.4 At Stage two AA, further information has been collated to examine the potential for changes in the baseline conditions as a result of the project with reference to the conservation objectives for each site. Where relevant, mitigation measures have been proposed to reduce the potential for adverse effects.

5.1.5 The assessment has concluded that for the majority of pathways there is no potential for an adverse effect on site integrity or any potential for the predicted effects to compromise any of the conservation objectives. However, for two pathways there was uncertainty in this conclusion either due to limitations in the evidence base or related to uncertainties in timing of construction (e.g., in relation to sensitive migration periods). This was relevant to the following pathways:

- The potential effects of airborne noise and visual disturbance during construction and operation on qualifying species; and
- The potential effects of underwater noise and vibration during piling on qualifying species.

5.1.6 Mitigation has been identified in relation to the effects of airborne noise and visual disturbance during construction which includes restrictions on working over winter in certain locations, acoustic barriers and visual screens, soft-start piling and cold weather restrictions. In operation as a precaution screening will be installed so that movements of workers or vehicles will not be as visible from the foreshore.

5.1.7 Based on the distribution of birds, the likely level of disturbance and the Applicant's commitment to mitigation, it is considered that there will be no adverse effects on the integrity of either the Humber Estuary SPA or Ramsar from the effects of airborne noise and visual disturbance.

5.1.8 Mitigation has been identified in relation to the effects of underwater noise and vibration during piling which includes soft-start piling, vibro-piling where possible, seasonal piling restrictions, night-time piling restrictions and use of Marine Mammal Observers.

5.1.9 Based on the assessment of effects on qualifying species (river and sea lamprey and grey seal), the likely level of disturbance and the Applicant's commitment to mitigation, it is considered that there will be no adverse effects on the integrity of the Humber Estuary SAC or Ramsar from the effects of underwater noise and vibration during piling.

5.1.10 A review of other plans and projects that could contribute to effects has established that significant adverse in-combination effects on site integrity with other plans and projects are not likely to occur.

5.1.11 In conclusion, based on scientific information and professional judgement, it is considered that the construction and consequent operation will create no adverse effects on the integrity of any European designated sites.

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7 Abbreviations/Acronyms

AA	Appropriate Assessment
ABB	ABB Power Generation Ltd
ABP	Associated British Ports
AEOI	Adverse Effect On Integrity
AMEP	Able Marine Energy Park
APIS	Air Pollution Information System
BAT	Best Available Techniques
BTO	British Trust for Ornithology
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
COVID	Coronavirus
cSAC	Candidate Special Areas of Conservation
CSIP	Cetacean Strandings Investigation Programme
dB	Decibel
dBA	A-weighted decibel
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DNA	Deoxyribonucleic Acid
EC	European Commission
EEA	European Economic Area
EEC	European Economic Community
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	European Marine Site
ERM	ERM Group
ES	Environmental Statement
EU	European Union
FID	Flight Initiation Distance
GPS	Global Positioning System
HDD	Horizontal Directional Drilling
HEEs	High Energy Events
HGVs	Heavy Goods Vehicle
HIT	Humber International Terminal
HM	Her Majesty’s (His Majesty’s)
HRA	Habitats Regulations Assessment
IAQM	Institute of Air Quality Management
ID	Identity
IECS	Institute of Estuarine & Coastal Studies
IERRT	Immingham Eastern Roll-on Roll-off Terminal
IMO	International Maritime Organisation
IOH	Immingham Outer Harbour

IOT	Immingham Oil Terminal
IROPI	Imperative Reasons of Overriding Public Interest
IUCN	International Union for Conservation of Nature
JNCC	In-combination Climate Change Impacts
LAeq	Equivalent Continuous Sound Pressure Level,
LAmax F	Maximum 'A'-weighted Sound Pressure Level (Fast Time Weighed)
Lmax.	Maximum 'A'-weighted Sound Pressure Level
LSE	Likely Significant Effect
MAGIC	Multi-Agency Geographic Information for the Countryside
MarESA	Marine Evidence based Sensitivity Assessment
MarLIN	Marine Life Information Network
MCAA	Marine and Coastal Access Act
MHWS	Mean High Water Springs
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MP	Mean Peak
MPA	Marine Protected Area
MPS	Marine Policy Statement
MS	Marine Straggler species
MW	Megawatt
NBN	National Biodiversity Network
NE	Natural England
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFF	National Planning Policy Framework
NSIP	Nationally Significant Infrastructure Projects
O&M	Operation and Maintenance
OCGT	Open Cycle Gas Turbine
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OtSMRS	Outstrays to Skeffling Managed Realignment Scheme
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyl
PEIR	Preliminary Environmental Information Report
PIANC	The World Association for Waterborne Transport Infrastructure
PINS	Planning Inspectorate
pSAC	Possible Special Area of Conservation
pSPA	Potential Special Protection Areas
PTS	Permanent Threshold Shifts
PW	Phocid Pinniped
Ramsar	Wetlands of international importance, designated under The Convention on Wetlands (Ramsar, Iran, 1971)
REC	Regional Environmental Characterisation

Ro-Ro	Roll On-Roll Off
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEL	Sound Exposure Levels
SL	Source Level
SPA	Special Protection Area
SPL	Sound Pressure Levels
SSC	Suspended Sediment Concentrations
SSSI	Site of Special Scientific Interest
TBT	Tributyltin
TSHD	Trailer Suction Hopper Dredger
TTS	Temporary Threshold Shift
UK	United Kingdom
WCA	Wildlife and Countryside Act
WeBS	Wetland Bird Survey
WODA	World Organization of Dredging Associations
ZoI	Zone of Influence

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

Appendix A: European/Ramsar Designated Sites Citations

STANDARD DATA FORM for sites within the 'UK national site network of European sites'

Special Protection Areas (SPAs) are classified and Special Areas of Conservation (SACs) are designated under:

- the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea) and to a limited extent in Scotland (reserved matters) and Northern Ireland (excepted matters);
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) in Scotland;
- the Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) in Northern Ireland; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area.

Each SAC or SPA (forming part of the UK national site network of European sites) has its own Standard Data Form containing site-specific information. The information provided here generally follows the same documenting format for SACs and SPAs, as set out in the [redacted]

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

More general information on SPAs and SACs in the UK is available from the [redacted] and [redacted] on the JNCC website. These webpages also provide links to Standard Data Forms for all SAC and SPA sites in the UK.

[redacted]

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK0030170**

SITENAME **Humber Estuary**

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1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
B	UK0030170

1.3 Site name

Humber Estuary

1.4 First Compilation date	1.5 Update date
2007-08	2015-12

1.6 Respondent:

Name/Organisation:	Joint Nature Conservation Committee
Address:	Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY
Email:	

Date site proposed as SCI:	2007-08
Date site confirmed as SCI:	2008-12
Date site designated as SAC:	2009-12
National legal reference of SAC designation:	Regulations 11 and 13-15 of the Conservation of Habitats and Species Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/490/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
-0.734722222	53.58916667

2.2 Area [ha]:	2.3 Marine area [%]
36657.15	91.6

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKE1	East Yorkshire and Northern Lincolnshire
UKF3	Lincolnshire
UKZZ	Extra-Regio

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.1 Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
1110			1656.9	0	P	C	A	C	C
1130			36657.15	0	G	B	B	B	B
1140			9384.23	0	G	B	B	B	B
1150	X		7.33	0	G	C	C	B	C
1210				0		D			
1310			47.65	0	P	C	C	B	C
1320			135.63	0	G	D			
1330									

			784.46	0	G	C	B	C	C
2110			18.33	0	G	C	A	C	C
2120			14.66	0	G	C	B	C	C
2130	X		14.66	0	G	C	C	C	C
2160			65.98	0	G	C	B	C	C

- **PF:** for the habitat types that can have a non-priority as well as a priority form (6210, 7130, 9430) enter "X" in the column PF to indicate the priority form.
- **NP:** in case that a habitat type no longer exists in the site enter: x (optional)
- **Cover:** decimal values can be entered
- **Caves:** for habitat types 8310, 8330 (caves) enter the number of caves if estimated surface is not available.
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation)

3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
F	1102	Alosa alosa			p				P	DD	D			
F	1103	Alosa fallax			p				P	DD	D			
M	1364	Halichoerus grypus			p	1800	1800	i		G	C	B	B	C
F	1099	Lampetra fluviatilis			p				P	DD	A	B	C	C
F	1095	Petromyzon marinus			p	251	500	i		M	B	C	C	C
M	1365	Phoca vitulina			p				P	DD	D			

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N03	4.4
N07	0.4
N04	0.4
N02	94.9
Total Habitat Cover	100.10000000000002

Other Site Characteristics

1 Terrestrial: Soil & Geology: shingle,sedimentary,sandstone,neutral,mud,sand,alluvium,clay 2 Terrestrial: Geomorphology and landscape: coastal,floodplain,lowland 3 Marine: Geology: gravel,mud,sedimentary,sand,sandstone/mudstone,clay,shingle,limestone/chalk 4 Marine: Geomorphology: shingle bar,lagoon,islands,estuary,subtidal sediments (including sandbank/mudbank),intertidal sediments (including sandflat/mudflat),cliffs

4.2 Quality and importance

Sandbanks which are slightly covered by sea water all the time for which the area is considered to support a significant presence. Estuaries for which this is considered to be one of the best areas in the United Kingdom. Mudflats and sandflats not covered by seawater at low tide for which this is considered to be one of the best areas in the United Kingdom. Coastal lagoons for which the area is considered to support a significant presence. Salicornia and other annuals colonising mud and sand for which the area is considered to support a significant presence. Atlantic salt meadows (Glauco-Puccinellietalia maritimae) for which the area is considered to support a significant presence. Embryonic shifting dunes for which the area is considered to support a significant presence. which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 1000 hectares. Shifting dunes along the shoreline with Ammophila arenaria (?white dunes?) for which the area is considered to support a significant presence. Dunes with Hippophae rhamnoides for which the area is considered to support a significant presence. which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 1000 hectares. Fixed dunes with herbaceous vegetation (?grey dunes?) for which the area is considered to support a significant presence. Petromyzon marinus for which the area is considered to support a significant presence. Lampetra fluviatilis for which the area is considered to support a significant presence. Halichoerus grypus for which the area is considered to support a significant presence.

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	M01		B
H	E02		O
H	J02		B
H	H02		B
H	K01		I

Positive Impacts			
Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	D05		I
H	A02		I
H	B02		I
H	A04		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,

T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions

i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): [redacted]

[redacted]

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK01	1.8	UK04	100.0		

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

	Yes
	No, but in preparation
X	No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE SPECIAL AREA OF CONSERVATION (SAC) AND SPECIAL PROTECTION AREA (SPA) STANDARD DATA FORMS

The codes in the table below generally follow those explained in the [redacted] (also referencing the relevant page number).

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	SPA (classified Special Protection Area)	53
B	cSAC, SCI or SAC (candidate Special Area of Conservation, Site of Community Importance, designated Special Area of Conservation)	53
C	SPA area/boundary is the same as the cSAC/SCI/SAC i.e. a co-classified/designated site (Note: this situation only occurs in Gibraltar)	53

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha• rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Habitat representativity (abbreviated to 'Representativity' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent representatively	57
B	Good representatively	57
C	Significant representatively	57
D	Non-significant presence representatively	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	58
B	> 2%-15%	58
C	≤ 2%	58

3.1 Degree of conservation (abbreviated to 'Conservation' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global assessment (abbreviated to 'Global' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	62
B	> 2%-15%	62
C	≤ 2%	62
D	Non-significant population	62

3.2 Degree of conservation (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Other species – essentially covers bird assemblage types

CODE	DESCRIPTION	PAGE NO
WATR	Non-breeding waterbird assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code

BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK04	Site of Special Scientific Interest (GB)	67
UK05	Marine Conservation Zone	67
UK06	Nature Conservation Marine Protected Area	67
UK86	Special Area (Channel Islands)	67
UK98	Area of Special Scientific Interest (NI)	67
IN00	Ramsar Convention site	67
IN08	Special Protection Area	67
IN09	Special Area of Conservation	67

STANDARD DATA FORM for sites within the 'UK national site network of European sites'

Special Protection Areas (SPAs) are classified and Special Areas of Conservation (SACs) are designated under:

- the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea) and to a limited extent in Scotland (reserved matters) and Northern Ireland (excepted matters);
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) in Scotland;
- the Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) in Northern Ireland; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area.

Each SAC or SPA (forming part of the UK national site network of European sites) has its own Standard Data Form containing site-specific information. The information provided here generally follows the same documenting format for SACs and SPAs, as set out in the [redacted]

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

More general information on SPAs and SACs in the UK is available from the [redacted] and [redacted] the JNCC website. These webpages also provide links to Standard Data Forms for all SAC and SPA sites in the UK.

[redacted]

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK9006111**

SITENAME **Humber Estuary**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
A	UK9006111

1.3 Site name

Humber Estuary

1.4 First Compilation date	1.5 Update date
2007-08	2015-12

1.6 Respondent:

Name/Organisation:	Joint Nature Conservation Committee
Address:	Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY
Email:	

1.7 Site indication and designation / classification dates

Date site classified as SPA:	2007-08
National legal reference of SPA designation	Regulations 12A and 13-15 of the Conservation Habitats and Species Regulations 2010, (http://www.legislation.gov.uk/uksi/2010/490/contents/made) as amended by The Conservation of Habitats and Species (Amendment) Regulations 2011 (http://www.legislation.gov.uk/uksi/2011/625/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude
0.0569

Latitude
53.5497

2.2 Area [ha]:

37630.24

2.3 Marine area [%]

89.5

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKZZ	Extra-Regio
UKF3	Lincolnshire
UKE1	East Yorkshire and Northern Lincolnshire

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment		
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C	
						Min	Max				Pop.	Con.	Iso.
B	A052	Anas crecca			w	2322	2322	i		G	C		C
B	A050	Anas penelope			w	5044	5044	i		G	C		C
B	A053	Anas platyrhynchos			w	2456	2456	i		G	C		C
B	A169	Arenaria interpres			w	629	629	i		G	C		C
B	A059	Aythya ferina			w	719	719	i		G	C		C
B	A062	Aythya marila			w	127	127	i		G	C		C
B	A021	Botaurus stellaris			r	2	2	cmales	P	G	B		C
B	A021	Botaurus stellaris			w	4	4	i		G	B		C
		Branta											

B	A675	bernicla bernicla			w	2098	2098	i		G	C		C
B	A067	Bucephala clangula			w	467	467	i		G	B		C
B	A144	Calidris alba			c	818	818	i		G	B		C
B	A144	Calidris alba			w	486	486	i		G	B		C
B	A672	Calidris alpina alpina			c	20269	20269	i		G	B		C
B	A672	Calidris alpina alpina			w	22222	22222	i		G	B		C
B	A143	Calidris canutus			w	28165	28165	i		G	B		C
B	A143	Calidris canutus			c	18500	18500	i		G	B		C
B	A137	Charadrius hiaticula			c	1766	1766	i		G	C		C
B	A137	Charadrius hiaticula			w	403	403	i		G	C		C
B	A081	Circus aeruginosus			r	10	10	bfemales	P	G	B		B
B	A082	Circus cyaneus			w	8	8	i		G	C		C
B	A130	Haematopus ostralegus			w	3503	3503	i		G	C		C
B	A157	Limosa lapponica			w	2752	2752	i		G	B		C
B	A616	Limosa limosa islandica			w	1113	1113	i		G	B		C
B	A616	Limosa limosa islandica			c	915	915	i		G	B		C
B	A160	Numenius arquata			w	3253	3253	i		G	C		C
B	A158	Numenius phaeopus			c	113	113	i		G	C		C
B	A151	Philomachus pugnax			c	128	128	i		G	C		C
B	A140	Pluvialis apricaria			w	30709	30709	i		G	B		C
B	A141	Pluvialis squatarola			w	1704	1704	i		G	B		C
B	A141	Pluvialis squatarola			c	1590	1590	i		G	B		C
B	A132	Recurvirostra avosetta			w	59	59	i		G	C		B
B	A132	Recurvirostra avosetta			r	64	64	p		G	C		B
B	A195	Sterna albifrons			r	51	51	p		G	B		C
		Tadorna											

B	A048	tadorna			w	4464	4464	i		G	B		C
B	A164	Tringa nebularia			c	77	77	i		G	C		C
B	A162	Tringa totanus			w	4632	4632	i		G	B		C
B	A162	Tringa totanus			c	7462	7462	i		G	B		C
B	A142	Vanellus vanellus			w	22765	22765	i		G	C		C

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

3.3 Other important species of flora and fauna (optional)

Species					Population in the site				Motivation					
Group	CODE	Scientific Name	S	NP	Size		Unit	Cat.	Species Annex		Other categories			
					Min	Max		C|R|V|P	IV	V	A	B	C	D
B	WATR	Waterbird assemblage			153934	153934	i						X	

- **Group:** A = Amphibians, B = Birds, F = Fish, Fu = Fungi, I = Invertebrates, L = Lichens, M = Mammals, P = Plants, R = Reptiles
- **CODE:** for Birds, Annex IV and V species the code as provided in the reference portal should be used in addition to the scientific name
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Unit:** i = individuals, p = pairs or other units according to the standard list of population units and codes in accordance with Article 12 and 17 reporting, (see reference portal)
- **Cat.:** Abundance categories: C = common, R = rare, V = very rare, P = present
- **Motivation categories: IV, V:** Annex Species (Habitats Directive), **A:** National Red List data; **B:** Endemics; **C:** International Conventions; **D:** other reasons

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N06	0.6
N03	4.6

N04	0.8
N02	93.6
N07	0.3
Total Habitat Cover	99.89999999999998

Other Site Characteristics

1 Terrestrial: Soil & Geology: mud,shingle,alluvium,sandstone,sand,neutral,clay,limestone,sedimentary,sandstone,shingle,sand,neut Terrestrial: Geomorphology and landscape: lowland,floodplain,coastal,lowland,floodplain,coastal 3 Marine: Geology: sand,gravel,mud,sedimentary,clay,sandstone/mudstone,shingle,limestone/chalk,clay,sedimentary,sanc Marine: Geomorphology: shingle bar,islands,intertidal sediments (including sandflat/mudflat),cliffs,estuary,intertidal sediments (including sandflat/mudflat),islands,lagoon,estuary,subtidal sediments (including sandbank/mudbank),shingle bar,cliffs

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC) During the breeding season the area regularly supports: Botaurus stellaris (Europe - breeding) 10.5% of the population in Great Britain 2000-2002 Circus aeruginosus 6.3% of the population in Great Britain 1998-2002 Recurvirostra avosetta (Western Europe/Western Mediterranean - breeding) 8.6% of the population in Great Britain 1998-2002 Sterna albifrons (Eastern Atlantic - breeding) 2.1% of the population in Great Britain 1998-2002 Over winter the area regularly supports: Botaurus stellaris (Europe - breeding) 4% of the population in Great Britain 1998/9 to 2002/3 Circus cyaneus 1.1% of the population in Great Britain 1997/8 to 2001/2 Limosa lapponica (Western Palearctic - wintering) 4.4% of the population in Great Britain 1996/7 to 2000/1 Pluvialis apricaria [North-western Europe - breeding] 12.3% of the population in Great Britain 1996/7 to 2000/1 Recurvirostra avosetta (Western Europe/Western Mediterranean - breeding) 1.7% of the population in Great Britain 1996/7 to 2000/1 On passage the area regularly supports: Philomachus pugnax (Western Africa - wintering) 1.4% of the population in Great Britain 1996-2000 ARTICLE 4.2 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: Calidris alpina alpina (Northern Siberia/Europe/Western Africa) 1.7% of the population 1996/7 to 2000/1 Calidris canutus (North-eastern Canada/Greenland/Iceland/North-western Europe) 6.3% of the population 1996/7 to 2000/1 Limosa limosa islandica (Iceland - breeding) 3.2% of the population 1996/7 to 2000/1 Tadorna tadorna (North-western Europe) 1.5% of the population 1996/7 to 2000/1 Tringa totanus (Eastern Atlantic - wintering) 3.6% of the population 1996/7 to 2000/1 On passage the area regularly supports: Calidris alpina alpina (Northern Siberia/Europe/Western Africa) 1.5% of the population 1996-2000 Calidris canutus (North-eastern Canada/Greenland/Iceland/North-western Europe) 4.1% of the population 1996-2000 Limosa limosa islandica (Iceland - breeding) 2.6% of the population 1996-2000 Tringa totanus (Eastern Atlantic - wintering) 5.7% of the population 1996-2000 ARTICLE 4.2 QUALIFICATION (79/409/EEC): AN INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS Over winter the area regularly supports: 153934 waterfowl (5 year peak mean 1991/92-1995/96) Including: Botaurus stellaris , Branta bernicla bernicla , Tadorna tadorna , Anas penelope , Anas crecca , Anas platyrhynchos , Aythya ferina , Aythya marila , Bucephala clangula , Haematopus ostralegus , Recurvirostra avosetta , Charadrius hiaticula , Pluvialis apricaria [North-western Europe - breeding], Pluvialis squatarola , Vanellus vanellus , Calidris canutus , Calidris alba , Calidris alpina alpina , Philomachus pugnax , Limosa limosa islandica , Limosa lapponica , Numenius phaeopus , Numenius arquata , Tringa totanus , Tringa nebularia , Arenaria interpres

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts

Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	K01		I
H	I01		B
H	G01		I
H	M02		B
H	M01		B

Positive Impacts

Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	A02		I
H	D05		I
H	B02		I
H	D05		I
H	A04		I
H	A03		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,

T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions
i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): [redacted]

[redacted]-
[redacted]

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK04	100.0				

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

- [ ] Yes
- [ ] No, but in preparation
- [X] No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

7. MAP OF THE SITES

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INSPIRE ID:

Map delivered as PDF in electronic format (optional)

[ ] Yes [X] No

Reference(s) to the original map used for the digitalisation of the electronic boundaries (optional).

EXPLANATION OF CODES USED IN THE SPECIAL AREA OF CONSERVATION (SAC) AND SPECIAL PROTECTION AREA (SPA) STANDARD DATA FORMS

The codes in the table below generally follow those explained in the [redacted] (also referencing the relevant page number).

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	SPA (classified Special Protection Area)	53
B	cSAC, SCI or SAC (candidate Special Area of Conservation, Site of Community Importance, designated Special Area of Conservation)	53
C	SPA area/boundary is the same as the cSAC/SCI/SAC i.e. a co-classified/designated site (Note: this situation only occurs in Gibraltar)	53

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha• rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Habitat representativity (abbreviated to 'Representativity' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent representatively	57
B	Good representatively	57
C	Significant representatively	57
D	Non-significant presence representatively	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	58
B	> 2%-15%	58
C	≤ 2%	58

3.1 Degree of conservation (abbreviated to 'Conservation' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global assessment (abbreviated to 'Global' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	62
B	> 2%-15%	62
C	≤ 2%	62
D	Non-significant population	62

3.2 Degree of conservation (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Other species – essentially covers bird assemblage types

CODE	DESCRIPTION	PAGE NO
WATR	Non-breeding waterbird assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code

BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK04	Site of Special Scientific Interest (GB)	67
UK05	Marine Conservation Zone	67
UK06	Nature Conservation Marine Protected Area	67
UK86	Special Area (Channel Islands)	67
UK98	Area of Special Scientific Interest (NI)	67
IN00	Ramsar Convention site	67
IN08	Special Protection Area	67
IN09	Special Area of Conservation	67

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

---

1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.

DD	MM	YY

Designation date

Site Reference Number

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough
Cambridgeshire PE1 1JY
UK
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948
Email: RIS@JNCC.gov.uk

2. Date this sheet was completed/updated:

Designated: 31 August 2007

3. Country:

UK (England)

4. Name of the Ramsar site:

Humber Estuary

5. Designation of new Ramsar site or update of existing site:

This RIS is for: Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area:

The boundary has been extended

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site included:

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* □;
ii**) an electronic format** (e.g. a JPEG or ArcView image) Yes
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* □;

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

8. Geographical coordinates (latitude/longitude):

053 32 59 N 000 00 03 E

9. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Kingston-upon-Hull

The Humber Estuary is located on the boundary between the East Midlands Region and the Yorkshire and the Humber Region, on the east coast of England bordering the North Sea.

Administrative region: City of Kingston upon Hull; East Riding of Yorkshire; Humberside; Lincolnshire; North East Lincolnshire; North Lincolnshire

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 37987.8

Min. -13
Max. 10
Mean No information available

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Humber Estuary is the largest macro-tidal estuary on the British North Sea coast. It drains a catchment of some 24,240 square kilometres and is the site of the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (max 7.4 m) and approximately one-third of the estuary is exposed as mud or sand flats at low tide. The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed in places by limited areas of grazing marsh in the middle and outer estuary. On the north Lincolnshire coast the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The Estuary regularly supports internationally important numbers of waterfowl in winter and nationally important breeding populations in summer.

13. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

1, 3, 5, 6, 8

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 1

The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.

It is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. Examples of both strandline, foredune, mobile, semi-fixed dunes, fixed dunes and dune grassland occur on both banks of the estuary and along the coast. The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Wave exposed sandy shores are found in the outer/open coast areas of the estuary. These change to the more moderately exposed sandy shores and then to sheltered muddy shores within the main body of the estuary and up into the tidal rivers. The lower saltmarsh of the Humber is dominated by common cordgrass *Spartina anglica* and annual glasswort *Salicornia* communities. Low to mid marsh communities are mostly represented by sea aster *Aster tripolium*, common saltmarsh grass *Puccinellia maritima* and sea purslane *Atriplex portulacoides* communities. The upper portion of the saltmarsh community is atypical, dominated by sea couch *Elytrigia atherica* (*Elymus pycnanthus*) saltmarsh community. In the upper reaches of the estuary, the tidal marsh community is dominated by the common reed *Phragmites australis* fen and sea club rush *Bolboschoenus maritimus* swamp with the couch grass *Elytrigia repens (Elymus repens)* saltmarsh community. Within the Humber Estuary Ramsar site there are good examples of four of the five physiographic types of saline lagoon.

Ramsar criterion 3

The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.

Ramsar criterion 5

Assemblages of international importance:

153,934 waterfowl, non-breeding season

(5 year peak mean 1996/97-2000/2001)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Eurasian golden plover, *Pluvialis apricaria*

altifrons subspecies – NW Europe, W Continental Europe, NW Africa population

17,996 individuals, passage, representing an average of 2.2% of the population

(5 year peak mean 1996-2000)

Red knot, *Calidris canutus*

islandica subspecies

18,500 individuals, passage, representing an average of 4.1% of the population

(5 year peak mean 1996-2000)

Dunlin, *Calidris alpina*
alpina subspecies – Western Europe (non-breeding) population
20,269 individuals, passage, representing an average of 1.5% of the population
(5 year peak mean 1996-2000)

Black-tailed godwit, *Limosa limosa*
islandica subspecies
915 individuals, passage, representing and average of 2.6% of the population
(5 year peak mean 1996-2000)

Common redshank, *Tringa totanus*
brittanica subspecies
7,462 individuals, passage, representing an average of 5.7% of the population
(5 year peak mean 1996-2000)

Common shelduck, *Tadorna tadorna*
Northwestern Europe (breeding) population
4,464 individuals, wintering, representing an average of 1.5% of the population
(5 year peak mean 1996/7-2000/1)

Eurasian golden plover, *Pluvialis apricaria*
altifrons subspecies – NW Europe, W Continental Europe, NW Africa population
30,709 individuals, wintering, representing an average of 3.8% of the population
(5 year peak mean 1996/7-2000/1)

Red knot, *Calidris canutus*
islandica subspecies
28,165 individuals, wintering, representing an average of 6.3% of the population
(5 year peak mean 1996/7-2000/1)

Dunlin, *Calidris alpina*
alpina subspecies – Western Europe (non-breeding) population
22,222 individuals, wintering, representing an average of 1.7% of the population
(5 year peak mean 1996/7-2000/1)

Black-tailed godwit, *Limosa limosa*
islandica subspecies
1,113 individuals, wintering, representing an average of 3.2% of the population
(5 year peak mean 1996/7-2000/1)

Bar-tailed godwit , *Limosa lapponica*
lapponica subspecies
2,752 individuals, wintering, representing an average of 2.3% of the population
(5 year peak mean 1996/7-2000/1)

Common redshank, *Tringa totanus*
brittanica subspecies
4,632 individuals, wintering, representing an average of 3.6% of the population
(5 year peak mean 1996/7-2000/1)

Ramsar criterion 8

The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:
153934 waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

European golden plover , *Pluvialis apricaria apricaria*, P. a. altifrons Iceland & Faroes/E Atlantic	17996 individuals, representing an average of 2.2% of the population (1996-2000)
Red knot , *Calidris canutus islandica*, W & Southern Africa	18500 individuals, representing an average of 4.1% of the population (1996-2000)
(wintering)	
Dunlin , *Calidris alpina alpina*, W Siberia/W Europe	20269 individuals, representing an average of 1.5% of the population (1996-2000)
Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe	915 individuals, representing an average of 2.6% of the population (1996-2000)
Common redshank , *Tringa totanus totanus*,	7462 individuals, representing an average of 5.7% of the population (1996-2000)

Species with peak counts in winter:

Common shelduck , *Tadorna tadorna*, NW Europe	4464 individuals, representing an average of 1.5% of the population (1996/7 to 2000/1)
European golden plover , *Pluvialis apricaria apricaria*, P. a. altifrons Iceland & Faroes/E Atlantic	30709 individuals, representing an average of 3.8% of the population (1996/7 to 2000/1)
Red knot , *Calidris canutus islandica*, W & Southern Africa	28165 individuals, representing an average of 6.3% of the population (1996/7 to 2000/1)
(wintering)	
Dunlin , *Calidris alpina alpina*, W Siberia/W Europe	22222 individuals, representing an average of 1.7% of the population (1996/7 to 2000/1)

Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe	1113 individuals, representing an average of 3.2% of the population (1996/7 to 2000/1)
Bar-tailed godwit , *Limosa lapponica lapponica*, W Palearctic	2752 individuals, representing an average of 2.3% of the population (1996/7 to 2000/1)

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.
See Sections 21/22 for details of noteworthy species
Details of bird species occuring at levels of National importance are given in Section 22

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15. **Biogeography** (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:
Atlantic

b) biogeographic regionalisation scheme (include reference citation):
Council Directive 92/43/EEC

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16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	neutral, shingle, sand, mud, clay, alluvium, sedimentary, sandstone, sandstone/mudstone, limestone/chalk, gravel, nutrient-rich
Geomorphology and landscape	lowland, coastal, floodplain, shingle bar, intertidal sediments (including sandflat/mudflat), estuary, islands, cliffs
Nutrient status	eutrophic
pH	circumneutral
Salinity	brackish / mixosaline, fresh, saline / euhaline
Soil	mainly mineral
Water permanence	usually permanent
Summary of main climatic features	Annual averages (Cleethorpes, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/cleethorpes.html) Max. daily temperature: 13.1° C Min. daily temperature: 6.4° C Days of air frost: 29.0 Rainfall: 565.4 mm Hrs. of sunshine: 1521.9

General description of the Physical Features:

The Humber estuary is approximately 70 km long from the limit of saline intrusion on the River Ouse at Boothferry to the estuary mouth at Spurn Head, where it enters the North Sea. The area of the estuary is approx. 365 km2, and it has a width of 6.6 km at the mouth.

The Humber is a macro-tidal estuary with a tidal range of 7.4 m, the second-largest range in the UK and comparable to other macro-tidal estuaries worldwide. It is a shallow and well mixed estuary, with an average depth of 6.5m rising to 13.2 m at the mouth.

The Humber is the second-largest coastal plain estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. Suspended sediment concentrations are high, and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast. This is the northernmost of the English east coast estuaries whose structure and function is intimately linked with soft eroding shorelines.

Upstream from the Humber Bridge, the navigation channel undergoes major shifts from north to south banks. This section of the estuary is noteworthy for extensive mud and sand bars, which in places form semi-permanent islands.

The estuary covers the full salinity range from fully marine at the mouth of the estuary (Spurn Head) to the limit of saline intrusion on the Rivers Ouse and Trent)). A salinity gradient from north to south bank is observed in the outer estuary, due to the incoming tide flowing along the north bank, while the fresh water keeps to the south bank as it discharges to the sea. As salinity declines upstream, reedbeds and brackish saltmarsh communities fringe the estuary..

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17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

The Humber catchment covers an area of ca. 24,240 km2, more than 20% of the land area of England. Average annual precipitation in the upland areas of the catchment is as much as 1000 mm. Average freshwater flow into the Humber estuary from the rivers is 250 m3s-1, ranging from 60 m3s-1 in drier periods to 450 m3s-1 in wet periods. Peak flows of up to 1500 m3s-1 have been recorded during floods. The rivers Trent and Ouse, which provide the main fresh water flow into the Humber, drain large industrial and urban areas to the south and west (River Trent), and less densely populated agricultural areas to the north and west (River Ouse). The Trent/Ouse confluence is known as Trent Falls.

On the north bank of the Humber estuary the principal river is the river Hull, which flows through the city of Kingston-upon-Hull, and has a tidal length of 32 km, up to the Hempholme Weir. The Hull provides only about 1% of the freshwater input to the estuary. On the south bank, the River Ancholme enters the Humber at South Ferriby, but the tide is excluded by a sluice and a tidal lock. Altogether, the total tidal length of rivers and estuary is 313 km.

There are several major urban centres within the river catchments. Nottingham, Leicester, and the West Midlands/Birmingham conurbation are drained by the Trent, the Leeds-Bradford area in West Yorkshire is drained by the Aire/Calder and the Sheffield/Rotherham/Doncaster area in South Yorkshire is drained by the Don. There are also large rural regions, whose populations are currently experiencing high population growth, while the urban areas are showing a small decline. The 1992 population for the Ouse catchment was 4.1 million, and for the Trent catchment was 7.1 million. The population of Humberside, which comprises North and North-east Lincolnshire, the East Riding of Yorkshire, and Kingston-upon-Hull (Hull), was just under 0.9 million. Land use around the estuary itself is 50-98% agricultural, within only two areas of high population/ industry – the major conurbation around Kingston-upon-Hull (Hull) on the north bank, and several large industrial areas around Grimsby/ Immingham/ Cleesthorpes on the south bank.

The area around the Humber estuary is low-lying, and much land-claim of wetlands and supratidal zones, as well as parts of the intertidal zone, was carried out in the past two centuries. The mid to outer estuary (Humber Bridge to Spurn Point) changed from a region of low water erosion in the 19th century to one of accretion in the 20th century, nonetheless a net loss of intertidal zone of some 3000 ha has taken place since the mid-19th century. Around the estuary some 894 km2 of land are below the 5 m contour, protected by extensive coastal defences. Most of the sediment entering the estuary comes from the North Sea, and a large part of it is believed to come from the continuing erosion of the Holderness Cliffs, which form the coastline to the north of the estuary mouth at Spurn Head. The estuary currently has approximately 1,775 ha of saltmarsh

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Sediment trapping

19. Wetland types:

Marine/coastal wetland

Code	Name	% Area
F	Estuarine waters	66.8
G	Tidal flats	26.4
H	Salt marshes	4.7
E	Sand / shingle shores (including dune systems)	0.8
7	Gravel / brick / clay pits	0.5
Q	Saline / brackish lakes: permanent	0.3
J	Coastal brackish / saline lagoons	0.3
Other	Other	0.1
9	Canals and drainage channels	0.01
Y	Freshwater springs	0.01

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Description

Much of the intertidal area of the Humber Estuary consists of mudflats with fringing saltmarsh. There are smaller areas of intertidal sand flats, and sand dunes. The saltmarsh is both eroding and accreting; although coastal squeeze is resulting in net losses, and cord grass Spartina anglica is a major colonising species. In areas of reduced salinity such as the Upper Humber there are extensive areas of common reed Phragmites australis with some sea club-rush Bolboschoenus maritimus. Mid-level saltmarsh tends to be much more floristically diverse, and in the higher level marsh with its dendritic network of drainage channels, salt pans and borrow pits grasses dominate with thrift Armeria maritima where the marsh is grazed by cattle and sheep. Extensive areas of eel grass Zostera marina and Z. nolti have been known to occur at Spurn Bight, although in recent years records are limited. Behind the sandflats of the Cleethorpes coast the mature sand-dune vegetation contains some locally and nationally rare species including chestnut flat sedge Blysmus rufus, bulbous meadow grass Poa bulbosa and dense silky-bent Apera interrupta. The sand dunes, which cap the shingle spit that forms Spurn Peninsula are dominated by marram grass Ammophila arenaria and patches of dense sea buckthorn Hippophae rhamnoides.

Ecosystem services

Aesthetic

Education

Food

Recreation

Storm/wave protection

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

None reported

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Birds

Species Information

Species Information
Birds
Species currently occurring at levels of national importance:

Great bittern, *Botaurus stellaris*
stellaris subspecies – W Europe, NW Africa (breeding) population
2 booming males, breeding, representing an average of 10.5% of the GB population
(3 year mean 2000-2002)

Eurasian marsh harrier, *Circus aeruginosus*
Europe population
10 females, breeding, representing an average of 6.3% of the GB population
(5 year mean 1998-2002)

Pied avocet, *Recurvirostra avosetta*
Western Europe (breeding) population
64 pairs, breeding, representing an average of 8.6% of the GB population
(5 year mean 1998-2002)

Little tern, *Sterna albifrons*
albifrons subspecies, Western Europe (breeding) population
51 pairs, breeding, representing an average of 2.1% of the GB population
(5 year mean 1998-2002)

Dark-bellied brent goose, *Branta bernicla*
bernicla subspecies
2,098 individuals, wintering, representing an average of 2.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Eurasian wigeon, *Anas penelope*
Northwestern Europe (non-breeding) population
5,044 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Common teal, *Anas crecca*
crecca subspecies, Northwestern Europe (non-breeding population)
2,322 individuals, wintering, representing an average of 1.2% of the GB population

(5 year peak mean 1996/7-2000/1)

Common pochard, *Aythya ferina*
Northeastern & Northwestern Europe (non-breeding) population
719 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Greater scaup, *Aythya marila*
marila subspecies, Western Europe (non-breeding) population
127 individuals, wintering, representing an average of 1.7% of the GB population
(5 year peak mean 1996/7-2000/1)

Common goldeneye, *Bucephala clangula*
clangula subspecies, Northwestern & Central Europe (non-breeding) population
467 individuals, wintering, representing an average of 1.9% of the GB population
(5 year peak mean 1996/7-2000/1)

Great bittern, *Botaurus stellaris*
stellaris subspecies – W Europe, NW Africa (breeding) population
4 individuals, wintering, representing an average of 4.0% of the GB population
(5 year peak mean 1998/9-2002/3)

Hen harrier, *Circus cyaneus*
Europe population
8 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1997/8-2001/2)

Eurasian oystercatcher, *Haematopus ostralegus*
ostralegus subspecies
3,503 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Pied avocet, *Recurvirostra avosetta*
Western Europe (breeding) population
59 individuals, wintering, representing an average of 1.7% of the GB population
(5 year peak mean 1996/7-2000/1)

Great ringed plover, *Charadrius hiaticula*
hiaticula subspecies
403 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Grey plover, *Pluvialis squatarola*
squatarola subspecies, Eastern Atlantic (non-breeding) population
1,704 individuals, wintering, representing an average of 3.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Northern lapwing, *Vanellus vanellus*
Europe (breeding) population
22,765 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Sanderling, *Calidris alba*
Eastern Atlantic (non-breeding) population

486 individuals, wintering, representing an average of 2.3% of the GB population
(5 year peak mean 1996/7-2000/1)

Curlew, *Numenius arquata*
arquata subspecies
3,253 individuals, wintering, representing an average of 2.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Ruddy turnstone, *Arenaria interpres*
interpres subspecies, Northeastern Canada & Greenland (breeding) population
629 individuals, wintering, representing an average of 1.3% of the GB population
(5 year peak mean 1996/7-2000/1)

Great ringed plover, *Charadrius hiaticula*
psammodroma subspecies
1,766 individuals, passage, representing an average of 5.9% of the GB population
(5 year peak mean 1996-2000)

Grey plover, *Pluvialis squatarola*
squatarola subspecies, Eastern Atlantic (non-breeding) population
1,590 individuals, passage, representing an average of 2.3% of the GB population
(5 year peak mean 1996-2000)

Sanderling, *Calidris alba*
Eastern Atlantic (non-breeding) population
818 individuals, passage, representing an average of 2.7% of the GB population
(5 year peak mean 1996-2000)

Ruff, *Philomachus pugnax*
Western Africa (non-breeding) population
128 individuals, passage, representing an average of 1.4% of the GB population
(5 year peak mean 1996-2000)

Whimbrel, *Numenius phaeopus*
islandicus subspecies
113 individuals, passage, representing an average of 2.3% of the GB population
(5 year peak mean 1996-2000)

Common greenshank, *Tringa nebularia*
Northwestern Europe (breeding) population
77 individuals, passage, representing an average of 5.5% of the GB population
(5 year peak mean 1996-2000)

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23. Social and cultural values:

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

Aesthetic
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation
Fisheries production
Livestock grazing
Non-consumptive recreation

Sport fishing
Sport hunting
Tourism
Transportation/navigation

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? No

If Yes, describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

Ownership category	On-site	Off-site
Non-governmental organisation (NGO)	+	+
Local authority, municipality etc.	+	+
National/Crown Estate	+	+
Private	+	+
Public/communal	+	+

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	
Cutting of vegetation (small-scale/subsistence)	+	
Fishing: commercial	+	+
Fishing: recreational/sport	+	+
Gathering of shellfish	+	+
Bait collection	+	+
Permanent arable agriculture		+
Permanent pastoral agriculture	+	+
Hunting: recreational/sport	+	+
Industrial water supply	+	+
Industry	+	+
Sewage treatment/disposal	+	+
Harbour/port	+	+

Flood control	+	+
Irrigation (incl. agricultural water supply)		+
Mineral exploration (excl. hydrocarbons)		+
Oil/gas exploration	+	+
Transport route	+	+
Domestic water supply		+
Urban development		+
Non-urbanised settlements		+
Military activities	+	+
Horticulture (incl. market gardening)		+

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26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
Disturbance to vegetation through cutting / clearing	1	Reedbeds being cut and cleared on margins of pits associated with angling. Management agreements and enforcement to address.	+		
Vegetation succession	1	Lack of reedbed management leading to scrub encroachment. Management agreement to address.	+		
Water diversion for irrigation/domestic/industrial use	1	Abstraction causes reduced freshwater input. Review of consents well advanced but not yet implemented.	+	+	
Overfishing	2	Substantial lamprey by-catch in eel nets in River Ouse.		+	
Pollution – domestic sewage	1	Reduced dissolved oxygen in River Ouse is a barrier to fish migration. Review of consents well advanced but not yet implemented.	+	+	+
Pollution – agricultural fertilisers	1	Reduced dissolved oxygen in River Ouse is a barrier to fish migration. To be addressed through Catchment Sensitive Farming Initiatives and implementation of Water Framework Directive.	+	+	+
Recreational/tourism disturbance (unspecified)	1	Particularly illegal access by motorised recreational vehicles and craft. Control through management scheme.	+		

Other factor	1	Coastal squeeze causing loss of intertidal habitats and saltmarsh due to sea level rise and fixed defences. The Humber Flood Risk Management Strategy has been developed and is being implemented.	+		+

For category 2 factors only. What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors? Overfishing - Overfishing – to be considered through an ‘in-combination’ assessment of possible factors as part of the Review of Consents exercise.
Is the site subject to adverse ecological change? YES

27. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	+
National Nature Reserve (NNR)	+	
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	+
Management agreement	+	+
Site management statement/plan implemented	+	
Area of Outstanding National Beauty (AONB)		+
Special Area of Conservation (SAC)	+	
IUCN (1994) category IV	+	

b) Describe any other current management practices:
The management of Ramsar sites in the UK is determined by either a formal management plan or through other management planning processes, and is overseen by the relevant statutory conservation agency. Details of the precise management practises are given in these documents.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

29. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Fauna.
Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.
Seal populations are monitored by the Sea Mammal Research Unit
Humber Wader Ringing Group
Spurn Bird Observatory
National Nature Reserve monitoring

Environment.
Institute of Estuarine & Coastal Studies, Hull: various
Industrial Concerns: monitoring on behalf of companies such as Associated British Ports and BP
Environment Agency monitoring: various
Geomorphological studies associated with shoreline management planning
National Nature Reserve monitoring

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30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

There are a four National Nature Reserves with associated facilities within the Ramsar site (Spurn, Far Ings, Donna Nook and Saltfleetby – Theddlethorpe Dunes) and a number of other visitor, information and/or education centres including the Spurn Bird Observatory, the Cleethorpes Discovery Centre, Water's Edge and Far Ings. A wide range of Humber wide and area-specific information is available through a range of media (eg leaflets, displays, internet etc) including 'Humber Estuary European Marine Site Codes of Conduct' developed with a range of stakeholders to cover a range of recreational and educational activities and 'Coastal Futures' – a partnership project working with local communities affected by flood risk and associated issues including managed realignment includes proactive education work within schools.

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31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Activities, Facilities provided and Seasonality.

Sailing: marinas at Brough, Winteringham, Hull, Grimsby and South Ferriby.

Bathing etc: Cleethorpes (some 6m visitors/yr).

Walking/Horse riding: throughout

Beach fishing, match sea-fishing, non-commercial bait digging.

Non-commercial samphire collection

Wildfowling

Tourist amusements: Cleethorpes.

Bird watching: throughout but particularly at Blacktoft Sands RSPB reserve and the four National Nature Reserves.

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32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs, European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6EB

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33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House, Northminster Road, Peterborough, PE1 1UA, UK

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34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see **15** above), list full reference citation for the scheme.

Site-relevant references

Site-relevant references

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Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
Telephone**: +41 22 999 0170** • Fax: **+41 22 999 0169** • email: **ramsar@ramsar.org**

STANDARD DATA FORM for sites within the 'UK national site network of European sites'

Special Protection Areas (SPAs) are classified and Special Areas of Conservation (SACs) are designated under:

- the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea) and to a limited extent in Scotland (reserved matters) and Northern Ireland (excepted matters);
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) in Scotland;
- the Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) in Northern Ireland; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area.

Each SAC or SPA (forming part of the UK national site network of European sites) has its own Standard Data Form containing site-specific information. The information provided here generally follows the same documenting format for SACs and SPAs, as set out in the [redacted]).

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

More general information on SPAs and SACs in the UK is available from the [redacted] and [redacted] the JNCC website. These webpages also provide links to Standard Data Forms for all SAC and SPA sites in the UK.

[redacted]

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA), Proposed Sites for Community Importance (pSCI), Sites of Community Importance (SCI) and for Special Areas of Conservation (SAC)

SITE **UK9020329**

SITENAME **Greater Wash**

TABLE OF CONTENTS

1. SITE IDENTIFICATION

Back to top

1.1 Type	1.2 Site code
A	UK9020329

1.3 Site name

Greater Wash

1.4 First Compilation date	1.5 Update date
2018-03	-

1.6 Respondent:

Name/Organisation:	Joint Nature Conservation Committee
Address:	Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY
Email:	

1.7 Site indication and designation / classification dates

Date site classified as SPA:	2018-03
National legal reference of SPA designation	Regulations 15 and 17-19 of The Conservation of Habitats and Species Regulations 2017 (https://www.legislation.gov.uk/uksi/2017/1012/contents/made), and Regulations 12, 19 and 20 of The Conservation of Offshore Marine Habitats and Species Regulations 2017 (http://www.legislation.gov.uk/uksi/2017/1013/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
0.7264	53.2356

2.2 Area [ha]:	2.3 Marine area [%]
353577.86	100.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKH1	East Anglia
UKF3	Lincolnshire
UKZZ	Extra-Regio
UKE1	East Yorkshire and Northern Lincolnshire

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
B	A001	Gavia stellata			w	1407	1407	i		G	B		C	
B	A177	Larus minutus			w	1255	1255	i		M			C	
B	A065	Melanitta nigra			w	3449	3449	i		G	A		C	
B	A195	Sterna albifrons			r	798	798	p		G	A		C	
B	A193	Sterna hirundo			r	510	510	p		G	B		C	
B	A191	Sterna sandvicensis			r	3852	3852	p		G	A		C	

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)

- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N01	99.0
N02	1.0
Total Habitat Cover	100

Other Site Characteristics

3 Marine: Geology: a mixture of coarse sediments, sand, mud, muddy sand and mixed sediments. 4 Marine: Geomorphology: intertidal mudflats and sandflats, subtidal sandbanks and biogenic reef, including Sabellaria reefs and mussel beds.

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC): During the breeding season the area supports Annex I populations of little tern (Sternula albifrons) (798 pairs, 5-year peak mean 2009-2013, 42% of GB breeding population), common tern (Sterna hirundo) (510 pairs, 5-year peak mean 2010-2014, 5.1% of GB breeding population) and Sandwich tern (Sterna sandvicensis) (3,852 pairs, 5-year peak mean 2010-2014, 35% of GB breeding population) (stage 1.1). During the winter, the site also supports populations of overwintering Annex I species: little gull (Hydrocoloeus minutus) (1,255 peak mean 2004/05-2005/06, no current GB population estimate) (stage 1.4) and red-throated diver (Gavia stellata) (1,407 individuals, 5-year peak mean 2002/03-2005/06, 8.3% of GB non-breeding population) (stage 1.1). ARTICLE 4.2 QUALIFICATION (2009/147/EC): Site regularly supports 3,449 Common scoter (Melanitta nigra) (5-year peak mean 2002/03-2007/08, 0.6% of biogeographic population), a regularly occurring migratory species not listed in Annex I of the EC Birds Directive is also supported within the site (stage 1.4).

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
M	G01		b
M	D03		b
H	C03		b
L	H03		b
L	F02		i

Positive Impacts			
Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]

Rank: H = high, M = medium, L = low
Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,
T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions
i = inside, o = outside, b = both

4.5 Documentation

The weblink 'http://jncc.defra.gov.uk/page-6895' allows access to site specific information for all marine MPAs in UK offshore waters.

Link(s): http://consult.defra.gov.uk/natural-england-marine/greater-wash-potential-special-protection-area-com/supporting_docur

http://publications.naturalengland.org.uk/publication/4597871528116224

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

Organisation:	For information about relevant management offshore please contact JNCC
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

[ ]	Yes
[ ]	No, but in preparation
X	No

6.3 Conservation measures (optional)

For available information on relevant conservation measures of the site, including the Conservation Objectives, see section 4.5.

7. MAP OF THE SITES

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INSPIRE ID:

Map delivered as PDF in electronic format (optional)

[ ] Yes X No

Reference(s) to the original map used for the digitalisation of the electronic boundaries (optional).

EXPLANATION OF CODES USED IN THE SPECIAL AREA OF CONSERVATION (SAC) AND SPECIAL PROTECTION AREA (SPA) STANDARD DATA FORMS

The codes in the table below generally follow those explained in the [redacted] on [redacted] (also referencing the relevant page number).

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	SPA (classified Special Protection Area)	53
B	cSAC, SCI or SAC (candidate Special Area of Conservation, Site of Community Importance, designated Special Area of Conservation)	53
C	SPA area/boundary is the same as the cSAC/SCI/SAC i.e. a co-classified/designated site (Note: this situation only occurs in Gibraltar)	53

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha• rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

3.1 Habitat representativity (abbreviated to 'Representativity' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent representatively	57
B	Good representatively	57
C	Significant representatively	57
D	Non-significant presence representatively	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	58
B	> 2%-15%	58
C	≤ 2%	58

3.1 Degree of conservation (abbreviated to 'Conservation' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global assessment (abbreviated to 'Global' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	62
B	> 2%-15%	62
C	≤ 2%	62
D	Non-significant population	62

3.2 Degree of conservation (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Other species – essentially covers bird assemblage types

CODE	DESCRIPTION	PAGE NO
WATR	Non-breeding waterbird assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code

BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK04	Site of Special Scientific Interest (GB)	67
UK05	Marine Conservation Zone	67
UK06	Nature Conservation Marine Protected Area	67
UK86	Special Area (Channel Islands)	67
UK98	Area of Special Scientific Interest (NI)	67
IN00	Ramsar Convention site	67
IN08	Special Protection Area	67
IN09	Special Area of Conservation	67

Appendix B: Summary Table of Sites, Features and Effects

Key

N/A	Effects are not relevant to this feature	N/R	HRA stage not required
No LSE	Likely Significant Effect can be excluded	LSE	Likely Significant Effect cannot be excluded
No AEOI	Adverse Effect On Integrity can be excluded	AEOI	Adverse Effect On Integrity cannot be excluded
C	Construction	O	Operation

Table B1. European sites and qualifying features, and each pathway of effect considered at each relevant HRA Stage for each phase of the proposed development

Site	Qualifying features	HRA Stage	Physical loss of habitat and associated species (Section 4.3)		Physical damage through disturbance and/or smothering of habitat (Section 4.4)		Physical loss or damage of habitat through alterations in physical processes (Section 4.5)		Direct changes to qualifying habitats beneath marine infrastructure due to shading (Section 4.6)		Physical change to habitats resulting from the deposition of airborne pollutants (Section 4.7)		Non-toxic contamination through elevated suspended sediment concentrations (Section 4.8)		Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases (Section 4.9)		Airborne noise and visual disturbance (Section 4.10)		Disturbance through underwater noise and vibration (Section 4.11)		Biological disturbance due to potential introduction and spread of non-native species (Section 4.12)	
			C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
Humber Estuary SAC	H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks	Stage 1 Screening	No LSE	No LSE	LSE	N/A	LSE	No LSE	No LSE	No LSE	N/A	N/A	LSE	N/A	LSE	N/A	N/A	N/A	N/A	N/A	LSE	LSE
		Stage 2 Appropriate Assessment	N/R	N/R	No AEOI	N/R	No AEOI	N/A	N/A	N/R	N/R	N/R	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI
	H1130. Estuaries	Stage 1 Screening	LSE	No LSE	LSE	LSE	LSE	No LSE	No LSE	LSE	No LSE	No LSE	LSE	No LSE	LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE
		Stage 2 Appropriate Assessment	No AEOI	N/R	No AEOI	No AEOI	No AEOI	N/R	N/R	No AEOI	N/R	N/R	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI
	H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats	Stage 1 Screening	LSE	No LSE	LSE	LSE	LSE	No LSE	No LSE	LSE	No LSE	No LSE	LSE	No LSE	LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE
		Stage 2 Appropriate Assessment	No AEOI	N/R	No AEOI	No AEOI	No AEOI	N/R	N/R	No AEOI	N/R	N/R	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI
	H1150. Coastal lagoons	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	H1310. Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
		Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE

Site	Qualifying features	HRA Stage	Physical loss of habitat and associated species (Section 4.3)		Physical damage through disturbance and/or smothering of habitat (Section 4.4)		Physical loss or damage of habitat through alterations in physical processes (Section 4.5)		Direct changes to qualifying habitats beneath marine infrastructure due to shading (Section 4.6)		Physical change to habitats resulting from the deposition of airborne pollutants (Section 4.7)		Non-toxic contamination through elevated suspended sediment concentrations (Section 4.8)		Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases (Section 4.9)		Airborne noise and visual disturbance (Section 4.10)		Disturbance through underwater noise and vibration (Section 4.11)		Biological disturbance due to potential introduction and spread of non-native species (Section 4.12)	
			C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
	H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	H2110. Embryonic shifting dunes	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with Marram	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	H2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	H2160. Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	S1095. *Petromyzon marinus*; Sea lamprey	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	LSE	No LSE	LSE	No LSE	N/A	N/A	LSE	No LSE	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	N/R	No AEOI	N/R	N/R	N/R	No AEOI	N/R	N/R	N/R
	S1099. *Lampetra fluviatilis*; River lamprey	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	LSE	No LSE	LSE	No LSE	N/A	N/A	LSE	No LSE	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	N/R	No AEOI	N/R	N/R	N/R	No AEOI	N/R	N/R	N/R
	S1364. *Halichoerus grypus*; Grey seal	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	LSE	No LSE	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	N/R	N/R	N/R
Humber Estuary SPA	A021 *Botaurus stellaris*; Great bittern (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A021 *Botaurus stellaris*; Great bittern (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A

Site	Qualifying features	HRA Stage	Physical loss of habitat and associated species (Section 4.3)		Physical damage through disturbance and/or smothering of habitat (Section 4.4)		Physical loss or damage of habitat through alterations in physical processes (Section 4.5)		Direct changes to qualifying habitats beneath marine infrastructure due to shading (Section 4.6)		Physical change to habitats resulting from the deposition of airborne pollutants (Section 4.7)		Non-toxic contamination through elevated suspended sediment concentrations (Section 4.8)		Toxic contamination through release of toxic contaminants bound in sediments, and accidental oil, fuel or chemical releases (Section 4.9)		Airborne noise and visual disturbance (Section 4.10)		Disturbance through underwater noise and vibration (Section 4.11)		Biological disturbance due to potential introduction and spread of non-native species (Section 4.12)	
			C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A048 *Tadorna tadorna*; Common shelduck (Non-breeding)	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A082 *Circus cyaneus*; Hen harrier (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A132 *Recurvirostra avosetta*; Pied avocet (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A140 *Pluvialis apricaria*; European golden plover (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A143 *Calidris canutus*; Red knot (Non-breeding)	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	A149 *Calidris alpina alpina*; Dunlin (Non-breeding)	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	A151 *Philomachus pugnax*; Ruff (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A

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			C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	A162 *Tringa totanus*; Common redshank (Non-breeding)	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	A195 *Sterna albifrons*; Little tern (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	Waterbird assemblage	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
Humber Estuary Ramsar	Criterion 1 – natural wetland habitats that are of international importance: Near-natural estuary with component habitats, specifically dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.	Stage 1 Screening	LSE	No LSE	LSE	LSE	LSE	No LSE	No LSE	LSE	No LSE	LSE	LSE	No LSE	LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE
		Stage 2 Appropriate Assessment	No AEOI	N/R	No AEOI	No AEOI	No AEOI	N/R	N/R	No AEOI	N/R	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI
	Criterion 3 – supports populations of plants and/or animal species of international importance:	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	LSE	No LSE	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	N/R	N/R	N/R

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			C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
	Breeding colony of grey seals *Halichoerus grypus* at Donna Nook.																					
	Criterion 5 – Bird Assemblages of International Importance: Wintering waterfowl.	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance: Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Redshank (passage) Shelduck, Golden Plover, Red Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit (overwintering).	Stage 1 Screening	LSE	LSE	LSE	No LSE	LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	LSE	LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	No AEOI	No AEOI	No AEOI	N/R	No AEOI	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	No AEOI	N/R	N/R	N/R	N/R
	Criterion 8 – Internationally important source of food for fishes, spawning grounds, nursery and/or migration path: River lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*.	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	LSE	No LSE	LSE	No LSE	N/A	N/A	LSE	No LSE	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	No AEOI	N/R	No AEOI	N/R	N/R	N/R	No AEOI	N/R	N/R	N/R
Greater Wash SPA	A001 *Gavia stellata*; Red-throated diver (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A065 *Melanitta nigra*; Common scoter (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A177 *Hydrocoloeus minutus*; Little gull (Non-breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A191 *Sterna sandvicensis*; Sandwich tern (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R

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			C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O
		Appropriate Assessment																				
	A193 *Sterna hirundo*; Common tern (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	A195 *Sternula albifrons*; Little tern (Breeding)	Stage 1 Screening	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	No LSE	N/A	N/A	N/A	N/A	No LSE	No LSE	N/A	N/A	N/A	N/A
		Stage 2 Appropriate Assessment	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R

Contact Us

ABPmer

Quayside Suite,
Medina Chambers
Town Quay, Southampton
SO14 2AQ

T +44 (0) 23 8071 1840
F +44 (0) 23 8071 1841
E enquiries@abpmer.co.uk

www.abpmer.co.uk